	Jaipur		Mumbai		Pune		Hyderabad	
School	2015	2016	2015	2016	2015	2016	2015	2016
DPS	3 : 2	4 : 3	2 : 3	2 : 3	7 : 4	7 : 5	7 : 5	3 : 2
FPS	4 : 3	4 : 3	3 : 4	3 : 5	3 : 2	3 : 4	7 : 6	4 : 3
LSP	5 : 2	5 : 3	5 : 4	4 : 5	1 : 2	4 : 5	6 : 5	5 : 2
LPS	7 : 2	7 : 4	7 : 3	7 : 5	3 : 5	7 : 5	8 : 3	7 : 2
PDS	1 : 1	1 : 1	1 : 1	1 : 1	5 : 3	5 : 4	9 : 7	1 : 1
LFS	1 : 2	2 : 3	1 : 2	1 : 2	3 : 4	4 : 5	3 : 2	1 : 2

For any given school, in any year, assume that the number of students in Jaipur was more than that in Mumbai, which in turn was more than that in Pune, and in turn was more than that in Hyderabad.

Also, for any given city, in any year, the number of students followed this pattern n (DPS) > n (FPS) > n (LSP) > n (LPS) > n (PDS) > n (LFS) (Here, n (XYZ) denotes the number of students in the school XYZ in that year).

30. If in 2015, the difference between the number of boys and the number of girls in LSP was 120 and 90 in Jaipur and Pune, respectively, then what was the difference between the number of boys and the number of girls in LSP in Mumbai in that year?
(A) 29 (B) 30
(C) 31 (D) 33

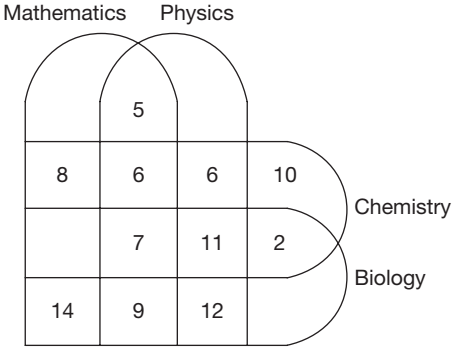
31. If '*boyage*' is defined as the percentage of boys in the total students, then for how many of the given 24 campuses is the value of *boyage* in 2016, more than that in 2015? (Consider each school in each city as a campus.)
(A) 4 (B) 6
(C) 8 (D) 10

32. If the number of girls in LSP, Pune in 2015 is the same as the number of boys in DPS, Mumbai in 2016, then the total number of students in DPS, Mumbai in 2016 is more than the number of students in
(A) FPS, Hyderabad in 2015.
(B) DPS, Pune in 2015.
(C) LFS, Jaipur in 2016.
(D) LPS, Pune in 2015.

33. In 2015, if the number of boys in DPS, Hyderabad is 315, then what is the maximum possible number of girls in LFS, Hyderabad?
(A) 210 (B) 212
(C) 204 (D) 196

Directions for questions 34 to 37: Answer the questions based on the information given below.

The Venn diagram below shows the number of students who study Mathematics, Physics, Chemistry and Biology. The total number of students studying the given subjects in the given order is 64, 76, 63 and 72, respectively.



34. How many students study only Physics?
(A) 11 (B) 20
(C) 12 (D) 14

35. How many students study only Mathematics?
(A) 1 (B) 2
(C) 3 (D) 4

36. How many students study all the four subjects?
(A) 7 (B) 6
(C) 12 (D) 22

37. How many students study either Physics and Mathematics or Chemistry and Biology?
(A) 67 (B) 99
(C) 53 (D) 45

Directions for questions 38 to 41: Answer these questions based on the information given below.

The table gives some information about the foreign exchange reserves of India for a period of ten years from 1990-91 to 1999-2000. Foreign exchange reserves comprise currency holdings and gold holdings. Currency holdings comprise reserves in three foreign currencies, such as in US Dollar, Pound Sterling and Euro.

The following table gives the prices (in ₹) of the three currencies and the price (in ₹) of gold by considering the year 1990–91 as the base year, in which the price of each of the currencies and the price of gold are taken as 100. The prices of each of these in the following years are given relative to that in the base year.

Holdings	Price with respect to the base year (1990–91)									
	1990–91	1991–92	1992–93	1993–94	1994–95	1995–96	1996–97	1997–98	1998–99	1999–2000
US Dollar	100	96	110	96	98	94	102	92	112	98
Pound Sterling	100	110	102	100	96	100	106	98	116	90
Euro	100	104	106	104	104	106	106	96	108	106
Gold	100	102	104	108	110	107	108	109	112	109

(i) Value (in ₹) of a currency (or gold) holding = Volume of the holding × Price (in ₹) of the holding.
(ii) Volume of a currency (or gold) holding = Number of units of that currency (or gold) held.
(iii) The quantity of each currency and that of gold with India remained constant throughout the given period and India had at least one unit of each of the three currencies and gold with it.

38. If the percentage increase in the total value of the foreign exchange reserves from 1990-91 to 1998-99 is x%, then x cannot be equal to
(A) 10 (B) 12.5
(C) 8 (D) 11

39. If the total value of the currency holdings during 1995–96 was more than that in 1990–91, then what is the maximum possible number of years during which the total value of the currency holdings was less than that in 1990–91?

40. In how many of the given years was the total value of the currency holdings less than that in the year 1992-93?

41. During which of the given years was the total value of the foreign exchange reserves the highest?

Directions for questions 42 to 46: Answer the questions based on the information given below.

A total of six colleges, namely from A, B, C, D, E and F jointly conducted an entrance examination. The exam had four sections-I, II, III and IV. The following table gives the sectional cut off marks specified by the colleges and the overall cut off marks. A student will get a call from a college only if he scores at least the sectional and overall cut off marks specified by that college. The maximum marks in each section is 50.

College	Section				
	I	II	III	IV	Overall
A	40		43		160
B		40	42	45	168
C	41		43		165
D		45		42	170
E	43		45		175
F		43		40	167

42. Anuj did not get a call from any of the colleges. What is the maximum marks he could have scored?
(A) 155 (B) 159
(C) 180 (D) 183

43. Ram got a call from only one college. What is the maximum marks he could have scored?
(A) 160 (B) 164
(C) 177 (D) 185

44. Madhuri got calls from all the six colleges. What is the minimum marks she could have scored?
(A) 175 (B) 178
(C) 179 (D) 180

45. Ravi scored a total of 190 marks. What is the minimum number of colleges from where he could have got calls from?
(A) 1 (B) 2
(C) 3 (D) 4

46. Ravi and Raja scored 175 marks each. What could be the maximum difference in the number of calls they got?
(A) 6 (B) 5
(C) 4 (D) 3

Directions for questions 47 to 50: Answer these questions based on the information given below.

A study on population of eight cities was conducted by the human resources and social welfare department. These eight cities were ranked from 1 to 8 based on social welfare and it was found that for any City X, the number of cities with a population less than it was exactly one less than the rank of City X on the basis of social welfare.

The following table gives the comparison of populations of the eight cities.

	Indore	Pune	Bhopal	Shillong	Agra	Cochin	Patna	Mysore
Indore	X	M	L					L
Pune		X			M			
Bhopal			X			L	L	L
Shillong				X				M
Agra					X			
Cochin						X	L	M
Patna							X	M
Mysore								X

M in the table denotes that the population of that city was more and L in the table denotes that the population of that city was less than the corresponding city. For example, the table shows that the population of Indore was more than that of Pune and less than that of Bhopal. It was also known that Indore was 3rd and Shillong was not among the top 5 in the rakings based on social welfare.

47. Which city was ranked first?
(A) Pune (B) Agra
(C) Bhopal (D) Mysore

48. How many cities have less population than Mysore?
(A) 3 (B) 2
(C) 4 (D) 7

49. What was the rank of Shillong based on Social Welfare?
(A) 7
(B) 6
(C) 5
(D) Cannot be determined

50. The cities are ranked again based on the population such that the city with the highest population is ranked 1st that with the second highest population ranked 2nd and so on. Which city would have its rank and the number of cities with a population less than it, as equal?
(A) Shillong (B) Mysore
(C) Bhopal (D) Cochin

EXERCISE-3

Directions for questions 1 to 4: Answer these questions on the basis of the information given below.

Table 8.1 shows the number of ships that arrived at Mumbai port on different days of the week from October 9th to 15th (i.e., from Sunday to Saturday).

Table 8.1

Day	9 Oct Sunday	10 Oct Monday	11 Oct Tuesday	12 Oct Wednesday	13 Oct Thursday	14 Oct Friday	15 Oct Saturday
Number of ships arrived	28	47	40	45	40	35	25

Each of the ships mentioned in Table 8.1 departs from the port in the next week, starting from October 16 to October 22 (i.e., Sunday to Saturday). Table 8.2 shows the number of ships that departed from the port on different days.

Table 8.2

Day	16 Oct Sunday	17 Oct Monday	18 Oct Tuesday	19 Oct Wednesday	20 Oct Thursday	21 Oct Friday	22 Oct Saturday
Number of ships departed	37	43	50	45	35	30	20

Further, no ship arriving at the port can depart from the port on or before the 5th day after the day on which it arrived. Also, no ship can remain at the port after the 10th day after the day on which it arrived. For example, a ship which arrived on Wednesday cannot depart on or before the next Monday, but it must definitely depart on or before the next Saturday.

1. If, of the ships that arrived on Monday, October 10th, 22 ships departed on the next Sunday, then the number of ships that arrived on Sunday, October 9th and departed after the next Sunday is
(A) 13 (B) 15
(C) 22 (D) 24

2. If in the above table, all the ships that arrived on or before Tuesday, left on or before next Tuesday, then the number of ships that arrived on Wednesday and departed on the next Tuesday is
(A) 10 (B) 15
(C) 20 (D) 25

3. If 20 ships that arrived on Wednesday departed on Friday, the number of ships that arrived on Friday and departed on Thursday is at least
(A) 5 (B) 10
(C) 25 (D) 30

4. The number of ships that arrived on Tuesday and departed on Monday is at least
(A) 0 (B) 3
(C) 5 (D) 10

Directions for questions 5 to 8: Answer these questions on the basis of the information given below.

Six students of a class wrote Physics and Chemistry exams. Each exam had nine questions and, in each exam, marks are given based on the number of questions attempted correctly as follows:

Number of correct attempts (n)	Marks
0, 1	$n \times 1$
2, 3, 4	$n \times 2$
5, 6, 7	$n \times 3$
8, 9	$n \times 4$

Note: Assume that no marks are given for wrong answers or unanswered questions.

Further, the results of the exams are as follows:

	Number of questions answered correctly			Total
Student	Physics	Chemistry	Total	marks
A				
B			7	
C			13	
D				24
E				39
F				51
Total	36	30	66	

It is also known that,
(1) The number of questions answered correctly by D in Physics is the same as that of E in Chemistry.
(2) The number of questions answered correctly by F in Physics and Chemistry are equal to the number of questions answered correctly by B and C in Chemistry, not necessarily in the same order.

5. The total marks scored by A is
(A) 21 (B) 25
(C) 29 (D) 36

6. Who scored the second lowest total marks?
(A) A (B) B
(C) C (D) D

7. In Physics, how many students scored more marks than E?
(A) 0 (B) 1
(C) 2 (D) 3

8. How many students scored more marks in Physics than in Chemistry?
(A) 4 (B) 3
(C) 2 (D) 5

Directions for questions 9 to 13: Answer these questions on the basis of the information given below.

The following table gives the details of the number of mock CATs conducted by different institutes in 2004 and the number of these mock CATs written by different students.

	Institute				
Student	P (30)	Q (40)	R (32)	S (24)	T (26)
Akshay	12	21	23	10	22
Bobby	16	20	16	20	11
Chahat	18	33	17	15	8
Daram	14	16	28	16	13
Emran	21	18	18	9	15
Feroz	16	21	15	12	10
Govinda	10	30	20	11	20
Hrithik	20	22	19	17	19

The number given in the brackets is the total number of mock CATs conducted by the respective institutes in 2004.

9. The number of students who wrote at least one mock CAT of each institute in common with Feroz is at least
(A) 0 (B) 1
(C) 2 (D) 3

10. Among the total mock CATs held, the number of mock CATs written by exactly one of Akshay and Hrithik is at least
(A) 18 (B) 20
(C) 23 (D) 26

11. Of the mock CATs conducted by institute R, the number of mock CATs which were written by more than one among Bobby, Emran and Govinda is at least
(A) 8 (B) 11
(C) 13 (D) 15

12. If Daram wrote all the mock CATs which were written by neither Chahat nor Feroz, then the number of mock CATs conducted by institute S and written by Daram, Chahat and Feroz is at most
(A) 6 (B) 7
(C) 8 (D) 9

13. Of the mock CATs conducted by institute Q, the number of common mock CATs written is the highest for
(A) Feroz and Akshay
(B) Hrithik and Chahat
(C) Chahat and Govinda
(D) Daram and Emran

Directions for questions 14 to 17: Answer these questions on the basis of the information given below.

Intra-State Migration Trends in India, 1991

Migration stream	X	Y
R → R	49·67%	76.71%
R → U	27·27%	11·95%
U → U	15·38%	7.04%
U → R	7·68%	4·3%

R = Rural; U = Urban

X = Male migrants in the stream as a percentage of total intra-state male migrants.
Y = Female migrants in the stream as a percentage of total intra-state female migrants.

	Male	Female
% of total intra-state migrants	24.89% (47.04)	75.11% (141.96)

Figures in brackets show absolute number of migrants in millions.

14. Which of the four migration streams mentioned alone has the highest gender ratio? Gender ratio of a stream is defined as the ratio of the number of male migrants to the number of female migrants in that stream.
(A) R → U (B) R → R
(C) U → R (D) U → U

15. Male migrants from urban to urban form what percentage of the female migrants from rural to urban?
(A) 37.8% (B) 42.6%
(C) 48.7% (D) 53.7%

16. What is the percentage of male migrants from urban to rural out of the total migrant population?
(A) 1.9% (B) 2.1%
(C) 2.3% (D) 2.5%

17. Total migrants from rural to rural areas form what percentage of total migrants in all the streams together?
(A) 55.62% (B) 54.89%
(C) 69.97% (D) 73.27%

Directions for questions 18 to 21: Answer these questions on the basis of the information given below.

Six friends, who are from six different cities, were asked about the cities to which each of them and their friends belong. Their replies were as follows.

	Bangalore	Chennai	Delhi	Hyderabad	Kolkata	Mumbai
Aman	Emma	Biswa	Dev	Aman	Charan	Fazal
Biswa	Aman	Fazal	Biswa	Emma	Charan	Dev
Charan	Emma	Fazal	Dev	Biswa	Aman	Charan
Dev	Charan	Biswa	Fazal	Dev	Aman	Emma
Emma	Emma	Biswa	Dev	Charan	Aman	Fazal
Fazal	Biswa	Dev	Fazal	Charan	Emma	Aman

It is known that no two persons gave an equal number of true replies, and that they all belong to a city from among, Bangalore, Chennai, Delhi, Hyderabd, Kolkata and Mumbai and no two persons belong to the same city.

18. Which of the following persons gave the highest number of true replies?
(A) Emma (B) Biswa
(C) Charan (D) Dev

19. The person who belong to Hyderabad is
(A) Aman (B) Biswa
(C) Charan (D) Dev

20. How many persons gave more true replies than Biswa?
(A) 1 (B) 2 (C) 3 (D) 5

21. How many persons gave his/her city name correctly?
(A) 0 (B) 1 (C) 2 (D) 3

Directions for questions 22 to 25: Answer these questions on the basis of the information given below.

A group of four experts, namely Anand, Babu, Charan and David were asked to rate three features—expressions, dialogue delivery and body language-of two artists, such as A_1 and A_2.

Table 8.3 gives the minimum, average and maximum rating given by the four experts on a scale of (0 to 10) where 0, 1, ... are integers.

	Expressions	Dialogue delivery	Body language
A_1	(5, 7.75, 10)	(6, 7.25, 8)	(6,7.5,9)
A_2	(5, 6.75, 8)	(2, 4, 8)	(4, 5.5, 7)

Table 8.4 gives the minimum and maximum rating across the three features for each expert artist combination.

	A_1	A_2
Anand	(5, 9)	(7, 8)
Babu	(6, 8)	(3, 6)
Charan	(6, 10)	(2, 7)
David	(8, 9)	(3, 8)

Table 8.5 given the average rating by experts features separately with average being compared across artists.

Expert	Expressions	Dialogue delivery	Body Language
Anand	6	7.5	8
Babu	6	5.5	6
Charan	8.5	4	6
David	8.5	5.5	6

22. The rating given by Babu for 'Expressions' for A_1 is
(A) 5 (B) 6
(C) 7 (D) 8

23. The rating given by Charan for 'Body language' for A_2 is
(A) 4 (B) 5
(C) 6 (D) 7

24. The rating given by Charan for 'Expressions' for A_2 is
(A) 7 (B) 6
(C) 8 (D) 9

25. The rating given by Anand for 'Dialogue delivery' for A_2 is
(A) 5 (B) 6
(C) 7 (D) 8

ANSWER KEYS

Exercise-1

1. 3:5	10. (B)	19. (B)	28. (D)	37. (A)	46. (C)
2. 20	11. (B)	20. (A)	29. (C)	38. (B)	47. (B)
3. 141	12. (D)	21. (B)	30. (B)	39. (C)	48. (A)
4. 410	13. (C)	22. (C)	31. (D)	40. (C)	49. (D)
5. 9	14. (B)	23. (C)	32. (A)	41. (A)	50. (D)
6. (D)	15. (B)	24. (D)	33. (C)	42. (A)	
7. (B)	16. (D)	25. (B)	34. (B)	43. (D)	
8. (A)	17. (D)	26. (D)	35. (D)	44. (C)	
9. (B)	18. (D)	27. (D)	36. (B)	45. (A)	

Exercise-2

1. (C)	10. 8	19. (B)	28. (D)	37. (C)	46. (B)
2. (B)	11. 94	20. (D)	29. (C)	38. (C)	47. (B)
3. (C)	12. 36	21. (B)	30. (C)	39. 3	48. (C)
4. (C)	13. (B)	22. (B)	31. (C)	40. 6	49. (D)
5. 77	14. (A)	23. (C)	32. (D)	41. 1998–99	50. (B)
6. 77	15. (C)	24. (C)	33. (C)	42. (D)	
7. 0	16. (C)	25. (C)	34. (B)	43. (D)	
8. 26	17. (C)	26. (C)	35. (B)	44. (B)	
9. 0	18. (C)	27. (C)	36. (A)	45. (B)	

Exercise-3

1. (A)	5. (D)	9. (B)	13. (C)	17. (C)	21. (B)	24. (A)
2. (B)	6. (C)	10. (C)	14. (A)	18. (A)	22. (C)	25. (D)
3. (D)	7. (A)	11. (B)	15. (B)	19. (C)	23. (B)	
4. (B)	8. (A)	12. (D)	16. (A)	20. (D)		

SOLUTIONS

EXERCISE-1

1. The ratio of the number of villages that have a population in the range of 3001 – 5000, to the total number of villages having a population in the range of 6001 to 10,000 = 15:25 = 3:5.

2. The percentage of villages having a population in the range of 1000 – 3000 = 10 + 8 = 18%.
The percentage of villages having a population in the range of 3001 – 5000 = 15%.
The required percentage increase = $\frac{3}{15} \times 100 = 20\%$.

3. The percentage of villages having a population in the range of 5001 – 6000 = 20%
The percentage of villages having a population in the range of (6001 – 20,000) = 25 + 22 = 47%.
Given that 20% = 60
$\therefore 47\% = \frac{47}{20} \times 60 = 141$

4. The percentage of villages having a population of at least 3000 = 15 + 20 + 25 + 22 = 82%.
The number of villages having a population of at least 3000 = $\frac{82}{100} \times 500 = 410$

5. Since the number of villages in group-B has to be the minimum, the population of each village has to be the greatest.
$\therefore$ Each village should have a population of 5000 people.
The number of villages = $\frac{45000}{5000} = 9$

6. The number of students playing at least one game = 341.
$\therefore$ The number of students playing none of the games = 159
The number of students playing exactly one game
= 27 + 23 + 31 + 18 = 99
$\therefore$ The number of students playing at most one game = 159 + 99 = 258

7. The number of students who play either cricket or basketball but not football = 27 + 18 + 19 + 8 + 16 + 31 = 119.

8. Students playing at least three games = Students playing exactly three + Students playing exactly four.
= 8 + 13 + 36 + 31 + 37 = 125

9. The number of students playing at most one game = 258.
The number of students playing at least two games
= 500 – 258 = 242.
Difference = 16

10. The number of students who do not play Cricket, Football or Hockey is 31 + 159 = 190

11. We must find the ratio of luxury cars to Fiat cars.
Luxury Fiat cars from the 1st table is 30%.
From the second table, it is 20% of total Fiat cars.
Now,
30% of Luxury = 20% of Fiat

$$\frac{\text{Luxury}}{\text{Fiat}} = \frac{20\%}{30\%} = \frac{2}{3}$$

Similarly,
Small : Maruti = 45 : 20 = 9 : 4
Small : Hyundai = 24 : 16 = 3 : 2
Small : Ford = 45 : 30 = 3 : 2
Small : Fiat = 24 : 24 = 1 : 1
Small : Toyota = 18 : 10 = 9 : 5
Now,
Maruti : Hyundai : Ford : Fiat : Toyota = 4 : 6 : 6 : 9 : 5
Similarly,
Small : Maruti = 9 : 4
Economy : Maruti = 3 : 4
Mid Size : Maruti = 2 : 1
Comfort : Maruti = 25 : 25 = 1 : 1
Luxury : Maruti = 3 : 2
Now,
Small : Economy : Mid size : Comfort : Luxury
9 : 3 : 8 : 4 : 6

12. The number of Luxury Fords = 150
$\therefore$ Total number of Ford cars = 1500
So also, the total number of Luxury cars = 1500
The number of Hyundai cars sold = 1500
(as Hyundai : Ford = 1 : 1)
The number of Economy cars sold = 750
(as Economy : Luxury = 1 : 2)
Of them, Economy Hyundai (90) are already counted.
$\therefore$ Hyundai or Economy cars = (1500 + 660 = 2160)

13. Toyota as a percentage of total

$$= \frac{5}{4+6+6+9+5} = \frac{5}{30} = 16.67\%$$

Percentage difference between small and midsize cars among Toyota cars sold = 2%
$\therefore$ 2% of 16.67% of total = 10
0.33% of total = 10
$\therefore$ Total = 3000

14. Number of students who scored 50 or more marks in Social = 131.
Number of students who scored 60 and above in Social = 104.

Those who scored 50 or more but less than 60 in Social = 131 – 104 = 27.

15. Total number of students = 160
Those who scored 50 and above = 117
Those who scored less than 50 = 160 – 117 = 43

16. Number of students who scored 50 or more but less than 70.
In Maths = 127 – 83 = 44
In Marathi = 139 – 91 = 48
In Social = 131 – 103 = 28
In Statistics = 149 – 108 = 41
In English = 117 – 93 = 24
The number of students is the highest for Marathi.

17. A student who scored more than 60 marks in Maths might not have not scored more than 60 marks in Marathi. Hence, we cannot determine the number of students who scored more than 60 marks in all the given subjects.

18. Total number of students = 160
Those who scored 60 or more in Marathi = 113
Those who scored less than 60 = 160 – 113 = 47

Solutions for questions 19 to 22: It is said that the company made a profit in each of the given years. That is in each year, Sales > Expenses. Let the value of the sales in the given years be $100x$, $130x$, $160x$, $140x$, $200x$ and $230x$, respectively and the values of expenses be $100y$, $120y$, $160y$, $210y$, $90y$ and $230y$, respectively. Since sales is greater than expenses in each year, $140x > 210y$ or $x > 1.5y$.

The minimum values of sales and the value of expenses and the minimum value of profit in terms of y are as follows.

Year	Sales	Expenses	Profit
2010	$150y$	$100y$	$50y$
2011	$195y$	$120y$	$75y$
2012	$240y$	$160y$	$80y$
2013	$210y$	$210y$	$0y$
2014	$300y$	$190y$	$110y$
2015	$345y$	$230y$	$115y$

19. In the years 2011, 2012 and 2015, the sales, expenses and profits of the company increased or decreased in unison.

20. At least in the years, 2011, 2012, 2014 and 2015, the profits of ABC Corporation increased when compared to the previous year.

21. If profitability in the year 2012 was 50%, $160x = 320y$ or $x = 2y$.
In 2014, Sales = $200 \times 2y = 400y$
Expenses = $190y$
$\therefore$ Profitability = $\frac{210}{400} \times 100 = 52.5\%$

22. Even for the minimum possible value, i.e., when $x = 1.5y$, we can see that the profit is the highest in the year 2015. For any higher value of sales also the profit is going to be the highest in 2015.

23. The number of Tamil movies which collected ₹ 40 crore or more but less than ₹80 crore= 131 – 93 = 38.

24. As we do not know the number of movies which collected less than ₹ 20 crore, we cannot find the answer.

25. The number of movies which collected ₹60 crore or more but less than ₹100 crore in the different language are as follows.
Hindi = 107–63 = 44
Tamil = 119 – 71 = 48
Telugu = 111 – 83 = 28
Kannada = 129 – 88 = 41
English = 97 – 73 = 24
The highest is for Tamil.

26. From the previous question, the value is
44 + 48 + 28 + 41 + 24 = 185.

27. For maximum collection, we have to assume that the lowest 25 (170 – 145) movies collected only slightly less than ₹ 20 crore and movie in each range collected the maximum possible revenues in that range.
The maximum collection = $25 \times 19.99 + 22 \times 39.99 + 16 \times 59.99 + 19 \times 79.99 + 25 \times 99.99 + 63 \times 140$
$\simeq 25 \times 20 + 22 \times 40 + 16 \times 60 + 19 \times 80 + 25 \times 100 + 63 \times 140$
= 500 + 880 + 960 + 1520 + 2500 + 8820
= ₹15180 crore

Solutions for questions 28 to 31: As it is mentioned that 35 students passed out of Class IV at the end of year I, three students who were in Class IV in year I failed in the class and as the number of students in Class IV in year II was 32, it means that 29 students got promoted from Class III at the end of year I.

$\therefore$ 2 students failed in Class III in year I, as there were 39 students in Class III in year II, 37 students were promoted from Class II.

$\therefore$ 5 students failed in Class II in year 1 and as there were 38 students in Class II in year II, 33 students were promoted from Class I. Therefore, 3 students failed in Class I in year I and 31 students newly joined in year II. The following can be represented in a table as follows.

Class	Students in Year I	Promoted	Failed	Students in Year II
I	36	33	3	34
II	42	37	5	38
III	31	29	2	39
IV	38	35	3	32

28. 31 students joined the school in year II.

29. 3 students failed in class I in year I.

30. 29 students were promoted from class III at the end of year I.

31. 13 students in the school failed in the annual exams in year I.

32. The maximum number of emails (in billion) expected to be sent from Hotmail to Hotmail account.
= (2074) – (300 + 317 + 3) = 2074 – 620 = 1454

33. The required number = (317 + 198 + 1 + 1) = 517.

34. The maximum number of emails expected (from yahoo to Hotmail)
= Min [(2074) – (300 + 317 + 3), (2183) – (180 + 100 + 85 + 2)]
= Min [(2074 – 620), (2183 – 367)]
= Min [1454, 1816] = 1454.
Choice (B)

35. Maximum number of emails can be sent from Msn or Eudora.
The maximum number of emails that could be sent from Msn = 10,000 – (1182 + 1784 + 2074 + 85 + 372 + 4 + 1818) = 10,000 – (7319) = 2681
The maximum number of emails that could be sent from Eudora = 10,000 (1182 + 1784 + 2074 + 386 + 198 + 4 + 1818) = 10,000 – (7446) = 2554
The maximum number of emails sent from Msn to Mailcity = 2681 – (386 + 198 + 3) = 2094
The maximum number of emails sent from Eudora to Hotmail or Msn = 2554 – (372 + 85 + 3) = 2094
∴ The maximum number of emails sent from one email account to another = 2094

Solutions for questions 36 to 40: If we convert the distribution of income from degrees to percentages, we get the incomes of Varun, Tarun, Arun, Karan and Charan as a percentage of total income of the family as 45%, 30%, 10%, 9% and 6%, respectively.

36 If Varun did not pay for 'Others', he can fully pay for fuel (8%), phone and electricity bill (10%) and rent (20%) or clothing (25%).

37. To get the least number of heads of expenses paid by more than one person, Varun (45%) must pay for clothing (25%) and rent (20%), Tarun (30%) must pay for food (30%), Arun (10%) must pay for the phone and electricity bill (10%) and Karan (9%) must pay for fuel. Only 'Others' (7%) is paid by Charan (6%) and Karan (1%).

38. If Varun does not spend any amount on food, his expenditure will be only on the remaining items. As remaining items constitute 70%, out of which 30 percentage points are contributed by Varun. If Varun fully contributes to fuel, phone and electricity bill and others, then his contribution on rent and clothing will become the least.
∴ The required percentage

$$= \frac{45 - (10 + 8 + 7)}{45} \times 100 = 44.44\%$$

39. The bill for food is 30%, and at most 40% of each person's income can be paid for food. If we use 40% of each person's income, we get 40% of the total. As we need only 30%, i.e., 75% of 40%, 25% of the total income need not be used.
As the sum of the incomes of Arun, Karan and Charan is 25%, if we use 40% of incomes of only Varun and Tarun, then all expenses of food can be accounted for.

40. As 5% of each of the expenses is contributed by Karan, his contribution will become maximum for that item which has the least value and, in this case, it is 'Others'.

$$\text{Required percentage} = 5\% + \frac{4}{7} \times 100 = 62.14\%$$

41. Let us fix the countries and the universities based on the information from the 3rd day to the 1st day.
On day 3, as there are 3 logins from different countries and from different universities, University D should be in Germany and University G should be in UK.
In the same way, based on the 2nd day's information, University E should be in USA and University A should be in Philippines.
In the same way, from the 1st day's information University B or F or C should be in China. University B or C or F should be in any other country other than Philippines or Germany.
∴ University E should be in USA.

42. University G is in UK.

43. Among the given countries, no country can host three universities.

44. As University A is in Philippines, it is not located in China.

45. University A is in Philippines.

46. As all passengers in the bus got down at city B, the required number is
(14 + 12 + 7 + 10 + 8) – (5 + 10 + 12 + 11) = 13

47. All the passengers who got in at stop 1 would have boarded the bus at city A.
∴ At most 14 – 5 = 9 passengers who got in at city A got down at Stop 2.

48. All the 10 people who got in at Stop 3 could have got down at the next stop and so none of them might have got down at the last stop.

49. Of the 12 passengers who got in at Stop 1, at least one got down at Stop 2 and at least 5 got down at Stop 3.
∴ At most 12 – (1 + 5) = 6

50. Of the 14 passengers who got in at city A, at most nine of them could have got down at Stop 3. Only two of the people who got in at Stop 1 could have got down at Stop 4 (as 10 of them would have got down at Stop 2). Among the seven people who got in at Stop 2, three of them would have got down at Stop 3 and four of them could have got down at city B, the third stop from where they got in
∴ At most 9 + 2 + 4 = 15 passengers could have got down at the third stop from where they got in.

Exercise-2

1. If the sales in the year 2003 were ₹120 crore, then its value in the year 2006 was
120 × 1.21 × 1.18 × 1.14 = 120 × 1.65 = 198 crore.

2. Let the value of sales in 2003 be 100.
The approximate values in the other years would be 2004–121, 2005–143, 2006–163, 2007–174.
The highest increase is in 2005.

3. As, till the year 2006 the growth in profit in each year is less than that of sales and the growth of profit in 2007 is more than that of sales, the profitability would be the least in 2006.

4. As the number of students is 260 and the total number of instances is 414, the minimum and maximum values of students taking only one hobby is 106 and 183.
∴ Only 120 is possible.

5. The minimum number of students who opted for at least two hobbies would be when all the students opted for exactly one or three hobbies and is obtained as follows.

$$x + y = 260$$
$$x + 3y = 414$$
$$y = 77$$

6. As in the previous question, the maximum number of students who opted for three hobbies would be 77.

7. All the students could have opted for one or two hobbies and so the minimum number of students who opted for exactly three hobbies is 0.

8. The maximum number of students in section A who passed in all the four subjects is 26.

9. In section C, 14 students have failed in Maths, 6 students in Physics, 9 students in Chemistry and 11 students in Biology. If all these students are distinct, 14 + 6 + 9 + 11 = 40 students would have failed in one subject each and so no student passed in all the four subjects.

10. For having the maximum number of students passing in exactly one subject, you should have the maximum number of students passing in all the four.
If x is the number of students in section B who passed in exactly one subject and y is the number of students who passed in exactly four subjects, then
$x + y = 40$ and $x + 3y = 136$
$x = 8$ and $y = 32$

11. The maximum number of students who passed in both Physics and Chemistry in the different sections are as follows.
A-31, B-32 and C-31, i.e., 31 + 32 + 31 = 94

12. We need to find the maximum number of students who passed in all the four subjects in each of the three sections, the values are as follows.
Section A – 26
Section B – 32
Section C – 26
Total 84.
∴ At least 120 – 84 = 36 students in the school failed to clear the Class X exam.

Solutions for questions 13 to 17: Sachin scored 18.18% of his runs in sixers (6s)
If we assume he scored the minimum number of 6s, i.e., one six, he would have scored six runs in sixers. As the percentage of runs scored in sixers is 18.18, his total score would be $\frac{6}{18.18} \times 100 = 33$
∴ Sachin has scored at least 33 runs.
But if he had scored only 33 runs, the total score would be 125 and since Kaif scored 10% of the total, the total score cannot be 125. So, we have to consider the next possibility, i.e., 250. When the total is 250, all the conditions are satisfied.

13. Dravid scored 20 runs of which 8 are in boundaries. Of the remaining 12, he scored an equal number of 1s and 2s or he scored 4 runs in singles.

14. Of all the players, the one with the highest number of boundaries was Sachin.

16.

	4s	6s
Sachin	6	2
Sehwag	2	2
Dravid	2	0
Kaif	4	0
Dhoni	5	5
Total	19	9

Total runs scored = $19 \times 4 + 9 \times 6 = 76 + 54 = 130$

17. Dhoni scored five sixers (6s).

18. The medical expenses increased from 6% of total expenses to 10% of the total which is the highest increase along with expenses on clothing. But as the increase of medical expenses is on a lower base, the expenses under that head would have the highest percentage increase.

19. The percentage share of entertainment expenses has fallen the most from 2005 to 2007. As it is given that the expenses under each head in 2007 was more than the corresponding value in 2005, assuming that the total expenses in 2005 and 2007 to be x and y, respectively.

$0.15\,y > 0.17\,x$

$\therefore 15\,y > 17x$

$\frac{y}{x} > \frac{17}{15}$

$\therefore$ Total expenses in 2007 was at least 13.33% more than the corresponding value in 2005.

20. If the total expenses in 2006 and 2008 are x and y, respectively,

$$\frac{5}{4} \times 0.05x = .10y$$

$$\frac{0.25}{4}x = .10y$$

$$\frac{x}{y} = \frac{40}{25} = \frac{8}{5}$$

$\therefore$ Expenses on clothing in 2008 = $14 \times 5 = 70$

Expenses on entertainment in 2006 = $15 \times 8 = 120$

$\therefore$ The required percentage = $\frac{70}{120} \times 100 = 58.33\%$

21. Let expenses on rent in 2005 be ₹14.

$\therefore$ Total expenses in 2005 = ₹100

Expenses on rent in 2008

$= 14 \times 1.1 \times 1.1 \times 1.1 = 14 \times 1.331 = 18.65$

Expenses on food in 2005 = ₹15

Expenses on food in 2008 = ₹18.65

$\therefore$ The percentage increase = $\frac{18.65 - 15}{15} \times 100 = 24.3\%$

Solutions for questions 22 to 25: As it is said that in reasoning none of the other three persons scored more than Chetan, Chetan is either A or C. From the second condition we can conclude that Balu and Anand is one among A or D in any order or one among B or C in any order.

22. If Deepak scored the lowest marks in the reasoning section, Deepak is student B which means Balu and Anand are one of A and D in any order and so Statement II would be false.

23. If Balu's lowest score is in the reasoning section, Balu is student B and Anand is student C and the statement that Anand's lowest score is in the quantitative section is true.

24. If Anand gets the highest score in the verbal section, he is student B and Balu is student C.

$\therefore$ Both statements cannot be simultaneously true. Anand and Balu can also be A or D in any order in which case both statements would be false.

$\therefore$ At most one of the statements is true.

25. If Deepak gets his lowest score in the verbal section, he is student D in which case Chetan is student A.

26. If Mercedes Ltd. had its lowest sales in Japan, Mercedes Ltd. is Company B and Toyo Ltd. is Company C while BWM Ltd. is Company A.

$\therefore$ If Statement 1 is true, then Statement 2 is necessarily true.

27. If Form Ltd. had its lowest sales in USA, then it is either Company A or Company D.

Case 1: Form Ltd. is Company A, then BWM Ltd. is Company C and the second condition cannot be satisfied.

Case 2: Form Ltd. is Company D. Then BWM Ltd. is Company A, and Mercedes Ltd. and Toyo Ltd. are companies B and C in any order.

$\therefore$ BWM Ltd. has its lowest sales in USA.

28. Using either statement (B) or statement (D) we can uniquely determine each of the four companies.

29. If Toyo Ltd. had the highest sales in USA, then it is Company B and Mercedes Ltd. is Company C and BWM Ltd. is Company A.

If Mercedes Ltd. had the highest sales in UK, then it is Company B and Toyo Ltd. is Company C in which case BWM Ltd. is Company A.

$\therefore$ If one of the statement is true, then the other must be false.

If Company B is Form Ltd., then Company C is BWM Ltd. and Toyo Ltd. and Mercedes Ltd. are one of companies A and D in any order.

$\therefore$ At most one of the two statements is true.

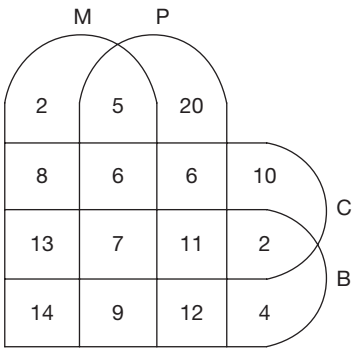
30. In 2015, the difference between the number of boys and the number of girls in LSP, Jaipur is 120.
∴ Number of students in the school is 280.
The difference between the number of boys and girls in LSP, Pune is 90.
The total number of students in LSP, Pune is 270.
The number of students in LSP, Mumbai must be between 270 and 280 and must be a multiple of 9.
It must be 279.
The difference between the number of boys and the number of girls is 31.

31. The value of *boyage* increased for DPS – Hyderabad, FPS – Hyderabad, LSP – Pune, LSP – Hyderabad, LPS – Pune, LPS – Hyderabad, LFS – Jaipur and LFS – Pune, i.e., a total of 8 schools.

32. As the number of girls (i.e., 2/3) in LSP, Pune in 2015 is same as that of boys in DPS, Mumbai in 2016, i.e.,
$\frac{2}{5}$(the number of students in DPS, in Mumbai, in 2016).
⇒ Number of students in LSP, Pune in 2015 < Number of students in DPS, Mumbai in 2016.
Number of students in DPS, Mumbai in 2016 will be definitely more than LPS, Pune in 2015.

33. The number of students in Hyderabad in DPS = 540
Maximum possible number of students in FPS is as follows:
In Hyderabad = 533 (multiple of 7 + 6 = 13)
In LSP, in Hyderabad = 528 (multiple of 6 + 5 = 11)
In LPS, in Hyderabad = 517 (multiple of 8 + 3 = 11)
In PDS, in Hyderabad = 512 (multiple of 9 + 7 = 16)
In LFS, in Hyderabad = 510 (multiple of 3 + 2 = 5)
∴ Number of girls = 204.

Solutions for questions 34 to 37:



34. 76 – (5 + 6 + 6 + 7 + 11 + 9 + 12) = 20.

35. 64 – (5 + 8 + 6 + 13 + 7 + 14 + 9) = 2.

36. By observation, only seven students study all the four subjects.

37. Physics and Mathematics = 5 + 6 + 7 + 9 = 27
Biology and Chemistry = 13 + 7 + 11 + 2 = 33
Maths, Physics, Chemistry and Biology = 7
∴ 27 + 33 – 7 = 27 + 33 – 7 = 53.

38. The least growth from 1990–91 to 1998–99 is in the price of Euro, i.e., 8% and the highest is for Pound Sterling, i.e.,16%. The value must be greater than 8% and less than 16%.

39. Since the total currency holdings in 1995–96 were more than that of 1990–91, it can be concluded from the data that it can be possible only when the percentage share (by volume) of Euro in currency holding is more than that of US Dollar. Comparing the values of currency holding for different currencies in different years, we get only three possible years (1994–95, 1997–98 and 1999–2000).

40. Comparing the currency reserves with the currency reserves in 1992–93, we can observe that the total currency holdings were less than those in the year 1992–93 in the years (90–91, 93–94, 94–95, 95–96, 97–98, 99–00). Therefore, there are 6 such years.

41. By observation it can be seen that in the year 1998–99, the value of each of the currency and the price gold was the highest, therefore, irrespective of shares of individual currencies in total reserves, the year 1998–99 had the highest reserves.

42. If Anuj scores 50, 42, 41, and 50 marks in Sections I, II, III and IV, respectively, then he would miss the cut off of colleges D and F due to Section II and would miss the cut off of colleges A, B, C and E due to Section III score. So, he would not get a single call even with a score of 50 + 42 + 41 + 50 = 183 marks.

43. If Ram scores 50, 44, 41 and 50 in Section I, II, III and IV, respectively, then he would get a call from only college F with a score of 185 marks.

44. To get calls from all colleges, she needs to score at least 43 in Section I, 45 in Section II, 45 in Section III and 45 in Section IV. The total (43 + 45 + 45 + 45 = 178) is also more than the overall cut off of all the colleges.

45. If Ravi scores 50 marks each in Sections I, II and IV and scores only 40 marks in Section III, he would only get calls from colleges D and F.

46. With a minimum of 174 marks (41 in Section I, 45 in Section II, 43 in Section III and 45 in Section IV) one can get calls from all colleges other than E. As seen from the first question, one can score 175 marks and still not get a call from any college. Therefore, the maximum difference is 5.

47. Here, it is given that for any City X, the number of cities with a population less than it was exactly one less than its rank, i.e., the city with the lowest population is ranked as 1. So, the city with the highest population is ranked as 8, it means that its population is greater than all the other 7 cities.
From the given table, we can say that all cities except Agra have more population than at least one other city.
∴ Agra was ranked first.

48. Here, we can tabulate all the information as follows:

	Indore	Pune	Bhopal	Shillong	Agra	Cochin	Patna	Mysore
Indore	X	M	L	L	M	L	L	L
Pune		X	L	L	M	L	L	L
Bhopal			X	L	M	L	L	L
Shillong				X	M			M
Agra					X	L	L	L
Cochin						X	L	M
Patna							X	M
Mysore								X

We know that Agra has the lowest population. Accordingly, we can fill Agra's spaces.
After doing this we can see that except for Pune and Agra, all the cities have a population more than at least 2 cities. So, Pune was ranked second. Accordingly, we can fill the remaining.
It is given that Indore was ranked third.
∴ Bhopal was ranked fourth and Mysore was ranked fifth, i.e., four cities have a lesser population than Mysore.

50. The city ranked fourth in terms of population, i.e., Mysore would have its rank according to population and the number of cities having a population less than it as equal.

Exercise–3

Solutions for questions 1 to 4: From the given data the following table can be constructed.

		Departure Day							
		Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
Arrival Day	Sun	a	b	c	d	-	-	-	28
	Mon	e	f	g	h	i	-	-	47
	Tue	-	j	k	l	m	n	-	40
	Wed	-	-	o	p	q	r	s	45
	Thu	-	-	-	T	u	v	w	40
	Fri	-	-	-	-	x	y	z	35
	Sat	-	-	-	-	-	a'	b'	25
	Total	37	43	50	45	35	30	20	

1. Given that: $e = 22$
$\Rightarrow a$ is $(37 - 22) = 15$
$\therefore b + c + d$ is $(28 - 15) = 13$
The number of ships that arrived on Sunday and departed after the next Sunday is 13.

2. From the table,
$d + h + i + l + m + n = 0$
$\Rightarrow a + b + c + e + f + g + j + k = 28 + 47 + 40 = 115$
And also, $a + b + c + e + f + g + j + k + o$
$= 37 + 43 + 50 = 130$
$\Rightarrow o = 15$
$\therefore o$ is 15.

3. From the table, $n + r + s + v + w + y + z + a' + b^1$
$= 30 + 20 = 50$
$a' + b' = 25$
$n + r + s + v + w + y + z = 25$
As $r = 20$, the maximum value of $y + z = 5$
As $x + y + z = 35$, the least possible value of x is 30.

4. From the table, $a + b + e + f + j = 80$
$(a + b + e + f)$ is at the most 75.
$\therefore j$ is at the least 5.

Solutions for questions 5 to 8: As D got 24 marks, the only possibility is
$3 \times 2 + 6 \times 3$ (=24)
$\Rightarrow$ 9 correct attempts.
Now as E got 39 marks, the only possibility is
$(7 + 6) \times 3$ (= 39)

⇒ 13 correct attempts.
But given that D and E got the same number of correct answers in Physics and Chemistry respectively (i.e., 6 correct answers)
⇒ D has 3 correct answers in Chemistry and E has 7 correct answers in Physics.
As F got 51 marks the only possibility is
$9 \times 4 + 5 \times 3$ (= 51)
⇒ F has 14 correct answers.
But given that B and C has the number of correct answers in Chemistry as the correct answers of F in different subjects.
⇒ B and C got 5 and 9 correct answers in Chemistry respectively.
(∴ Total correct answers of B is 7)
⇒ B and C got 7 – 5 = 2 and 13 – 9 = 4 correct answers in Physics.
As the total correct answers of B, C, D and E in Chemistry = 5 + 9 + 3 + 6 = 23.
F can have at most 7 correct answers in Chemistry.
⇒ F has 5 correct answers in Chemistry and 9 in Physics.
⇒ A has 8 and 2 correct answers in Physics and Chemistry, respectively.

	Physics	Chemistry	Total	Marks
A	8	2	10	36
B	2	5	7	19
C	4	9	13	44
D	6	3	9	24
E	7	6	13	39
F	9	5	14	51
Total	36	30	66	213

5. A scored 36 marks.

6. D scored the second lowest total marks.

7. In Physics, only A and F scored more marks than E

8. A, D, E and F got more marks in Physics than in Chemistry.

9. Feroz wrote 16 mock CATs conducted by institute P. Hence, the person who wrote more than 30 – 16 = 14 mock CATs conducted by P would have written at least one Mock CAT in common with Feroz.
Similarly, the values for Q, R, S and T are 19, 17, 12 and 16, respectively.
Only Hrithik satisfies the required condition.

10. The value will be the least when maximum number of mock CATs are written by both or none.
Among the tests conducted by P, at least 20 – 12 = 8 tests are written by exactly one of Akshay and Hrithik.
Similarly, the values for Q, R, S and T are 1, 4, 7 and 3, respectively.
∴ Required value = 8 + 1 + 4 + 7 + 3 = 23.

11. Among the 32 Mock CATs conducted by R, Bobby, Emran and Govinda wrote 16, 18 and 20, i.e., a total of 54 instances.
For the number of Mock CATs written by more than one of them to be minimum, maximum possible tests are to be written by one or three persons.
If each Mock CAT is assigned one person, 54 – 32 = 22 instances will be left.
Among these 22 instances, 2 instances per Mock CAT be assigned to 11 Mock CATs.

12. For the value to be maximum, each Mock CAT must be written by one or three persons.
Total instances = 16 + 15 + 12 = 43.
$\therefore$ Required value $= \frac{43-24}{2} = 9.$

13. A total of 40 Mock CATS were conducted by institute Q. Among these, Chahat and Govinda wrote at least 33 + 30 – 40 = 23 Mock CATs in common.
As no other person has written more than 23 Mock CATs in common with any person.
Hence, it is the highest for Chahat and Govinda.

14. By observation,
only R → U and U → U are the possible choices.

$$U \to U = \frac{15.38(\text{males})}{7.04(\text{females})} \cong 2.2$$

$$R \to U = \frac{27.27(\text{males})}{11.95(\text{females})} \cong 2.3$$

∴ Maximum gender ratio is R → U.

15. The ratio of total number of female immigrants to male immigrants is

$\frac{75.11}{24.89} \cong 3$. It is slightly more than 3.
Now the required value is:

$$\frac{15.38}{11.95 \times 3} \times 100 = \frac{11.38}{35.85} \times 100 \cong 43\%$$

The value will be slightly less than 43%.

16. Total male migrants from urban to rural areas is
= 7.68% of total male migrants

$$\cong 7.68\% \times \frac{1}{4} \times \text{total migrants}$$

≅ 1.9% of total migrants.

17. The ratio of total male migrants and total female migrants is 1 : 3.
Now total migrants from rural to rural areas as a percentage of total migrants from all streams can be found out by using allegations method, i.e.,

$= 76.71 - \dfrac{(76.71 - 49.67) \times 1}{(1+3)}$

$= 76.71 - 6.76 = 69.95\%$

As the actual ratio is a bit more than 1 : 3, the value will be slightly more than 69.95%.

Solutions for questions 18 to 21: As given that no two persons gave equal number of true replies, the number of true replies is 0, 1, 2, 3, 4 and 6 (as if five replies are correct the sixth reply also has to be correct).

If all the replies of Aman are correct, then Biswa and Dev will have equal number of correct replies, i.e., 1 each.

Similarly, if all the replies of Biswa are correct, then Aman and Charan will have 1 each as correct replies.

If all the replies of Charan are correct, then Biswa and Dev will have 1 each as correct replies.

Similarly, Dev and Fazal also cannot have all the replies correct.

∴ If all the replies of Emma are correct, then

Aman – 4
Biswa – 0
Charan – 3
Dev – 2
Emma – 6
Fazal – 1

∴ The persons and the city pairs are as follows:

Emma – Bangalore; Charan – Hyderabad, Biswa – Chennai; Aman – Kolkata, Dev – Delhi; Fazal – Mumbai

21. Only Emma gave her city name correctly.

Solutions for questions 22 to 25: Taking data from the three tables, we can arrive at the following expert, actor and feature combination.

	A_1			A_2		
	Expressions	**Dialogue delivery**	**Body language**	**Expressions**	**Dialogue delivery**	**Body language**
Anand	5	7	9	7	8	7
Babu	7	8	6	5	3	6
Charan	10	6	7	7	2	5
David	9	8	8	8	3	4

22. The rating given by Babu for 'Expressions' for A_1 is 7.

23. The rating given by Charan for 'Body language' for A_2 is 5.

24. The rating given by Charan for 'Expressions' for A_2 is 7.

25. The rating given by Anand for 'Dialogue delivery' for A_2 is 8.

9 OMET Based DI

CHAPTER

Learning Objectives

In this chapter, you will:

- Learn about different types of questions which have appeared in Other Management Entrance Tests (OMETs)
- Learn how to convert data from one form of presentation to other forms
- Practise questions that involve a lot of calculations and data
- Learning shortcuts to approximate and find the required value, thereby avoiding cumbersome calculations

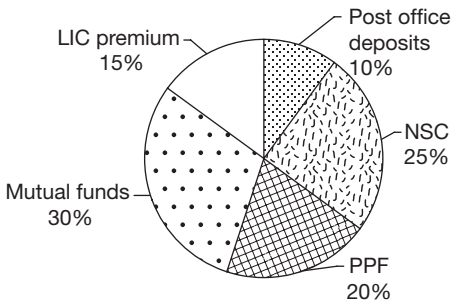
❒ INTRODUCTION

This chapter contains questions similar to the ones asked in other management entrance tests (OMET) like XAT, IIFT, SNAP, NMAT, etc. Exams like IIFT and NMAT are known to ask very calculation-intensive DI questions than the ones asked in CAT, also XAT is known to have asked unconventional and unorthodox sets which stand apart from the regular models asked in the CAT exam.

SOLVED EXAMPLES

These questions are based on the pie chart and the table given below.

The pie chart shows the breakup of the investment of a person in various schemes in 2000 and the table shows the investments in the same schemes in 2001.



Total investment = ₹50,000

Scheme	Percentage of total investment that is invested in the scheme
Post office deposits	8%
NSC	30%
LIC Premium	15%
PPF	15%
Mutual funds	32%

Total investment = ₹60,000

9.01: In how many of the schemes is his investment in 2000 less than that in 2001?

(A) 1 (B) 2

(C) 3 (D) 4

Sol: The share of LIC premium in both years were the same. His total investment increased from 2000 to 2001.
∴ His LIC premium in 2000 < His LIC premium in 2001.
His investments in post office deposits, mutual funds, PPF and NSC in 2000 were

$\frac{10}{100}(50000), \frac{30}{100}(50000), \frac{20}{100}(50000)$ and

$\frac{25}{100}(50000)$, i.e., 5000, 15,000, 10000 and 12500, respectively.
His investments in these schemes in 2001 were

$\frac{8}{100}(60000), \frac{32}{100}(60000), \frac{15}{100}(60000)$ and

$\frac{30}{100}(60000)$, i.e., 4800, 19,200, 9000 and 18000.

∴ A total of three schemes satisfied the given conditions.

9.02: In which scheme was his total investment in both years together the maximum?
(A) Post Office deposits
(B) NSC
(C) LIC premium
(D) Mutual funds

Sol: From the previous solution, his total investment in both years in Post Office deposits, mutual funds, PPF and NSC (in ₹) were 9800, 34,200, 19000 and 30500. His total investment in LIC Premium in both yeas = $\frac{15}{100}$ (50000 + 60000) = ₹16,500.
∴ Maximum total investment was in mutual funds.
Alternately: Percentage of his investments was maximum in mutual funds in each year. Therefore, his total investment must be maximum in mutual funds.

9.03: In 2002, his total investment was ₹70,000. His investment breakup was the same as that in 2000. In how many schemes in 2002 was his investment more than ₹12,600?
(A) 0 (B) 1
(C) 2 (D) 3

Sol: $12600 = \frac{12600}{70000}(100) = 18\%$ of his total investment. His investment was more than 18% of his total investment in three schemes, i.e., PPF, NSC and mutual funds.

9.04: In how many schemes in 2001 was his investment more than his average investment in the schemes?
(A) 2 (B) 3
(C) 4 (D) 0

Sol: There were 5 schemes.
∴ Average investment would be $\frac{100}{5} = 20\%$ of total investment. His investments in mutual funds and NSC exceeded this.
∴ Two schemes satisfied the given conditions.

9.05: If his combined investments in the various schemes in 2000 and 2001 were represented in a pie chart, for how many schemes would the angle be more than 90°?
(A) 0 (B) 1
(C) 4 (D) 2

Sol: $90° = \frac{90°}{360°}(100) = 25\%$.
As his investments in LIC premium, PPF and Post Office deposits in both years formed less than 25% of his total investment, the angle for these schemes in the pie chart formed will be less than 90°.
∴ For the other two schemes the angle would be more than 90°.

EXERCISE-1

Directions for questions 1 to 5: These questions are based on the table given below which shows the number of tons of fish caught through the traditional and modern methods across several years in Andhra Pradesh.

	Fishing in inland waters in different types of water bodies						Fishing in the seas	
	Artificial Tanks		Lakes		Rivers		Seas	
	Traditional	Modern	Traditional	Modern	Traditional	Modern	Traditional	Modern
1996	25	586	41	169	129	1348	569	5341
1997	47	631	72	201	181	1421	831	5583
1998	57	754	131	296	241	1639	947	6164
1999	61	836	129	354	297	1743	1152	6341
2000	63	929	129	421	324	1869	1181	6861
2001	60	1016	108	494	351	1931	1261	7146
2002	61	1089	121	528	407	2046	1734	7232
Total	374	5841	731	2463	1930	11997	7675	44668

1. During the year 1998, what is the total tonnage of fish caught in the inland waters?
(A) 10229 (B) 6164
(C) 4768 (D) 3118

2. Which of the following can be inferred from the given data for the period from 1999 to 2002?
I. The tonnage of fish caught in the inland waters by traditional methods is increasing every year over its value in the previous year.
II. The tonnage of fish caught by the traditional methods is continuously decreasing.
III. The tonnage of fish caught by the modern methods is continuously decreasing.
IV. There is a decrease in the quantity of fish caught by traditional methods in two successive years.
(A) I only (B) II only
(C) II and III only (D) I and IV only

3. During the given years, the quantity of fish caught by modern methods is approximately how many times that caught by traditional methods?
(A) 3 (B) 4
(C) 2 (D) 6

4. When compared to the previous year during which of the following years is the growth rate in quantity of fish caught, the least?
(A) 1998 (B) 1999
(C) 2000 (D) 2001

5. The average weight of the fish caught in the artificial tanks, lakes, rivers and the seas is in the ratio 2 : 3 : 4 : 5. The number of fish caught in which of the following water bodies is the least?
(A) Artificial tanks (B) Lakes
(C) Rivers (D) Seas

Directions for questions 6 to 10: These questions are based on the table and the bar graph given below.

Income plan of five persons for the year 2003–04

Rupees in Lakh

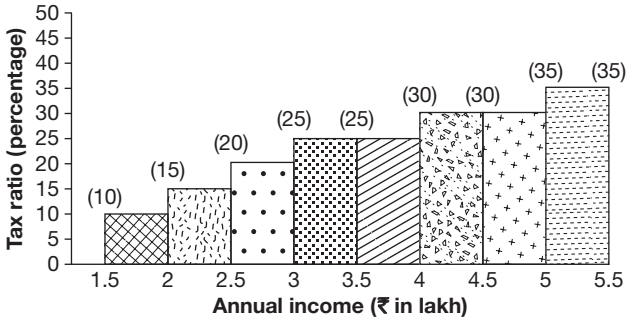
Name of the person	Sharma	Rao	Gupta	Solkar	Kuchroo
Profession	Doctor	Engineer	Business man	Doctor	Professor
Annual income	4.50	3.50	3.00	4.00	5.00
Annual expenditure	3.00	2.50	2.50	2.50	3.50
Annual savings	1.50	1.00	0.50	1.50	1.50

The annual savings are invested as shown below

Rupees in Thousand

Name of the person	Sharma	Rao	Gupta	Solkar	Kuchroo
PPF	50	50	25	50	80
Life insurance	20	8	7	20	15
Medical insurance	5	2	3	5	5
Pension plan	10	17	5	15	10
Debt funds	35	13	5	40	20
Monthly income plan (MIP)	30	10	5	20	20

The graph below shows various income slabs and the corresponding tax rates. For example, an annual income of ₹1.8 lakh falls in the range of ₹1.5 lakh – ₹2.0 lakh. Hence, the tax rate applicable is 10%. Similarly, for an income of ₹2 lakh, the tax rate is 15% as it falls in the slab of ₹2 lakh – ₹2.5 lakh.



Note: Income tax is calculated on the annual income.

6. How many of the given five persons paid an income tax exceeding rupees one lakh for the year 2003–04?

7. For which of the given persons, the ratio of the annual savings to that of the annual expenditure is least?

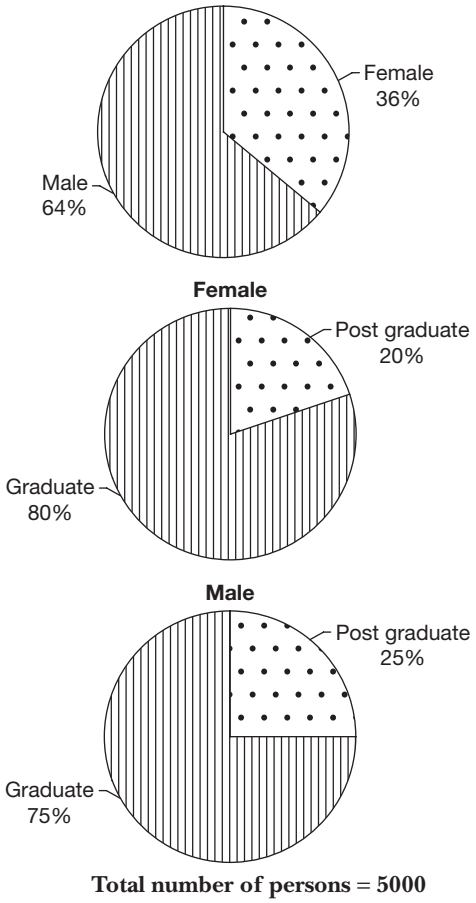
8. How much more should Gupta save so that his savings is 35% of his income?

9. An interest of 8% per annum is payable on the investment in PPF for the given year. Considering all the five persons, what is the average amount of interest payable per person?

10. If there is an exemption of tax on PPF, what is the total tax payable by the two doctors on their total taxable income?

Directions for questions 11 to 14: These questions are based on the pie charts below.

The pie charts give the breakup of graduates and postgraduates among males and females and the breakup of males and females in percentage.



Total number of persons = 5000

11. If 10% of the female postgraduates are married, the number of unmarried female postgraduates is

(A) 36 (B) 54

(C) 324 (D) 224

12. What approximate percentage of the students of the college are graduates?

(A) 65% (B) 75%

(C) 70% (D) 77%

13. If 496 male postgraduates are at least 30 years old, the number of male postgraduates aged below 30 years is
(A) 292 (B) 284
(C) 304 (D) 316

14. The total number of postgraduates is approximately what percentage of the total number of graduates?
(A) 32.4% (B) 28.6%
(C) 26.8% (D) 30.2%

Directions for questions 15 to 18: Study the following tables carefully and answer these questions.

Number of candidates who qualified in a competitive examination from five cities over the years

Year	City				
	Chennai	Delhi	Hyderabad	Kolkata	Mumbai
2004	4224	8670	8100	15600	4200
2005	6720	10500	6240	16240	1700
2006	4626	13000	14490	13230	3750
2007	3150	12960	13490	18900	3080
2008	7280	13340	11200	15870	4680
2009	6900	9120	13440	11800	4060
2010	9280	9800	13440	11590	5120

Percentage of candidates not qualified in the competitive examination from the five cities

Year	City				
	Chennai	Delhi	Hyderabad	Kolkata	Mumbai
2004	89	83	82	76	88
2005	86	79	88	72	90
2006	90	75	77	79	85
2007	94	76	81	73	89
2008	87	77	84	77	87
2009	88	81	79	80	86
2010	90	80	76	81	84

15. The difference in the number of candidates who qualified from Mumbai in any of the given years and that in the previous year was the highest in
(A) 2007 (B) 2009
(C) 2010 (D) 2006

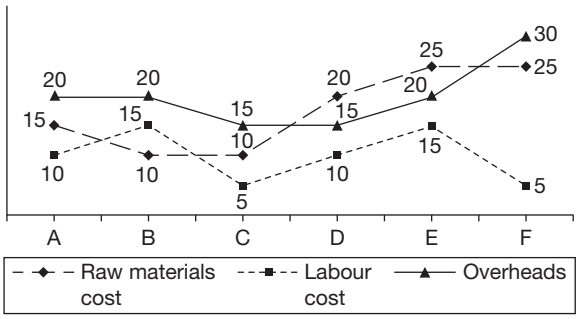
16. In which of the following years was the number of candidates who appeared from Chennai, the highest?
(A) 2010 (B) 2007
(C) 2008 (D) 2006

17. What is the number of candidates who did not qualify from Kolkata in 2009?
(A) 46,400 (B) 45,200
(C) 47,200 (D) 49,200

18. How many candidates appeared from Hyderabad in 2007?
(A) 73,000 (B) 76,000
(C) 71,000 (D) 77,000

Directions for questions 19 to 23: These questions are based on the following graph.

Six different companies A, B, C, D, E and F manufacture a similar product. The cost of raw materials, labour cost and overheads per unit are given below.



19. Which of the following products has the maximum cost per unit?
(A) A (B) B
(C) D (D) F

20. If company B produces 5000 units and sells them at ₹68, then the profit of the company is
(A) ₹1,65,000 (B) ₹1,40,000
(C) ₹1,15,000 (D) ₹1,55,000

21. Which of the following statements is true?
(A) The labour costs of E and F are same.
(B) The ratio of costs, overheads and labour is same for A, B and E.
(C) The ratio of total cost of A and D is same as the ratio of total cost of E and F.
(D) Both (A) and (B).

22. Company D can produce a maximum of 1000 units per day and company F can produce up to 800 units per day. If these companies sell their products at ₹60 and ₹80, respectively, then what percentage of D's profit is F's profit in the total maximum production of 10 days?
(A) 15 : 16 (B) 3 : 4
(C) 7 : 8 (D) 9 : 10

23. If the labour cost of B is the same as the labour cost of C, then what is the ratio of the total cost of the two companies?
(A) 1 : 1 (B) 1 : 2
(C) 1 : 3 (D) Cannot be determined

Directions for questions 24 to 28: These questions are based on the following table which represents the number of garments manufactured by four companies A, B, C and D for four segments of people, males (M), females (F), children (C) and sports persons (S) during quarters I, II, III and IV of the year 2003.

(in thousands)

	A				B				C				D				
	M	F	C	S	M	F	C	S	M	F	C	S	M	F	C	S	Total
I	33	60	72	20	18	25	36	12	26	35	41	21	41	71	88	30	629
II	44	76	80	25	23	31	43	15	40	59	71	28	55	78	98	35	801
III	45	75	85	30	30	34	48	18	52	68	81	26	60	80	95	41	868
IV	96	84	95	25	32	35	52	21	62	75	83	30	71	92	99	35	937
Total	168	295	332	100	103	125	179	66	180	237	276	105	227	321	380	141	3235

24. If the companies are arranged based on the number of garments manufactured by them in the year 2003, then which of the following is true?

(A) A > D > B > C (B) D > B > C > A

(C) D > A > C > B (D) A > D > C > B

25. For which of the following quarters is the percentage increase over the previous quarter in the number of garments manufactured by company C, for the female segment, the least?

(A) I (B) II

(C) III (D) IV

26. In the year 2003, the overall growth achieved by these companies in the number of garments manufactured is 25% more when compared to the number of garments manufactured in 2002. What was the total production of garments by these companies in the year 2002 in thousands?

(A) 2426 (B) 2588

(C) 2634 (D) 2432

27. For the year 2003, what is the ratio of the total number of garments manufactured for male segment to that of the female segment?

(A) 113 : 163 (B) 489 : 206

(C) 231 : 106 (D) 369 : 103

28. For how many companies is there a growth in the number of garments in every quarter and for every segment?

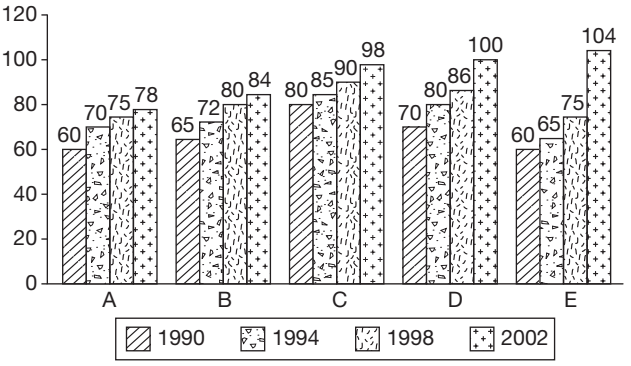
(A) 0 (B) 1

(C) 2 (D) 3

Directions for questions 29 to 32: These questions are based on the information given below.

The table represents the percentage of votes cast in an election in five small constituencies over four different election years and the bar graph shows the population (in thousands) of these five constituencies in the respective years.

Year	A	B	C	D	E
1990	45%	60%	75%	40%	55%
1994	50%	64%	80%	60%	70%
1998	65%	85%	60%	50%	80%
2002	70%	72%	65%	45%	60%



29. What is the total number of votes cast in the given five constituencies in the year 1998?

(A) 2,93,000 (B) 2,73,750

(C) 2,84,250 (D) 3,43,800

30. In the year 1994, what is the average number of votes cast in the given five constituencies?

(A) 48,516 (B) 44,295

(C) 42,248 (D) 48,446

31. In 2002, how many people in the five constituencies put together did not cast their vote?

(A) 1,67,246 (B) 1,77,820

(C) 1,79,840 (D) None of these

32. What is the ratio of the total number of votes cast in constituency D in the given four years to that in constituency E?

(A) 1231 : 2481 (B) 2481 : 1231
(C) 1640 : 2009 (D) 2009 : 1640

Directions for questions 33 to 36: Answer the following questions based on the table given below.

A, B, C and D are four different trains starting from the same station at different times with different average speeds and all are travelling on parallel tracks. Train A started at 05:00 hrs.

Time	Distance from the starting point (in kilometres)			
	Train A	Train B	Train C	Train D
6:10	100	–	–	–
6:30	100	–	30	–
7:00	130	40	60	–
8:00	200	100	130	–
12:00	400	260	330	187.5
16:00	600	460	530	437.5
18:00	680	560	610	492.5
19:00	720	600	650	562.5
19:15	720	600	650	562.5
19:30	740	650	690	562.5
20:00	750	700	730	656.25
21:00	800	760	800	718.75
22:00	840	840	820	778.25
23:30	850	910	900	875
00:00	900	940	900	906.25
01:30	1000	1000	1000	1000

Note: Some of the trains had maintained uniform speed.

33. The average speed of which train was the least among the four trains between 16:00 hrs to 22:00 hrs?
(A) Train A (B) Train B
(C) Train D (D) Train C

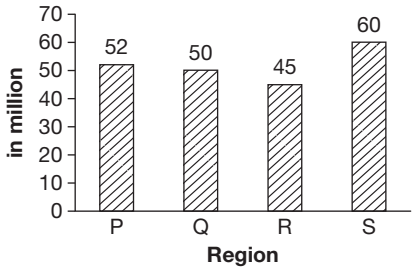
34. At 16:00 hrs, which two trains are farthest from each other?
(A) Train A and Train C
(B) Train A and Train B
(C) Train A and Train D
(D) Train C and Train D

35. At how many instances, is there a possibility of one train crossing another train after 12 noon?
(A) 1 time
(B) 0 times
(C) 2 times
(D) More than two times

36. If the stoppages of train A are not considered, then the approximate average speed of train A from 05:00 hrs to 01:30 hrs will be (assume it has only two stops).
(A) 48.8 kmph (B) 50.2 kmph
(C) 52 kmph (D) 54 kmph

Directions for questions 37 to 40: These questions are based on the graph and the table given below.

As per the National Readership Survey (NRS), the details regarding the readership (in million) of four major newspapers in regions P, Q, R and S are as follows:



The following table gives the percentage of readers for the newspapers in the four regions.

Newspapers	Region			
	P	Q	R	S
A	30%	25%	20%	30%
B	40%	25%	30%	30%
C	10%	30%	40%	20%
D	20%	20%	10%	20%

37. How many readers (in million) read newspaper B in region P?
(A) 20.8 (B) 30
(C) 16.5 (D) 22.5

38. What is the ratio of the number of readers who read newspaper A in region Q to the number of readers of newspaper B in region S?
(A) 11 : 12 (B) 25 : 36
(C) 18 : 17 (D) None of these

39. What is the total number (in millions) of readers who read newspaper C in all the four regions?
(A) 26 (B) 52.5
(C) 48.5 (D) 50.2

40. What is the ratio of the total readers of newspaper B to that of newspaper C?
(A) 341 : 171 (B) 324 : 251
(C) 3 : 5 (D) None of these

Directions for questions 41 to 44: These questions are based on the table given below.

Table 9.1 Details of Indian immigrants (people of Indian origin) in different countries as on 1980

Country	Persons of Indian origin (PIOs)(in 000s)	PIOs as a % of host country's population	No. of PIOs (in 000s) having foreign citizenship	% of total PIOs
(1) **AFRICA**				
(a) Kenya	70	0.31	1	0.55
(b) Mauritius	701	70.10	700	5.52
(c) Mozambique	21	0.14	11	0.16
(d) South Africa	850	2.57	850	6.69
(e) Tanzania	40	0.17	33	0.32
(2) **AMERICA**				
(a) Canada	229	0.89	129	1.80
(b) Guyana	300	30.30	300	2.36
(c) Jamaica	39	1.62	38	0.30
(d) Suriname	140	35.90	140	1.10
(e) Trinidad and Tobago	430	35.25	430	3.39
(f) USA	500	0.21	287	3.94
(3) **ASIA**				
(a) Afghanistan	46	0.30	45	0.36
(b) Bhutan	70	4.93	–	0.55
(c) Burma	330	0.84	50	2.60
(d) Malaysia	1170	7.07	1029	9.21
(e) Nepal	3900	27.12	2388	30.64
(f) Singapore	100	3.83	74	0.79
(g) Sri Lanka	1023	6.28	457	8.05
(h) Thailand	65	0.12	55	0.51
(4) **EUROPE**				
(a) France	42	0.8.	38	0.33
(b) Germany	32	0.50	8	0.25
(c) Netherlands	103	0.70	100	0.81
(d) UK	789	1.39	395	6.21
(5) **MIDDLE EAST**				
(a) Bahrain	48	11.16	–	0.38
(b) Iraq	35	0.21	–	0.28
(c) Kuwait	110	5.88	1	0.87
(d) Libya	36	0.88	–	0.28

(*Continued*)

Country	Persons of Indian origin (PIOs)(in 000s)	PIOs as a % of host country's population	No. of PIOs (in 000s) having foreign citizenship	% of total PIOs
(e) Oman	190	14.29	–	1.50
(f) Qatar	52	15.76	–	0.41
(g) Saudi Arabia	250	1.80	–	1.97
(h) UAE	240	16.55	1	1.89
(I) Yemen	103	1.41	100	0.81
(6) **OCEANIA INDONESIA**				
(a) Australia	99	0.61	87	0.78
(b) Fiji	339	47.75	339	2.67
(c) Indonesia	30	0.02	15	0.24
Total	12522	0.25	8101	100.00

41. In how many countries is the number of PIOs having citizenship of the country as a percentage of total PIOs in the country more than 90%?
(A) 5 (B) 11 (C) 12 (D) 14

42. The names of how many of the given countries which has the number of PIOs more than one lakh but less than five lakh, ends with a consonant?
(A) 2 (B) 3 (C) 4 (D) 5

43. For how many of the given countries is the country's total population less than the total number of PIOs in all the countries together?
(A) 16 (B) 18 (C) 19 (D) 17

44. The number of persons of Indian origin in ASIA is more/less than that in AMERICA by what percentage?
(A) 24.8 (B) 48 (C) 71.2 (D) 309.2%

Directions for questions 45 to 47: Answer the following questions based on the information given below.

The following table shows the growth in urban population since 1901 and the percentage of rural and urban population in the total population of India.

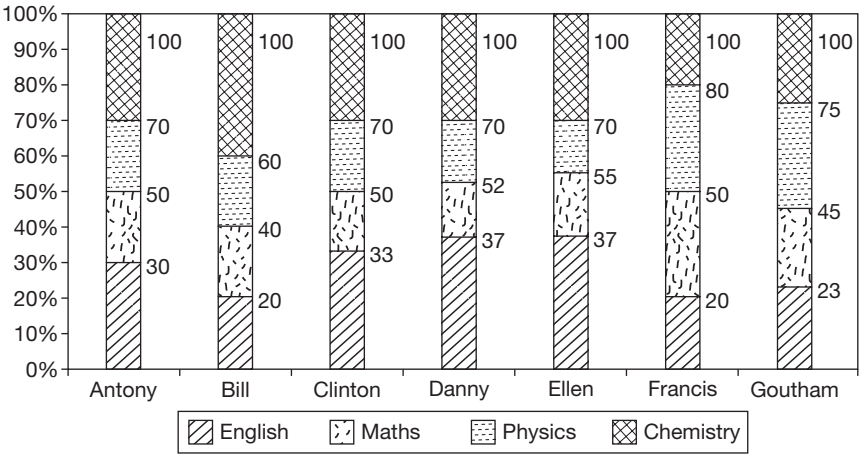
Year	Urban population (in million)	Percentage of total population	
		Rural	Urban
1901	25.8	89.0	11.0
1911	25.9	89.6	10.4
1921	28.0	88.7	11.3
1931	33.5	87.8	12.2
1941	44.1	85.9	14.1
1951	62.4	82.4	17.6
1961	78.9	81.7	18.3
1971	108.9	79.8	20.2
1981	162.2	76.3	23.7
1991	217.6	74.3	25.7

45. The approximate percentage increase in the rural population from 1901 to 1991 was approximately
(A) 130% (B) 160%
(C) 210% (D) 240%

46. For which of the following periods was the percentage increase in the total population, the highest?
(A) 1951–1961 (B) 1961–1971
(C) 1971–1981 (D) 1981–1991

47. In the time given, the only occasion when India's total population decreased was during
(A) 1901–1911 (B) 1911–1921
(C) 1921–1931 (D) 1931–1941

Directions for questions 48 to 50: The following graph shows the percentage of marks scored by Antony, Bill, Clinton, Danny, Ellen, Francis and Goutham in four subjects in their Class XII exam.



48. Who scored the highest marks in Maths?
(A) Goutham (B) Francis
(C) Danny (D) Anthony

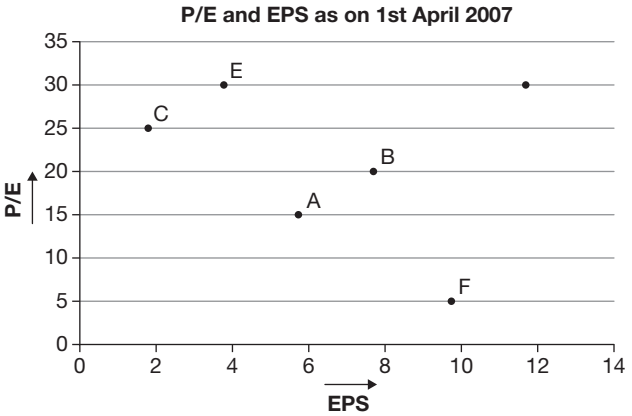
49. In English, the marks scored by Ellen is approximately what percentage more than those by Goutham?
(A) 43% (B) 55%
(C) 65% (D) 63%

50. The total marks scored by all the seven students in Physics is approximately
(A) 672 (B) 650
(C) 480 (D) 553

EXERCISE-2

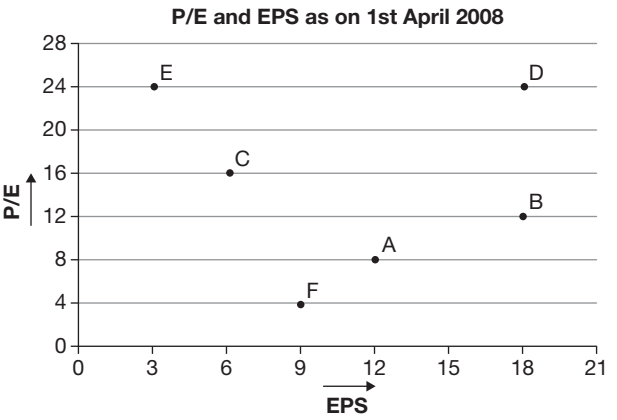
Directions for questions 1 to 5: Answer the following questions based on the information given below.

The following data gives the P/E ratio and EPS of six companies for two consecutive years.



Total number of shares on 1st April 2007

A	B	C	D	E	F
12.5	14.8	27.0	8.5	22	7.2



Total number of shares as on 1st April 2008 (in lakh)

A	B	C	D	E	F
17.5	14.8	40.5	8.5	22.0	7.2

$$\text{P/E ratio} = \frac{\text{Price of the share in rupees}}{\text{Earnings per share in rupees (EPS)}}$$

Difficulty Level-2: Moderate

$$\text{EPS} = \frac{\text{Total earnings of the company}}{\text{Total number of shares of the company}}$$

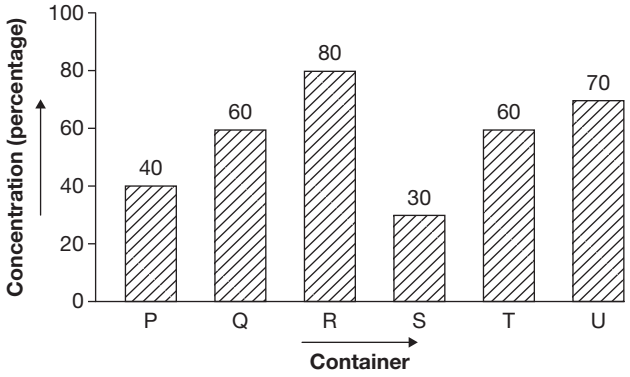
1. What is the percentage increase in total earnings of Company A from 1st April 2007 to 1st April 2008?
2. Which company had the highest increase in total earnings from 1st April 2007 to 1st April 2008?
3. What is the price of a share of Company B on 1st April 2008?
4. In percentage terms, the share price of which company appreciated the most from 1st April 2007 to 1st April 2008?
5. If the total earnings of Company E is same as that of Company D as on 1st April 2009, then what will be the EPS of Company E on 1st April 2009, given that the earnings of Company D decrease by 10% compared to that on 1st April 2008 and the number of shares of Company E as on 1st April 2009 is 27.0 lakh?

Directions for questions 6 to 10: Study the following table and answer the questions that follow. The table below compares five different countries on various aspects.

Country	Population (Lakh)	Literacy rate	Number of women per 1000 men	% of rural population
A	1321	70%	970	45%
B	2501	61%	951	62%
C	540	85%	1021	51%
D	91	90%	992	39%
E	832	80%	989	42%

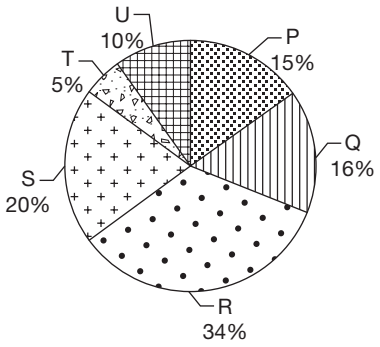
6. Which country has the highest number of illiterate people?
   (A) A (B) B
   (C) C (D) D
7. The urban population of Country A exceeds the urban population of Country E by
   (A) 254.5 lakh (B) 377 lakh
   (C) 244 lakh D) 223 lakh
8. What is the approximate number of women in the country which has the second highest number of men?
   (A) 4140 lakh (B) 650 lakh
   (C) 670 lakh (D) Cannot be determined
9. Which country has the least number of literate women?
   (A) D (B) C
   (C) E (D) Cannot be determined
10. For which country is the number of men who are literate, as a percentage of the total number of men, the highest?
    (A) E (B) C
    (C) D (D) Cannot be determined

Directions for questions 11 to 15: Answer the following questions based on the information given below.



Each of six different containers, labelled from P to U contains some solution of milk and water with the concentration of milk (in percentage) as specified as above.

Percentage distribution of the total volume of six solutions



Total volume of all six solutions together = 100 litres

11. Which two solutions when mixed will yield a solution with maximum concentration?
    (A) R and Q (B) Q and U
    (C) R and T (D) R and U
12. Solutions P, Q, R are mixed in equal proportions and the resultant solution is labelled as X, while solutions S, T and U are mixed in equal proportions to give a solution labelled as Y. Which of the following is definitely true?
    (A) The concentration of X is more than that of Y.
    (B) The concentration of X is less than that of Y.
    (C) The concentration of X is equal to that of Y.
    (D) None of the above
13. What is the approximate concentration of the solution formed by mixing the entire volumes of R and S?
    (A) 27% (B) 55%
    (C) 61.5% (D) 64%

14. Which solution contains the maximum quantity of milk?
(A) Q (B) R
(C) S (D) T

15. How many pairs of solutions can be selected such that if their entire volumes are mixed, the concentration of the resulting solution will be more than 50%?
(A) 8 (B) 9
(C) 10 (D) 11

Directions for questions 16 to 20: Answer these questions based on the information given below.

In the recent past India has witnessed a mass transition to ATM enabled services. The following table shows the costs incurred by any bank, in rupees per transaction, when a customer of that bank uses an ATM of any of the banks.

For example, when an SBI customer uses an SBI ATM, then the cost incurred by SBI is ₹3 per transaction. When he uses an ICICI ATM, the cost incurred by SBI is ₹10 per transaction and when he uses a UTI ATM, the cost incurred by SBI is ₹12 per transaction.

(Transaction costs* in ₹)

	ATM of									
Customer	**SBI**	**ICICI**	**UTI**	**HDFC**	**PNB**	**IDBI**	**GTB**	**Citi Bank**	**HSBC**	**Corp Bank**
SBI	3	10	12	6	8	15	20	6	15	20
ICICI	12	2	21	7	9	19	11	14	17	22
UTI	16	10	5	14	10	14	9	17	19	18
HDFC	7	12	16	6	11	18	16	21	8	14
PNB	8	10	14	20	4	16	11	5	18	8
IDBI	22	11	12	8	17	8	12	7	11	14
GTB	13	8	12	13	22	17	11	25	13	20
Citi Bank	11	9	12	14	16	22	16	8	24	13
HSBC	28	16	17	22	22	23	17	18	12	15
Corporation Bank	14	14	17	10	17	27	14	13	11	9

* Transaction costs from January 2003 to June 2003.

From the month of July 2003 onwards, the banks in the above list formed two alliances, namely STAR and JUMBO, where HDFC and PNB are part of the STAR alliance while the remaining banks belong to the JUMBO alliance. Members of the STAR alliance get a 25% discount on transaction costs incurred for all transactions between themselves and similarly members of JUMBO alliance get a 20% discount on all transactions between themselves.

Transaction costs between members belonging to STAR alliance and those belonging to JUMBO alliance continue as per the table above (i.e., without any discounts).

16. If in a particular month in 2003, the customers of SBI bank made a total of 2 million ATM transactions, of which 75% were transacted through its SBI's own ATM's and the remaining through HDFC ATM's, then what is the total expenditure (in millions) incurred on ATM transactions by SBI in that month?

17. After the alliances are formed, for how many banks is it profitable to use the ATM's of another bank instead of its own?

18. If in June 2003, HSBC incurred a total expenditure of ₹252 lakh on account of its customers transacting through ATM's and of this, 50% was on account of transactions through HSBC ATM's, then what is the least possible number of ATM transactions (in lakh) by the customers of HSBC in June 2003?

19. If in the month of March 2003, all the banks had 10 million transactions each through their own ATM's, then which bank would incur the maximum additional expenditure in case its ATM's went out of operation for that month and its customers transacted through the ATM's of the next cheapest alternative bank?

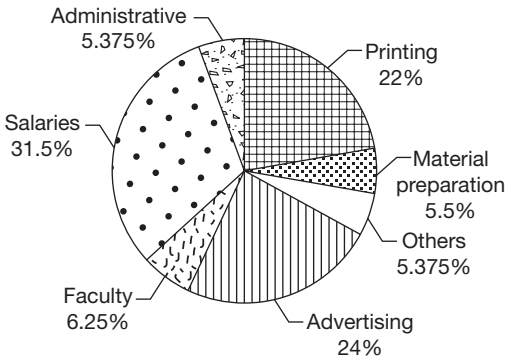
20. After the alliances were formed, for how many banks is the cost incurred per transaction, when it's customer uses the ATM of any other bank at least five and at most 18.

Directions for questions 21 to 25: These questions are based on the following information.

After every question there are two statements I and II. Mark your answer as Choice (A) if statement I alone is true. Choice (B) if statement II alone is true. Choice (C) if both statements are true. Choice (D) if neither of the statements is true.

Details of expenses of Excellent Management Training Institute (EMTI) are given in the pie chart and the table below.

Expenses of EMTI for 2015–16



Percentage increase in expenses from 2014–15 to 2015–16

Faculty	25%
Advertising	20%
Material preparation	10%
Printing	25%
Administrative	7.5%
Salaries	5%
Others	7.5%

Note: It is known that the expenses towards faculty in 2015–16 were ₹12.5 lakh.

21. I. The total expenses incurred towards advertising in 2014–15 were ₹10 lakh.
II. The total expenses incurred towards 'Others' in 2015–16 were ₹10.75 lakh.

22. I. In 2014–15, the total expenses incurred towards faculty and that incurred towards material preparation were equal.
II. In 2015–16, the total expenses incurred were ₹200 lakh.

23. I. The expenses incurred towards printing in 2015–16 are 4.4 times the expenses incurred towards material preparation in 2014–15.
II. The total expenses incurred in 2014–15 were ₹169.40 lakh.

24. I. The ratio of the expenses incurred towards administrative expenses in 2015–16 to that in 2014–15 is 47 : 40.
II. The increase in the total expenditure from 2014–15 to 2015-16 is more than 10%.

25. I. The total expenses incurred towards salaries in both the years put together are ₹126 lakh.
II. The total expenses incurred towards material preparation in both the years put together are ₹2.1 lakh.

Directions for questions 26 to 30: Answer these questions based on the information given below.

The following table gives the percentage share in the turnover of a business group by all the four companies, such as A, B, C and D of the group, for the period from 2003 to 2008. The table also gives the total turnover (in ₹ crore) of the group in these years.

	2003	2004	2005	2006	2007	2008
A	31	36	32	34	29	27
B	18	24	26	27	26	24
C	22	15	19	21	23	25
D	29	25	23	18	22	24
Total	850	1020	1165	1245	1380	1425

26. What was the percentage increase in the turnover of Company A from 2005 to 2006?
(A) 10.4% (B) 12.1% (C) 13.5% (D) 15.2%

27. How many of the companies of the group had an increase in turnover from 2003 to 2004?
(A) 0 (B) 1 (C) 2 (D) 3

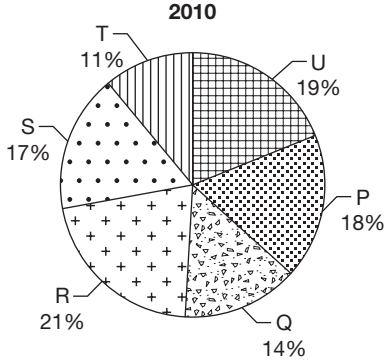
28. Which company had the highest percentage increase in turnover from 2003 to 2008?
(A) A (B) B (C) C (D) D

29. In which of the following years was the percentage increase in the turnover, over the previous year of all the four companies put together, the highest?
(A) 2004 (B) 2005 (C) 2006 (D) 2007

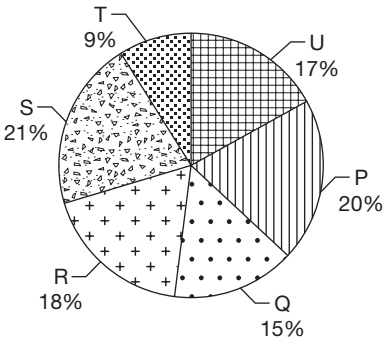
30. Which company of the group had an increase in turnover, when compared to the previous year in each year from 2004 to 2008?
(A) Only A (B) Only B
(C) Only D (D) None of the companies

Directions for questions 31 to 34: The following pie charts highlights the details of sales and expenses of six units, such as P, Q, R, S, T and U of a company across two years.

2010

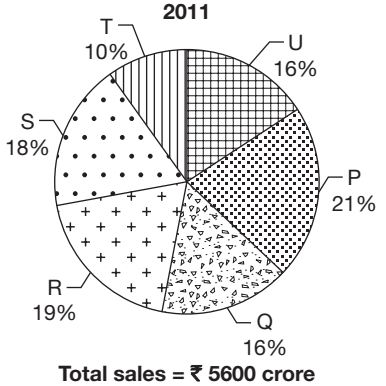


Total sales = ₹ 4800 crore

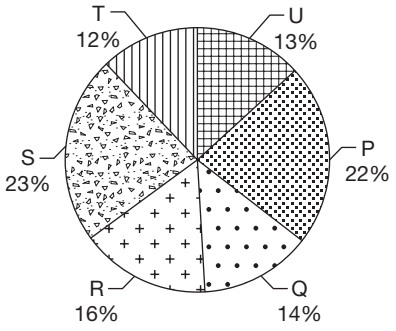


Total expenses = ₹ 3650 crore

2011



Total sales = ₹ 5600 crore



Total expenses = ₹ 4200 crore

$$\text{Profitability (\%)} = \frac{\text{Profit}}{\text{Expenses}} \times 100$$

31. Which unit of the company had the highest percentage increase in sales from 2010 to 2011?

(A) P (B) Q
(C) R (D) T

32. The highest percentage increase in profits for any unit from 2010 to 2011 is

(A) 131.6% (B) 138.3%
(C) 147.4% (D) 162.5%

33. Which unit of the company had the highest profitability in 2010?

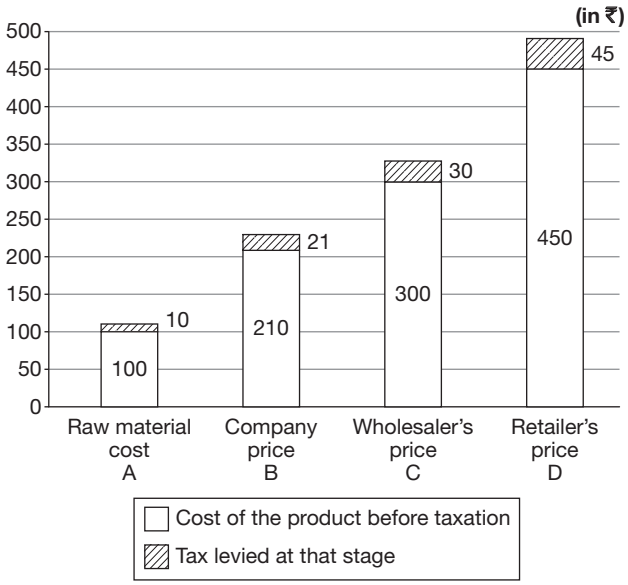
(A) U (B) T
(C) R (D) Q

34. How many units of the company had a profitability more than 50 in 2011?

(A) 5 (B) 4
(C) 3 (D) 2

Directions for questions 35 to 38: These questions are based on the following graph, which gives a particular system of taxation applicable upon a certain product.

Price of a product at various stages in the supply-chain



Note: (i) The company buys the product from the raw material supplier at the 'Raw material cost' and then sells the product to the wholesale dealer at the 'Company price'. The retailer buys the product from the wholesale dealer at the 'wholesaler's price' and then sells it to the customers at the 'Retailer's price'.

(ii) The rate at a stage =

$$\frac{\text{Tax levied at the stage}}{\text{Cost of product before taxation}} \times 100\%$$

The above taxation system is replaced by a new system of taxation in which only the 'value added' in any particular stage is taxed by the corresponding tax rate.

Value added in a stage = [cost of product before tax in that stage – cost of product after tax in the previous stage (according to new taxation)]. There will be no change in the tax at the first stage and in each of the other stages the price of the product will be reduced by the cumulative amount that is saved in all the earlier stages as well as that stage due to the new system of taxation. So that the value added in each of the stages remained same as that in the old taxation.

35. What is the least value added to the product in any stage (in ₹)?

36. What is the cost of the product after tax at the end of stage C as per the new system of taxation?

37. A retailer had bought a product when the old system of taxation was in place. After two days the new system of taxation came into act and he had to sell the same product at the new price. What is the approximate amount that the retailer would have saved, on each unit of the product if he waited for another two days before buying the product?

38. What is the final price that a customer needs to pay as per the new system of taxation?

Directions for questions 39 to 42: These questions are based on the information given below.

Indian Thermal Power Corporation (ITPC) has nine thermal power plants setup at various locations, such as in A, B, C, D, E, F, G, H, and I. The utilization factor is the ratio of the actual electricity generated (output) by a power plant to its installed capacity. The net capacity factor of ITPC is the ratio of net electricity generated (net output) by all the plants to the total installed capacity. The following table gives details about the installed capacity and the utilization factor of four of the nine plants in 2014.

Power Plant	Installed capacity (in MW)	Utilization factor
A	1200	0.6
B	600	0.8
C	1100	0.9
D	800	0.7

The following information is also given:

I. Plant B has the lowest installed capacity and plant A has the highest capacity.
II. Plants E and G have the same installed capacity whereas every other plant has a distinct installed capacity which is a multiple of 100 MW.
III. The average utilization factor of plants E and G is the same as that of plant B and the total output of plants E and G together is the same as that of plants B and D together.
IV. The installed capacity as well as the output of plant I is more than that of F, whose capacity as well as output is more than that of H.
V. The utilization factors of the five plants which are not mentioned in the table above are 0.4, 0.5, 0.5, 0.7 and 0.9.
VI. The average utilization factor of plants E, G and H is 0.66.

39. Find the net capacity factor of ITPC.
(A) 0.60 (B) 0.62
(C) 0.63 (D) 0.66

40. What is the percentage contribution of plants H and C in the net output?
(A) 16.7% (B) 23.33%
(C) 26.67% (D) 25.3%

41. In 2015, the average capacity utilization of plants A, C and E is 0.82 and there is no change in their installed capacity. What is the change in the net output of these plants over 2014?
(A) 254 MW (B) 384 MW
(C) 124 MW (D) Cannot be determined

42. What is the installed capacity of Plant F?
(A) 700 MW
(B) 900 MW
(C) 1000 MW
(D) Cannot be determined

Directions for questions 43 to 46: Answer these questions based on the information given below.

The following table gives the production and demand of a product from the year 2008 to 2015.

Year	Production (P) (in units)	Demand (D) (in units)
2008	500	500
2009	350	440
2010	400	400
2011	280	380
2012	480	510
2013	600	500
2014	600	600
2015	550	480

Every year a certain percentage of the production in that year is kept as storage(s) for the next year's use. The surplus, if any, is exported and additional quantity, if required, then it is imported.

43. If the storage is 20% every year and the export in 2008 was 10 units, then the production in 2007 was
(A) 750 units (B) 550 units
(C) 600 units (D) 650 units

44. From 2009 to 2015, in how many years was the product definitely exported or imported?
(A) 1 (B) 2
(C) 3 (D) 4

45. What should be the storage percentage at which there is neither import nor export in the year 2013?
(A) 83.33 (B) 66.66
(C) 50 (D) 25

46. If the storage is 10% in each of the years, then between the years 2009 and 2015, the exports in year A is equal to the imports in year B. A + B =
(A) 4010
(B) 4008
(C) 4009
(D) More than one of the above

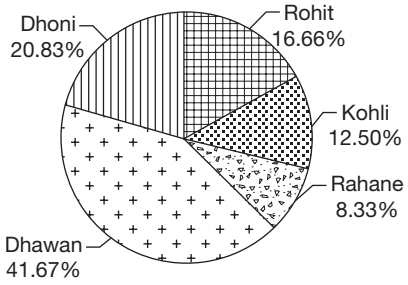
Directions for questions 47 to 50: Answer the questions based on the information given below.

India scored less than 1000 runs in a test match and most of the runs were scored by five batsmen, namely Rohit, Dhawan, Dhoni, Kohli and Rahane. Given below are the charts showing the distribution of the total runs scored by these batsmen and the runs scored by them in 4's and 6's.

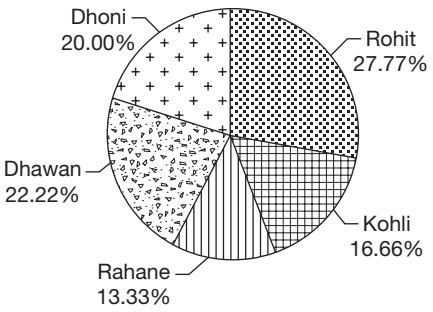
Further it is given that these players scored 77.77% of their combined total score in 4's and 6's and scored 90% of the total runs scored by India in that match.

Distribution of the total runs scored by the five batsmen

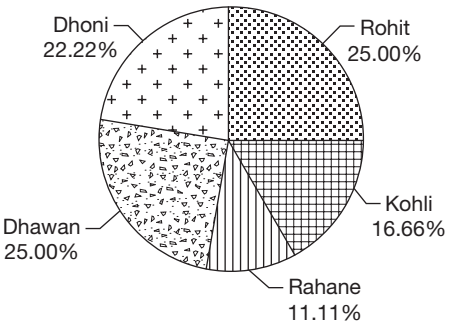
Runs scored in 60's



Runs scored in 4's



Total runs scored in the match



The remaining runs scored by these players were in 1's and 2's.

47. What per cent of the total runs scored by Rahane was in 4's and 6's?
(A) 37.5%
(B) 62.5%
(C) 75%
(D) 83.33%

48. The total number of 4's and 6's hit by Dhawan was
(A) 10 (B) 15
(C) 25 (D) 30

49. By what per cent is the total runs scored by Dhawan in 6's more/less than the total runs scored by Rohit in 4's?
(A) Less by 40%
(B) Less by 20%
(C) More by 25%
(D) Less by 20.83%

50. Kohli scored what percentage of his total score in 1's and 2's?
(A) 15%
(B) 20%
(C) 20.83%
(D) 27.77%

EXERCISE-3

Directions for questions 1 to 3: Answer these questions on the basis of the information given below.

Based on the diagram given below five terms, such as A, B, C, D and E are defined as follows:

A → Sum of all the numbers inside the equilateral triangle.
B → Sum of all the numbers inside the rectangle.
C → Sum of all the numbers inside the right-angled triangle.
D → Sum of all the numbers inside the square.
E → Sum of all the numbers inside the circle.

The heights of five friends, namely Abhinav, Bindia, Chetan, Dravid and Enosh are as follows:

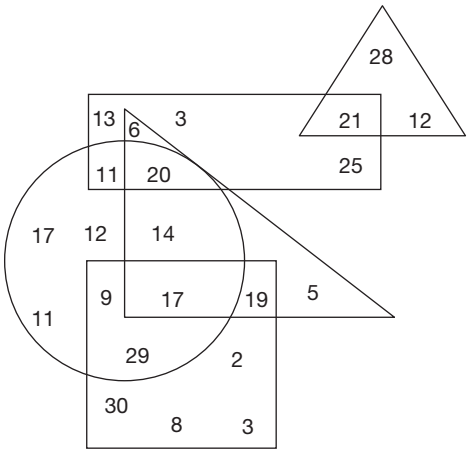
1. Abhinav's height is 3D – 3A.

2. Bindia's height is E divided by the only number inside the right-angled triangle that is not part of any other figure, then it is multiplied by the smallest number in the square.

3. Chetan's height is the sum of all the numbers that are part of exactly three figures.

4. Dravid's height is the sum of all the numbers that are part of at least two figures.

5. Enosh's height is the sum of all the numbers which are greater than eight and lie inside the square or the rectangle.



1. What is the difference in the heights of Bindia and Abhinav?
(A) 109 (B) 112
(C) 176 (D) 134

2. Who is the tallest among the five?
(A) Bindia (B) Chetan
(C) Enosh (D) Abhinav

3. If the height of Suman, Enosh's cousin, is the sum of all the numbers that are part of at least three figures, what is the difference in the heights of Dravid and Suman?
(A) 90 (B) 83
(C) 72 (D) None of these

Directions for questions 4 to 7: Answer these questions on the basis of the information given below.

The following table gives the percentage distribution of the runs scored by four cricketers in the first five matches of their career.

Match	Gaurav	Sheru	Tenchin	Drahul
1st	25	24	20	18
2d	18	22	26	15
3rd	20	24	21	22
4th	25	14	26	23
5th	12	16	7	22

Further, it is known that,

(1) The runs scored by Gaurav in his 2nd match was not more than that scored by Drahul in his 2nd Match.

(2) The runs scored by Tenchin in his 3rd match was not less than that scored by Sheru in his 3rd match.

(3) In the fifth match, the runs scored by Tenchin was not more than half of that scored by Gaurav.

4. If the number of runs scored by the given players in their fourth matches are compared, then who had the highest score?
(A) Gaurav (B) Sheru
(C) Tenchin (D) Drahul

5. If Drahul scored 126 runs in his first match, then the total runs scored by Tenchin in his first five matches is at most
(A) 350 (B) 400
(C) 450 (D) 500

6. The ratio of the runs scored by Gaurav in his second match to the runs scored by Sheru in his third match was at least
(A) 0.96 (B) 1
(C) 1.1 (D) 1.2

7. Among all the given players, the highest score made in a match in their first five matches was by
(A) Gaurav (B) Sheru
(C) Tenchin (D) Drahul

Directions for questions 8 to 12: Answer these questions on the basis of the information given below.

A total of eight teams, namely P, Q, R, S, T, U, V and W take part in a hockey tournament. In the first stage, the teams are divided into two groups of four teams each. Each team in a group played exactly one match with every other team in its group. The tournament is scheduled such that two group matches take place every day and all the group matches are over in six days. Three points are awarded for a win and one point for a draw. The following table gives the points of each team at the end of each of the six days.

Team	P	Q	R	S	T	U	V	W
Day 1	3	1	0	0	0	0	1	0
Day 2	3	1	0	3	0	1	1	1
Day 3	4	1	0	3	3	1	1	2
Day 4	4	1	0	4	4	4	1	2
Day 5	4	1	0	7	4	4	1	5
Day 6	4	2	0	7	5	7	1	5

It is known that no team played on three consecutive days and that team Q played on Day 2.

8. Which of the following teams are in one group?
(A) P, V, R, W (B) P, R, T, S
(C) P, R, U, W (D) None of these

9. Which of the following teams played on Day 3?
(A) T and R (B) T and V
(C) T and U (D) Cannot be determined

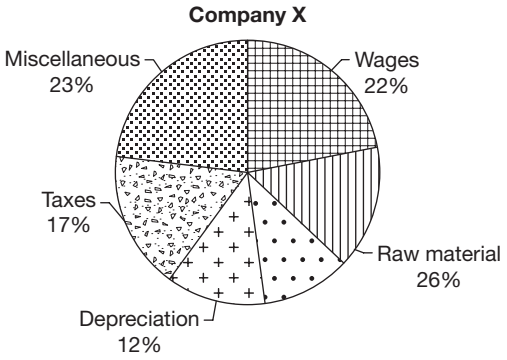
10. Which of the following teams lost a match on Day 5?
(A) V (B) P
(C) Q (D) T

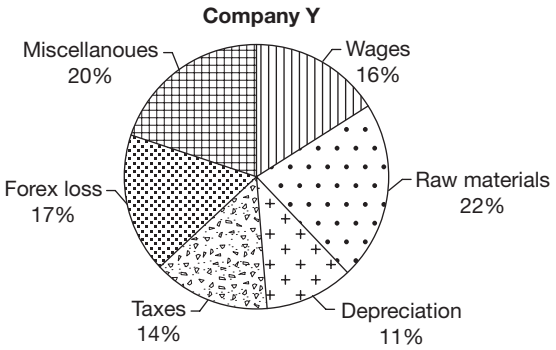
11. Which of the following teams played a match on Day 5?
(A) T, W (B) Q, V
(C) W, P (D) W, R

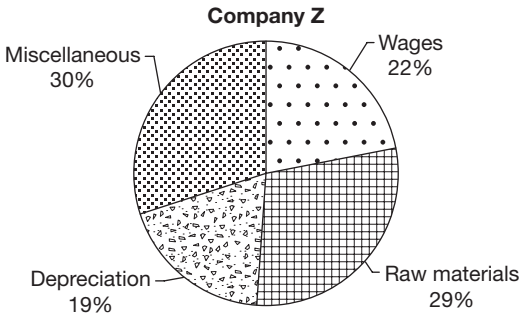
12. Which team did U beat on Day 4?
(A) P
(B) V
(C) R
(D) Cannot be determined

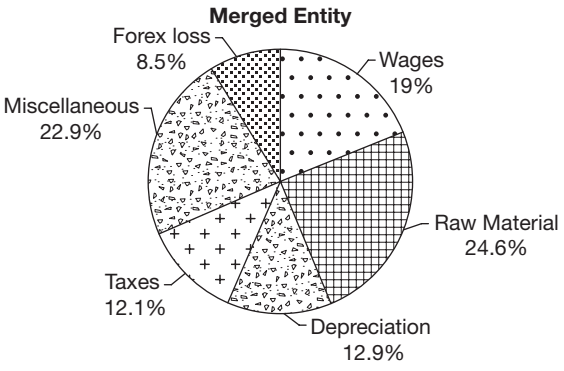
Directions for questions 13 to 16: Answer the questions on the basis of the information given below.

The Agenta group was a diversified business house which had three companies X, Y and Z. As part of restructuring, the group decided to merge all the three companies. The following pie charts give the break-up of expenses of each company and that of the merged entity in the year 2007.









13. What is the ratio of the total expenses of companies X and Y?
(A) 3 : 2 (B) 2 : 5
(C) 3 : 5 (D) 2 : 3

14. The forex loses of company Y was what percentage of the depreciation expenses of Company Z?
(A) 152% (B) 186%
(C) 205% (D) 223%

15. The wage bill of which of the three companies was the highest?
(A) X (B) Y
(C) Z (D) Both X and Y

16. The expenses of Company Z was under quoted by 20% because the taxes paid by it was not included in the given diagrams. If this figure is also included, then the taxes paid would account for what percentage of the expenses of the merged entity?
(A) 23.2% (B) 21.5%
(C) 18.6% (D) None of these

Directions for questions 17 to 20: Answer these questions on the basis of the information given below.

The following are the runs scored by the players of the Indian cricket term in a match. The names are given in the order in which they came out to bat.

1.	Rahul	–	11
2.	Dhawan	–	27
3.	Pujara	–	35
4.	Kohli	–	53
5.	Rahane	–	6
6.	Pandya	–	27
7.	Saha	–	5
8.	Jadeja	–	39
9.	Ashwin	–	28
10.	Umesh	–	11
11.	Kuldip	–	5

The remaining runs in the team's total score are extras, which are not credited in the name of any batsman. It is also known that no batsman stopped his innings in between or retired hurt. The values below give the runs at which India lost its wickets, the fall of wickets occurred during 22, 54, 98, 121, 146, 157, 193, 212, 231, 252.

17. Who was the third batsmen to be out?
(A) Dhawan (B) Pujara
(C) Kohli (D) Cannot be determined

18. Who was the last batsmen to be out?
(A) Ashwin
(B) Umesh
(C) Kuldip
(D) Cannot be determined

19. By the time Pandya was out, how many wickets had India lost?
(A) 5 (B) 6
(C) 7 (D) 8

20. If during none of the partnerships India got more than two extra runs, who was the second last batsman to be out?
(A) Jadeja
(B) Ashwin
(C) Umesh
(D) Cannot be determined

ANSWER KEYS

Exercise-1

1. (D)	10. 207500	19. (D)	28. (B)	37. (A)	46. (C)
2. (A)	11. (C)	20. (C)	29. (B)	38. (B)	47. (B)
3. (D)	12. (D)	21. (C)	30. (A)	39. (D)	48. (B)
4. (D)	13. (C)	22. (A)	31. (B)	40. (B)	49. (B)
5. (B)	14. (D)	23. (D)	32. (C)	41. (B)	50. (D)
6. 3	15. (D)	24. (C)	33. (A)	42. (C)	
7. Gupta	16. (A)	25. (D)	34. (C)	43. (D)	
8. 55000	17. (C)	26. (B)	35. (D)	44. (D)	
9. 4080	18. (C)	27. (A)	36. (B)	45. (C)	

Exercise-2

1. 180	10. (D)	19. ICICI	28. (B)	37. 34	46. (A)
2. (C)	11. (D)	20. 3	29. (A)	38. 428	47. (D)
3. 216	12. (A)	21. (B)	30. (D)	39. (D)	48. (D)
4. (C)	13. (C)	22. (C)	31. (A)	40. (D)	49. (A)
5. 5.1	14. (B)	23. (A)	32. (C)	41. (D)	50. (D)
6. (B)	15. (C)	24. (B)	33. (B)	42. (D)	
7. (C)	16. 7.5	25. (D)	34. (C)	43. (B)	
8. (B)	17. 4	26. (C)	35. 69	44. (C)	
9. (A)	18. 15	27. (D)	36. 296	45. (A)	

Exercise-3

1. (B)	4. (D)	7. (D)	10. (A)	13. (C)	16. (D)	19. (C)
2. (C)	5. (D)	8. (C)	11. (D)	14. (D)	17. (B)	20. (C)
3. (D)	6. (B)	9. (B)	12. (D)	15. (B)	18. (D)	

SOLUTIONS

EXERCISE-1

1. The total tonnage of fish caught in the inland waters in 1998 = (Total quantity of fish caught in 1998) – (Total quantity of fish caught in the sea in 1998)
= (10,229) – (947 + 6164) = 3118 tons.

2. The tonnage of fish caught in the inland waters during 1999 = 61 + 129 + 297 = 487.
Similarly, the tonnage in 2000 = 516, in 2001 = 519 and in 2002= 589
There has been an increase in every year, statement (I) is true. Statement (I) is maintained in Choice (A) as well as Choice (D). By checking statement (IV), the quantity of fish caught, using the traditional method has decreased successively in two years.
∴ IV cannot be inferred.
Only statement (I) can be inferred.

3. During the given years, the total quantity of fish caught by the modern methods
= 5841 + 2463 + 11997 + 44668 = 64,969 ≅ 65,000 The quantity of fish caught by traditional methods = 374 + 731 + 1930 + 7675 = 10,710 ≅ 11,000; $\frac{65,000}{11,000} \cong 6$

4. The percentage increase in the quantity (tonnage) of fish caught over previous year in 1999 = $\frac{684}{10,229}$

In 1998 = $\frac{1262}{8,967}$, In 2000 = $\frac{864}{10,913}$,

in 2001 = $\frac{590}{11,777}$ and in 1997 = $\frac{759}{8208}$

Among the given fractions, in the fraction pertaining to 2001, the denominator is the greatest and the numerator is the least. Hence, the value of this fraction is the least.

5. Number of fish caught = $\frac{\text{Quantity of fish}}{\text{Average weight}}$

Number of fish caught in artificial tanks

$$= \frac{374+5841}{2} = \frac{6215}{2} = 3017 \times 5$$

In lakes = $\frac{731+2463}{3}$ =1064

In rivers = $\frac{1930+11997}{4}$ = 3481.

In seas = $\frac{7675+44668}{5} = \frac{52343}{5}$ = 10468.6

The number of fish caught in the lakes is the least.

6. Income tax paid by Sharma = (30/100) × 4.5
= 1.35 > 1 lakh
Income tax paid by Rao = (25/100) × 3.5
= 1/4 × 3.5 < 1 lakh
Income tax paid by Gupta = (25/100) × 3 < 1 lakh
Income tax paid by Solkar = (30/100) × 40 > 1 lakh
Income tax paid by Kuchroo = (35/100) × 5 > 1 lakh
There are three such persons.

7. The ratio of savings to expenditure for the persons are as follows:

Sharma = $\frac{1.5}{3} = \frac{1}{2}$

Rao = $\frac{1}{2.5} = \frac{2}{5}$

Solkar = $\frac{1.5}{2.5} = \frac{3}{5}$

Gupta = $\frac{0.5}{2.5} = \frac{1}{5}$

Kuchroo = $\frac{1.5}{3.5} = \frac{3}{5}$

We can observe that Gupta has the least ratio.

8. 35% of Gupta's Income = (35/100) × 3 lakh = ₹1.05 lakh
Savings of Gupta currently = ₹50,000
Gupta should save ₹55,000 more to reach the target of 35%.

9. Total investments in PPF by the five persons
= 50 + 50 + 25 + 50 + 80 = ₹2.55 lakh = ₹2,55,000
Interest payable per annum
= (8/100) × 2,55,000 = ₹20,400
Average interest payable per person = 20,400/5 = ₹4080

10. The two doctors are Sharma and Solkar.
Sharma's income = ₹4.50 lakh
PPF = ₹50000 or ₹0.50 lakh
Taxable income = 4.5 – 0.5 = ₹4.00 lakh
Tax payable = (30/100)₹ 4 = ₹1.20 lakh
Solkar's taxable income = 4.00 – 0.50 = ₹3.50 lakh
Tax payable = 25/100 × 3.50 = ₹87,500
Total tax payable by these two doctors
= 1,20,000 + 87,500 = ₹2,07,500

11. Number of female postgraduates

$$= \frac{20}{100}.\frac{36}{100}.5000 = \frac{20}{100}.1800 = 360$$

Number of unmarried female postgraduates

$$= \frac{90}{100}.360 = 324$$

12. Number of graduates = Number of female graduates + Number of male graduates = $\left(\frac{80}{100}\right)\left(\frac{36}{100}\right)(5000) + \left(\frac{75}{100}\right)\left(\frac{64}{100}\right)(5000)$

$= \left(\frac{28.8}{100}\right)(5000) + \left(\frac{48}{100}\right)(5000) = \left(\frac{76.8}{100}\right)(5000)$

$\therefore$ 76.8% of the students of the college are graduates.

13. Number of male postgraduates $= \frac{25}{100}\frac{64}{100}.5000$

$= \frac{16}{100}5000 = 800$

Number of male postgraduates who are at least 30 years old = 496

Number of male postgraduates aged below 30 years = 800 – 496 = 304

14. Number of postgraduates = Number of male postgraduates + Number of female postgraduates

$= \frac{25}{100}\frac{64}{100}5000 + \frac{20}{100}\frac{36}{100}.5000$

$= \frac{16}{100}5000 + \frac{7.2}{100}5000 = \frac{23.2}{100}5000$

Required % $= \frac{\frac{23.2}{100}\times 5000}{\frac{76.8}{100}\times 5000}\times 100\% = 30.2\%$

15. The maximum difference occurred between the number of qualified candidates in 2005 and 2006.

16. The number of candidates who appeared from Chennai in 2004 $= \frac{4224\times 100}{100-89} = \frac{4224\times 100}{11}$

($\because$ 4224 candidates qualified in 2004, 89% did not qualify)

$\therefore$ 11% qualified.

Also, the number of candidates who appeared from Chennai in 2006, 2007, 2008 and 2010 were $\frac{4626\times 100}{10}$, $\frac{3150\times 100}{6}$, $\frac{7280\times 100}{13}$ and $\frac{9280\times 100}{10}$, respectively.

The maximum of all these $= \frac{9280\times 100}{10}$

($\therefore$ From all the above values, $\frac{9280\times 100}{10}$ has the highest numerator and proportionate denominator. Therefore, it is the highest of the values).

$\therefore$ Highest value occurred in 2010.

17. In 2009, 80% did not qualify.

$\therefore$ 20% qualified

20% = 11800

80% = 4(11800) = 47200

18. In 2007, 81% did not qualify.

$\therefore$ 19% qualified

19% = 13490

1% = 710

Number appeared = 100% = 71000

19. The total costs per unit of the different companies are as follows.

A = 10 + 15 + 20 = ₹45 B = 15 + 10 + 20 = ₹45

C = 5 + 10 + 15 = ₹30 D = 20 + 10 + 15 = ₹45

E = 25 + 15 + 20 = ₹60 F = 25 + 5 + 30 = ₹60

20. Sales income of the company:

B = 5000 × 68 = ₹3,40,000

Total cost of production of B for 5000 units

= 5000 × 45 = ₹2,25,000

$\therefore$ Profit = ₹1,15,000

21. If we observe the total cost of all the companies, then total costs of A and D are ₹45 and ₹45, respectively.

$\therefore$ Ratio of total costs = 1 : 1

Similarly, for E and F, the ratio of total costs = 1 : 1

$\therefore$ Statement C is correct.

22. Profit of company D for one-day production

= 1000 (60 – 45) = ₹1,50,000

Profit of company F for one-day production

= 800 (80 – 60) = ₹1,60,000

The ratio will be the same whether it is calculated for one day or for ten days.

$\therefore$ Ratio of profits = 15 : 16

23. The labour cost of B and C is same, say x.

$\therefore$ Total cost of B is $x + 20 + 10 = x + 30$

Total cost of C is $x + 15 + 10 = x + 25$

$\therefore$ The ratio of the total cost is $x + 30 = x + 25$

The solution cannot be determined.

24. During the year 2003, the total number of garments manufactured by A = 168 + 295 + 332 + 100 = 895.

Similarly, those manufactured by

B = 473, C = 798 and D = 1069.

Hence, D > A > C > B

Alternate method:

By observation, we can find that the total number of garments is the greatest for company D, and the next highest is for A.

25. The percentage increase in the number of garments manufactured by company C for female segment for the appropriate periods is as follows:

Second quarter $= \frac{59-35}{35} = \frac{24}{35}$

Third quarter $= \frac{68-59}{59} = \frac{9}{59}$

Fourth quarter $= \frac{75-68}{68} = \frac{7}{68}$

$\frac{7}{68}$ is the least as the numerator is the smallest and the denominator is the greatest.

Note: First quarter need not be considered since the number of garments for the previous quarter is not given.

26. If the total number of garments manufactured in 2002 was 100, then the total number of garments manufactured in 2003 was 125. Since the total number of garments manufactured in 2003 is 3235, those manufactured in 2002 = $\frac{100}{125} \times 3235 = 2588$ thousands.

27. The ratio of the total number of garments manufactured for the male segment to that of female segment
= (168 + 103 + 180 + 227): (295 + 125 + 237 + 321)
= 678 : 978 = 113 : 163

28. Only for company B there is a growth in every segment for every quarter.

Solutions for questions 29 to 32: Let us calculate the total number of votes cast in different constituencies in different years.

Year	A	B	C	D	E
1990	$60{,}000 \times \frac{45}{100} = 27{,}000$	$65{,}000 \times \frac{60}{100} = 39{,}000$	$80{,}000 \times \frac{75}{100} = 60{,}000$	$70{,}000 \times \frac{40}{100} = 28{,}000$	$60{,}000 \times \frac{55}{100} = 33{,}000$
1994	$70{,}000 \times \frac{50}{100} = 35{,}000$	$72{,}000 \times \frac{64}{100} = 46{,}080$	$85{,}000 \times \frac{80}{100} = 68{,}000$	$80{,}000 \times \frac{60}{100} = 48{,}000$	$65{,}000 \times \frac{70}{100} = 45{,}500$
1998	$75000 \times \frac{65}{100} = 48{,}750$	$80{,}000 \times \frac{85}{100} = 68{,}000$	$90{,}000 \times \frac{60}{100} = 54{,}000$	$86{,}000 \times \frac{50}{100} = 43{,}000$	$75{,}000 \times \frac{80}{100} = 60{,}000$
2002	$78000 \times \frac{70}{100} = 54{,}600$	$84000 \times \frac{72}{100} = 60{,}480$	$98000 \times \frac{65}{100} = 63{,}700$	$100000 \times \frac{45}{100} = 45{,}000$	$104000 \times \frac{60}{100} = 62{,}400$

29. Required answer =
48750 + 68000 + 54000 + 43000 + 60000, i.e., 2,73,750.

30. In 1994, the required average number of votes cast
= (35000 + 46080 + 68000 + 48000 + 45500) ÷ 5 = 48,516.

31. In 2002, 464000 – 286180 = 1,77,820 people did not cast their vote.

32. Required ratio = $\frac{164000}{200900} = \frac{1640}{2009}$.

33. Trains A, B, C, D covered 240, 380, 290 and 341 km between 16:00 hrs. and 22:00 hrs. Hence, the average speed of Train A was the least during this period.

34. At 16:00 hrs
Train A is 600 km away from starting point.
Train B is 460 km away from starting point.
Train C is 530 km away from starting point.
Train D is 437.5 km away from starting point.
∴ Trains A and D are 162.5 km apart which is the farthest distance.

35. B crosses A at 840 kms at around 22:00 hrs.
C crosses A at 840 kms at around 22:00 hrs.
B crosses C at 840 kms at around 22:00 hrs.
Similarly, trains B, C and D could have crossed train A anytime between 12:00 and 16:00 before train A crossed them again and took the lead.
Hence, there are more than two cases possible.

36. The total stoppage times of Train A
= (6:10 to 6:30) + (19:00 to 19:15) = 35 minutes
Total distance = 1000 km
Total time = 05:00 hrs to 01:30 hrs – 35 minutes
= 19 hours 55 minutes ≃ 20 hours

Hence, the average speed = $\frac{1000}{20} = 50$ kmph

(Slightly more than 50, actually)

37. In region P, the total number of readers = 52 million.
The number of readers reading newspaper B

$$= \frac{40}{100} \times 52 \text{ million}$$

$$= \frac{2}{5} \times 52 \text{ million}$$

$$= 20.8 \text{ million}$$

38. The number of readers reading newspaper A in region

$$Q = \frac{25}{100} \times 50 \quad \rightarrow \quad (1)$$

The number of readers reading newspaper B in region

$$S = \frac{30}{100} \times 60 \quad \rightarrow \quad (2)$$

The required ratio = 25 × 50 : 30 × 60 = 25 : 36

39. The required number of readers

$= \frac{10}{100} \times 52 + \frac{30}{100} \times 50 + \frac{40}{100} \times 45 + \frac{20}{100} \times 60$

$= 5.2 + 15 + 18 + 12 = 50.2$ million

40. The total readers of B

$= \frac{40}{100} \times 52 + \frac{25}{100} \times 50 + \frac{30}{100} \times 45 + \frac{30}{100} \times 60$

$= 20.8 + 12.5 + 13.5 + 18 = 64.8$

The total readers of C = 50.2

The required ratio = 64.8 : 50.2 = 324 : 251

41. The required percentage is more than 90%, in the countries Mauritius, South Africa, Guyana, Jamaica, Suriname, Trinidad and Tobago, Afghanistan, France, Netherlands, Yemen and Fiji, i.e., a total of 11 countries.

42. The countries are Netherlands, Kuwait, Oman and Yemen.

43. The given condition is satisfied for a country only when PIOs as a percentage of the country's population is more than the value of PIOs as a percentage of total PIOs. This happened for 17 countries, namely for Mauritius, Guyana, Jamaica, Suriname, Trinidad and Tobago, Bhutan, Singapore, France, Germany, Bahrain, Kuwait, Libya, Oman, Qatar, UAE, Yemen and Fiji.

44. PIO 's (ASIA)

$= 46 + 70 + 330 + 1170 + 3900 + 100 + 1023 + 65 = 6704$

PIO 's (America)

$= 229 + 300 + 39 + 140 + 430 + 500 = 1638$

$\therefore$ Required % $= \frac{6704}{1638} - 1 \ (100) = 309.2\%$

45. Since the answer choices are not close, we can approximate the values.

Urban population in 1901 $\approx$ 26 million

Rural population in 1901 $\approx$ eight times the urban population

$\therefore$ Rural population $= 26 \times 8 = 208$ million

In 1991, urban population $\approx$ 215

In 1991, rural population = three times urban population

$\therefore$ Rural population in 1991 $= 215 \times 3 = 645\%$ increase $= \frac{645 - 208}{208} \times 100 = 210$

46. The approximate population in the years are as follows:

1941: $\frac{44.0}{19} \times 100 = 315$

1951: $\frac{62 \cdot 5}{17 \cdot 6} \times 100 = 355$

1961: $\frac{79}{18 \cdot 3} \times 100 = 430$

1971: $\frac{109}{20 \cdot 2} \times 100 = 540$

1981: $\frac{162}{23 \cdot 7} \times 100 = 685$

1991: $\frac{218}{25 \cdot 7} \times 100 = 847$

Among the years mentioned only for 1961–71 and 1971–81 there is more than 25% increase

$= \frac{540 - 430}{430} \times 100 = 25 \cdot 5\%$ and $\frac{685 - 540}{540} \times 100 \approx 27\%$

47. Closely observing the values for urban population and the percentage of urban population in the total population we can see that only for the period 1911–1921, the actual increase in urban population

$= \frac{28 - 25 \cdot 9}{25 \cdot 9} \times 100 = 8$ which is less than the percentage increase in the percentage of urban population

$= \frac{11 \cdot 3 - 10 \cdot 4}{10 \cdot 4} \times 100 \approx 8 \cdot 5\%$ which means there is a decrease in the base, i.e., total population.

48. The marks scored by Antony in Maths $= \frac{20}{100} \times 370 = 74.$

The marks scored by Bill in Maths $= \frac{20}{100} \times 280 = 56$

The marks scored by Clinton in Maths $= \frac{17}{100} \times 380 = 64.6$

The marks scored by Danny in Maths $= \frac{15}{100} \times 365 = 54.75$

The marks scored by Ellen in Maths $= \frac{18}{100} \times 375 = 67.5$

The marks scored by Francis in Maths $= \frac{30}{100} \times 360 = 108$

The marks Goutham scored in Maths $= \frac{22}{100} \times 390 = 85.8$

Francis scored the highest in Maths.

49. The marks scored by Ellen in English $= \frac{37}{100} \times 375 = 138.75$

The marks scored by Goutham in English $= \frac{23}{100} \times 390 = 89.7$

The required percentage $= \frac{138.75 - 89.7}{89.7} \times 100 = 54.6\%$

50. The total marks scored in Physics by all the students

$= \frac{20}{100} \times 370 + \frac{20}{100} \times 280 + \frac{20}{100} \times 380 + \frac{18}{100} \times 365 + \frac{15}{100} \times 375 + \frac{30}{100} \times 360 + \frac{30}{100} \times 390$

$= 74 + 56 + 76 + 65.7 + 56.25 + 108 + 117$

$= 553$

EXERCISE-2

1. Total earnings = EPS × Total number of shares
The number of shares of Company A has increased from 12 × 5L to 17 × 5L (L = lakhs)

$$\frac{17\cdot5-12\cdot5}{12\cdot5}\times100=40\%$$

Assume that Company A had only 10 shares in 2007.
∴ Total earnings = 10 × 6 = ₹60
Now, for the next year, the number of shares increases by 40% that is 10 becomes 14.
Total earnings = 14 × 12 = 168
∴ Required percentage increase

$$=\frac{168-60}{60}\times100=\frac{108}{60}\times100=180\%$$

2. For A it is 180% (from the previous question).
For B, as the number of shares hasn't changed, we can directly calculate the increase in total earnings from the increase in EPS.

$$\text{Increase}=\frac{18-8}{8}\times100=\frac{10}{8}\times100=125\%$$

For C, the number of shares increases from 27 × 0L to 40 × 5 lakh, that is a 50% increase.
Assume that C had only 10 shares in 2007.
Total earnings 10 × 2 = 20
The next year, the number of shares increases by 50%, that is 10 becomes 15.
Total earnings 15 × 6 = 90

$$\text{Increase}=\frac{90-20}{20}\times100=350\%$$

For D, as the number of shares does not change, we can use the same logic as used for Company B and find that the increase is 50%.

3. Share price = EPS × P/E = 18 × 12 = ₹ 216

4. Since the share price = P/E × EPS, the prices of companies on 1st April 2007 and 1st April 2008 can be found as follows.

Company	2007	2008
A	90	96
B	160	216
C	50	96
D	360	432
E	120	72
F	50	36

It is the highest for C.

5. Total earnings of D in 2008:
∴ EPS × The number of shares = 18 × 8× 5L = ₹153 lakh

$$\text{Earnings in 2009}=\frac{90}{100}\times153$$

Earnings of E in 2009:

$$\text{EPS}=\frac{90\times153}{100\times27}=5.1$$

6. For the number of illiterates to be maximum, the literacy rate should be minimum. By observing the data given, it is true for Country B.

7. 55% of 1321 – 58% of 832
Treating 55% as (50% + 5%) and 58% as (60% – 2%)
{660.5 + 66.05} – {499.2 – 16.64}
726.5 – 482.6 = 243.9

8. The second highest number of men is in Country A, as it has the second highest population.

$$\text{Number of women in A}=\frac{970}{1970}\times1321$$

$$\frac{970}{1970}\cong\frac{1}{2}\text{ but less than }\frac{1}{2}$$

$$\therefore\text{ Number of women}<\frac{1}{2}\times1321<660.5$$

Thus, it is slightly less than 660.

9. Even if all the women in Country D is literate, there will only be 91 × 1/2 = 45 lakh literate women in D.
Even if all the men in any other country (say C) are literate, out of a total of 540 × 0.85 = 460 lakh literates, only about 270 lakh (half the total population) can be men (since the male-female ratio is approximately 1) and the remaining 190 lakh will have to be literate women which is definitely higher than the number of literate women in D; thus, D has the least number of literate women.

10. Here, we need literacy rate among men and women separately which is not given.

11. We have to select amongst the solutions Q, R, T and U (as they have higher concentration as compared to others).

$$(\text{R, Q}):\text{C}=\frac{(80)(34)+(16)(60)}{16+34}$$

$$=\frac{2720+960}{50}=\frac{3680}{50}=73.6$$

$$(\text{R, U}):\text{C}=\frac{(80)(34)+(10)(70)}{44}$$

$$=\frac{2720+700}{44}=\frac{3420}{44}=77.7$$

$$(R, T) : C = \frac{(80)(34)+(60)(5)}{39}$$

$$= \frac{2720+300}{39} = \frac{3020}{39} = 77.4$$

For Q and U, the concentration is less than 70%.
∴ Solutions R and U have to be mixed to get maximum concentration.

12. P + Q + R = X
S + T + U = Y
By observation, X has more concentration than Y.

13. (Concentration) R and S

$$= \frac{(80)(34)+(30)(20)}{34+20} = \frac{2720+600}{54}$$

$$\Rightarrow \frac{3320}{54} = 61.5\%$$

14. The solution which contains the maximum quantity of milk is R since its concentration as well as its total quantity is maximum.

15. Pairs of solutions are (P, Q), (P, R), (P, U)
(Q, R), (Q, T), (Q, U)
(R, S), (R, T), (R, U), (T, U).
A total of 10 pairs of solutions are there.

16. ATM transactions through SBI ATM's

$$= 2 \times \frac{75}{100} = 1.5 \text{ million.}$$

∴ Total expenditure incurred by SBI = 1.5 × 3
= 4.5 million rupees
ATM transactions of SBI through HDFC ATM's = 0.5 million
∴ Total expenditure incurred by SBI = 0.5 × 6
= 3 million rupees
Total cumulative expenditure = 4.5 + 3 = 7.5 million rupees.

17. Let us make a table to represent the information:

Bank	Cost per transaction	Next best alternative	Cost of this alternative	Profitable (Y/N)
SBI	3	HDFC	6	No
ICICI	2	HDFC	7	No
UTI	5	ICICI	$10 \times \frac{80}{100} = 8$	No
HDFC	6	SBI	7	No
PNB	4	Citi Bank	5	No
IDBI	8	Citi Bank	$7 \times \frac{80}{100} = 5.60$	Yes
GTB	11	ICICI	$8 \times \frac{80}{60} = 6.4$	Yes
Citi Bank	8	ICICI	$9 \times \frac{80}{100} = 7.2$	Yes
HSBC	12	Corporation	$15 \times \frac{80}{100} = 12$	No
Corporation	9	HSBC	$11 \times \frac{80}{100} = 8.80$	Yes

It can thus be seen that for four banks it is profitable to use another bank's ATM's after the alliances are formed.

18. Total expenditure of HSBC = 252 lakh
Total expenditure through its own ATM's = 126 lakh
∴ Total transaction through its own ATM's

$$= \frac{\text{Total expendidture}}{\text{Cost per transaction}} = \frac{126}{12} = 10.5 \text{ lakh}$$

For the transactions to be minimum the remaining 126 lakh expenditure must be through an ATM that has the highest cost per transaction for HSBC customers, which is the case of SBI at ₹28 per transaction.

∴ Total transactions through SBI = $\frac{126}{28} = 4.5$ lakh

Total cumulative transactions = 10.5 + 4.5 = 15 lakh

19. In the month of March 2003, the alliance was not formed were no discounts are possible on member banks transactions, this has to be kept in mind while working out these questions. Let us now form a table and solve the question.

Bank	Cost	Least cost alternative	Additional expenditure per transaction
SBI	3	HDFC – 6	3
ICICI	2	HDFC – 7	5
UTI	5	GTB – 9	4
HDFC	6	SBI – 7	1
PNB	4	Citibank – 5	1
IDBI	8	Citibank – 7	*Saving of ₹1 *
GTB	11	ICICI – 8	* Saving of ₹3 *
Citi Bank	8	ICICI – 9	1
HSBC	12	Corporation – 15	3
Corporation Bank	9	HDFC – 10	1

Since transactions (ATM) are the same for all banks, ICICI will have the maximum additional expenditure.

20. Only for ICICI, PNB and IDBI was the cost of transaction at least five and at most 18.

Solutions for questions 21 to 25:

Given that the expenses towards faculty
= 6.25% of total expenses = ₹12.5 lakh
Total expenses = 12.5 × 100 / 6.25 = ₹200 lakh
Tabulating the expenses in lakh of rupees.

	2015–16	2014–15
Faculty	12.5	12.5/1.25 = 10.0
Advertising	48.00	48/1.2 = 40.0
Material preparation	11.00	11/1.1 = 10.0
Printing	44.00	44/1.25 = 35.20
Administrative	10.75	10.75/1.075 = 10.0
Salaries	63.00	63/1.05 = 60
Others	10.75	10.75/1.075 = 10
Total	200	175.20

21. Statement I is wrong because the expenses towards advertisement in 2014-15 were ₹40 lakh.
As per the table, Statement II is correct.

22. As per the table, Statements I and II are true.

23. As per the table, the ratio of printing expenses in 1995–96 to material preparation in 2014–15 = 44/10 = 4.4
Thus, statement I is true.
As per the table, total expenses in 2014–15 are not ₹169.40 lakh.
Thus, statement II is wrong.

24. As per the table, the ratio of amounts incurred towards the administrative expenses in 2015–16 and 2014–15
= 10.75: 10 = 1075 : 1000 = 43 : 40
Thus, statement I is wrong.
The percentage increase in total expenditure from 2014-15 to 2015–16 = (200/175.20 – 1) × 100 = 14.1%
Thus, statement II is correct.

25. As per the table, the total expenses towards salaries are 60 + 63 = ₹123 lakh
Thus, statement I is wrong.
The total expenditure towards material preparation in both the years = 11 + 10 = ₹21 lakh
Therefore, both the statements are wrong.

26. The turnover of Company A in 2005 = $\frac{32}{100} \times 1165 = 372.8$

The turnover of Company A in 2006 = $\frac{34}{100} \times 1245 = 423.3$

The percentage increase = $\frac{50.5}{372.8} \times 100 = 13.5\%$

27. The turnover of the group increased by 20% from 2003 to 2004. If the percentage share in 2003 is less than 120% of that in 2004, there will be an increase in turnover from 2003 to 2004, i.e., for companies A, B and D.

28. To find the company with the highest percentage increase, we need to find only the company which had the highest percentage increase in share in the group turnover, i.e., Company B.

29. The turnover of all the four companies put together is the group turnover and the highest percentage increase in the group turnover was from 2003 to 2004.

30. None of the companies had an increase in turnover over the previous year in each year from 2004 to 2008.

Solutions for questions 31 to 34: The sales, expenses and profits of the different units in 2010 and 2011 are as follows.

2010

Units	Sales (₹ crore)	Expenses (₹ crore)	Profit (₹ crore)	Profitability
P	864	730	134	14.3%
Q	672	547.5	124.5	22.7%
R	1008	657	351	53.4%
S	816	766.5	49.5	6.6%
T	528	328.5	199.5	60.9%
U	912	620.5	291.5	47.0%

2011

Units	Sales (₹crore)	Expenses (₹crore)	Profit (₹crore)	Profitability
P	1176	924	252	27.3%
Q	896	588	308	52.4%
R	1064	672	392	58.0%
S	1008	966	42	4.0%
T	560	504	56	11.1%
U	896	546	350	64.2%

31. We need to consider only P or Q as they are the only companies to have more than 25% increase in sales.

For P it is $= \frac{1176-864}{864} \times 100 = \frac{312}{864} \times 100 = 36\%$

For Q it is $\frac{896-672}{672} \times 100 = \frac{224}{672} \times 100 = 33.3\%$

Therefore, the highest is for P.

32. The highest percentage increase in profit would be for Q which is $\frac{308-124.5}{124.5} \times 100 = \frac{183.5}{124.5} \times 100 = 147.4\%$

33. In 2010, the profitability was the highest for unit T.

34. Units Q, R and U had a profitability more than 50% in 2011.

Solutions for questions 35 to 38: From the given data:

Stage	A	B	C	D
Total cost after tax	110	231	330	495
Total cost before tax	100	210	300	450
Value added	100	100	69	120
Tax rate	10%	10%	10%	10%

According to new system of taxation, only 'value added' is to be taxed.

Stage	A	B	C	D
Total cost after tax	110	220	295.9	428
Total cost before tax	100	210	289	416
Value added	100	100	69	120
Rate	10%	10%	10%	10%
Tax on value added	10/-	10/-	6.9/-	12/-

35. In stage 'C', the least value is added, i.e., ₹69.

36. From the above table, it is ₹295.9.

37. The operator in stage D had to buy from stage C operators.
In the old system, he paid ₹330.
In the new system he pays ₹295.9.
Thus, if he follows the old system, he will pay
330 – 295.9 = ₹34.1 more.

38. From the table, final cost = 427.9

39. The lowest installed capacity of a plant is 600 MW and the highest capacity is 1200 MW. As it is mentioned that every plant except E and G have distinct capacities which are multiples of 100 MW, of the remaining five plants three of them will have installed capacities of 700, 900 and 1000 MW.

Power plant	Capacity (in MW)	Utilization factor	Output
A	1,200	0.6	720
B	600	0.8	480
C	1,100	0.9	990
D	800	0.7	560
	700		
	900		
	1,000		
	X		
	X		

As the total output of plants E and G is same as that of plants B and D (1040 MW) and their average utilization factor is same as that of B (0.8), installed capacity of E and G together = 1040/0.8 = 1300 MW
∴ Installed capacity of plants E and G is 650 MW each.

Power plant	Capacity (in MW)	Utilization factor	Output
A	1200	0.6	720
B	600	0.8	480
C	1100	0.9	990
D	800	0.7	560
	700		
	900		
	1000		
E	650		
G	650		

As their installed capacities are the same, plants E and G must have utilization factors of 0.7 and 0.9 so that the average will be 0.8. But we don't know which one has a

utilization factor of 0.7. Since the installed capacity of I, F and H are in a descending order, we know their respective installed capacities.

Power plant	Installed capacity (in MWs)	Utilization factor	Output
A	1200	0.6	720
B	600	0.8	480
C	1100	0.9	990
D	800	0.7	560
E	650	0.7/0.9	455/585
F	900		
G	650	0.9/0.7	585/455
H	700		
I	1000		

The installed capacity of E, G and H together is 2000. If their combined utilization factor is 0.66, their output must be (2000) (0.66), i.e., 1320 MW. Since we already know that the output of E and G together is 1040, the output of H is 280 MW. Since plant H's capacity and output are known, its utilization factor

$= 280/700 = 0.4.$

The utilization factor of the only two remaining plants, F and I will be 0.5 each.

Power plant	Installed capacity (in MWs)	Utilization factor	Output
A	1,200	0.6	720
B	600	0.8	480
C	1,100	0.9	990
D	800	0.7	560
E	650	0.7/0.9	455/585
F	900	0.5	450
G	650	0.9/0.7	585/455
H	700	0.4	280
I	1,000	0.5	500
Total	7,600		5,020

Net capacity factor = Total output / Total installed capacity = 5020/7600 = 0.66

40. Contribution of plants H and C = [(990 + 280)/ 5020] × 100 = 25.3%

41. The question cannot be answered as the utilization factor of E cannot be uniquely determined (it can be 0.7 or 0.9).

42. The installed capacity of Plant F is 900 MW.

43. Export in 2008 = P – D + S_{2007} – S_{2008}

$= 500 - 500 + S_{2007} - \frac{20}{100}(500)$

$= S_{2007} - 100 = S_{2007} - 100$

But it is given to be 10 units.

$\therefore S_{2007} = 110$

$\Rightarrow \quad \frac{20}{100}(P_{2007}) = 110$

$\Rightarrow \quad P_{2007} = 550$ units

44. Let x be the storage percentage.

Export in 2009 $= 350 - 440 + \frac{x}{100}(500 - 350)$

If there is neither export nor import, export = 0

$\therefore 0 = 350 - 440 + \frac{x}{100}150$

$x = 60\%$

$\therefore$ When storage percentage is 60, there is neither export nor import.

But in 2010 the export $= 400 + \frac{x}{100}(350-400)$

The value can never be zero. Hence, there is an import. Similarly, there is either import or export in 2012 and 2015.

$\therefore$ There are three such instances.

45. Export $= 600 - 500 + \frac{x}{100}(480 - 600)$

$= 100 + \frac{x}{100}(-120)$

But there is neither an import nor an export.

$\therefore 0 = 100 + \frac{x}{100}(-120)$

$\Rightarrow x = \frac{10000}{120} = 83.33$

46. The export (E) or import (I) will be as follows:

Year	P	D	E	I
2009	350	440	–	75
2010	400	400	–	5
2011	280	380	–	88
2012	480	510	–	50
2013	600	500	88	–
2014	600	600	–	–
2015	550	480	75	0

The imports in 2009 are equal to the exports in 2015.
$\therefore$ 2009 + 2015 = 4010
But the imports in 2011 are equal to the exports in 2013.
$\therefore$ 2011 + 2013 = 4010

Solutions for questions 47 to 50:

6's		
Kohli	12.5%	$\frac{1}{8}$
Rohit	16.66%	$\frac{1}{6}$
Dhoni	20.83%	$\frac{5}{24}$
Dhawan	41.67%	$\frac{5}{12}$
Rahane	8.33%	$\frac{1}{12}$

4's		
Kohli	16.66%	$\frac{1}{6}$
Rohit	27.77%	$\frac{5}{18}$
Dhoni	20%	$\frac{1}{5}$
Dhawan	22.22%	$\frac{2}{9}$
Rahane	13.33%	$\frac{2}{15}$

Let the number of 4's and 6's be 90 K_1 and 24 K_2, respectively.
Choice total runs scored in 4's = 90 K_1 × 4
Total runs scored in 6's = 24 K_2 × 6

For K_1, K_2 = 1
Runs scored 4's 6's by the 5 bats men: 90 × 4 24 × 6
They scored 77.77% of their total runs in 4's and 6's.
360 + 144 = 504
Their total score = $\frac{9}{7}$ (504) = 648 runs.

Now this is 90% of India's total score.
$\frac{9}{10}$ (India's total Score) = 648
Therefore, India's total score = 720
We can check that no other combinations satisfy the given conditions.

	Runs scored			
Batsmen	**4's**	**6's**	**In 1's and 2's**	**Total runs**
Kohli	60 (15)	18 (3)	30	108
Rohit	100 (25)	24 (4)	38	162
Dhoni	72 (18)	30 (5)	42	144
Dhawan	80 (20)	60 (10)	22	160
Rahane	48 (12)	12 (2)	12	72

47. Rahane scored 48 + 12 = 60 runs in 4's and 6's whereas his total score was 72.

$$\frac{62}{72}\times 100 = 83.33\%$$

48. The total number of 4's and 6's hit by Dhawan was 30.
20 boundaries and 10 over boundaries.
20 + 10 = 30

49. The total runs scored by Dhawan in 6's = 60
Total runs scored by Rohit in 4's = 100
Now, 60 is less than 100 by

$$\frac{40}{100}\times 100 = 40\%$$

50. Kohli scored 30 runs out of a total of 108 runs in 1's and 2's.

Now, $\frac{30}{108}\times 100 = 27.77\%$

EXERCISE-3

Solutions for questions 1 to 3:

Value of A is = 28 + 21 + 12 = 61
Value of B is = 13 + 11 + 6 + 20 + 3 + 25 + 21 = 99
Value of C is = 6 + 20 + 14 + 17 + 5 + 19 = 81
Value of D is = 9 + 29 + 17 + 2 + 17 + 30 + 8 + 3 = 117
Value of E is = 17 + 11 + 12 + 9 + 29 + 17 + 14 + 20 + 11 = 140
Abhinav's height = 3 × 117 – 3 × 61 = 168

Bindia's height = E ÷ Only no. inside the right-angled triangle X
The smallest number in the square
Bindia's height = 140 ÷ 5 × 2 = 56
Chetan's height = 20 + 17 = 37
Dravid's height = 21 + 6 + 11 + 20 + 14 + 17 + 9 + 29 + 19 + 30 = 194
Enosh's height = 13 + 11 + 20 + 21 + 25 + 9 + 17 + 29 + 19 + 30 = 194

1. Difference in the heights of Bindia and Abhinav is 168 – 56 = 112.

2. The tallest person is Enosh.

3. Suman's height = 20 + 17 = 37
Dravids height = 146
∴ Difference = 146 – 37 = 109.

Solutions for questions 4 to 7: Let the total runs scored by Gaurav, Sheru, Tenchin and Drahul in their first five matches be G, S, T and D, respectively.

From (1), we get: $\frac{18}{100}G \le \frac{15}{100}D$

$\Rightarrow \frac{D}{G} \ge \frac{6}{5}$ → (1)

From (2), we get: $\frac{21}{100}T \ge \frac{24}{100}S \Rightarrow \frac{T}{S} \ge \frac{8}{7}$ → (2)

From (3), we get: $\frac{7}{100}T \le \frac{1}{1}\frac{12}{100}G$

$\Rightarrow \frac{G}{T} \ge \frac{7}{6}$ → (3)

4. $\frac{23}{100}D \ge \frac{23}{100}\frac{6}{5}G \ge \frac{27.6}{100}G$

But Gaurav scored only 25% of the total runs in his fourth match. Hence, Drahul scored more than Gaurav in the fourth match. Similarly, Drahul scored more than Sheru and Tenchin, and hence, he is the highest scorer.

5. Given $\frac{18}{100}D = 126$

$\Rightarrow D = 700$

$\frac{D}{T} = \frac{D}{G}\frac{G}{T} \ge \frac{6}{5}\frac{7}{6}$

$\Rightarrow T \le \frac{5}{7}D$

$\Rightarrow T \le 500$

6. Required ratio $= \frac{\frac{18}{100}G}{\frac{24}{100}S}$

$= \frac{3G}{4S} = \frac{3}{4}\frac{G}{T}\frac{T}{S} \ge 1$

The ratio is at least 1.

7. For Drahul the highest score in any match is $\frac{23}{100}D$

$\ge \frac{23}{100}\frac{6}{5}G$

(i.e., 27.6%)

$\ge \frac{23}{100}\frac{7}{5}T$

(i.e., 32.2%)

$\ge \frac{23}{100}\frac{8}{5}S$

(i.e., 36.8%)

But none of G, T and S had more than these percentages as scores in any match.

∴ Drahul scored the highest.

Solutions for questions 8 to 12: On day 1, Q and V both scored one point each. So, they would have drawn their match. On day 6, Q again drew with T and on day 4, T drew with S.

∴ Q, V, T and S are in one group and P, R, W and U are in the other group.

The matches on the different days which can be directly obtained from the table are:

Day 1	P	Q – V
Day 2	U – W	S
Day 3	P – W	T
Day 4	U	S – T
Day 5	W	S
Day 6	U	Q – T

Since U scored 7 points, it did not lose to P. As P won on Day 1 and played W on Day 3, P would have won against R on Day 1. U would have won against P or R on Day 4 and the other team (R or P) on Day 6.

In the second group as T had played on Day 4 and Day 6, it beat V on Day 3 and Q cannot play on Day 3 as it had already played on Day 1 and Day 2. The final table would be as follows:

Day 1	P – R	Q – V
Day 2	U – W	S – Q
Day 3	P – W	T – V
Day 4	U – P/R	S –T
Day 5	W – R	S –V
Day 6	U – R/P	Q – T

8. P, R, U and W are in one group.

9. T and V played on Day 3.

10. R and V lost on Day 5.

11. Among the given teams, W and R played on Day 5.

12. U could have won against P or R on Day 4.

Solutions for questions 13 to 16: It can be seen that the expenses on account of forex loses is only for Company Y. As it is 17% of the total expenses of Company Y and 8.5% of the merged entity, the expenses of Company Y is 50% of the total expens-

es of the merged entity. As the expense under taxes are only for companies X and Y, the taxes paid by Company Y would account for $\frac{14}{2}$ = 7% of the taxes paid by the merged entity while the remaining 5.1% of the taxes paid was due to Company X.

17% of X = 5.1% of $(x + y + z)$

$\therefore$ x = 30% of $(x + y + z)$

$\therefore$ Ratio of expenses of X, Y and Z = 3 : 5 : 2.

13. Ratio of expenses of companies X and Y = 3 : 5

14. Forex loses of Company Y = 8.5% of total

depreciation expenses of Company Z = $19 \times \frac{2}{100}$ = 3.8% of total

Required ratio = $\frac{8.5}{3.8} \times 100 = 223\%$

15. As the total expenses of the companies are in the ratio 3 : 5 : 2, the wage bill of Company Y would be the highest as 16% of 5 > 22% of 3 > 22% of 2.

16. Assume the expenses of X, Y and Z are ₹300, ₹500 and ₹200, respectively.

$\therefore$ Taxes paid by company Z = ₹50

Share of taxes paid = $\frac{171}{1050} \times 100 = 16.3\%$

Solutions for questions 17 to 20: As the name of the players are given in the order in which they came to bat, Rahul and Dhawan are the openers. As the first wicket fell at the score of 22, it has to be Rahul as Dhawan scored 27 runs. The next wicket has to be Dhawan as 32 runs were scored between the fall of the first and the second wickets and Pujara scored 35 runs. Using the same logic, the third wicket to fall was that of Pujara. When the fourth wicket fell, India's score was 121. As the first three batsmen scored 11 + 27 + 35 = 73 runs and Kohli scored 53 runs, had Kohli been out, India's score had to be at least 73 + 53 = 126 runs. Therefore, Rahane was the fourth batsman out. Similarly, Kohli was the fifth to be out. Now, the batsmen who were out have scored 11 + 27 + 35 + 53 + 6 = 132 runs. As the next wicket fell at 157, it was Saha (6th wicket). The seventh wicket was that of Pandya and the eighth Jadeja. The next wicket (9th wicket) can be Ashwin or Umesh. Had Ashwin been the 9th batsman out, the scores of all players till that point adds up to 231, which means all the 5 extra runs in India's innings happened during the last wicket partnership.

17. The third batsman to be out was Pujara.

18. The last batsmen to be out cannot be determined.

19. By the time Pandya was out, India had lost seven wickets.

20. In the case mentioned, Umesh was the 10th batsman to be out.

Challenge Your Understanding
Practice Set 1

Directions for questions 1 to 4: Answer these questions on the basis of the information given below.

The table below gives the process of manufacture of four different products A, B, C and D, each of which has to pass through all the four machines 1, 2, 3 and 4.

Machine \ Product	A	B	C	D
1	(6, 1)	(4, 1)	(3, 1)	(6, 2)
2	(8, 2)	(5, 1)	(6, 2)	(4, 1)
3	(3, 1)	(4, 2)	(6, 1)	(5, 1)
4	(5, 1)	(4, 1)	(5, 1)	(6, 2)

Each product should pass through machines 1, 2, 3 and 4 in that order, before it is ready. For each machine the first figure in bracket indicates the quantity (in units) of the corresponding product made, while the second indicates the time taken to produce that quantity.

For example, machine 1 can produce 6 units of product D in 2 hours or 1 unit every 20 minutes.

Each day only one type of product can be made and each day the working time is from 9.30 a.m. to 5.30 p.m. All machines are operated in such a way that any unit that is started on a day is finished by the end of that day. The selling prices and the percentage profit on each of the products is as given below.

Product	A	B	C	D
Selling price	275	504	234	345
Profit percentage *	10	12	30	15

* as a percentage of cost price.

All machines operate simultaneously.

1. What is the maximum number of units of any product that can be manufactured in a single day?
2. If the maximum revenue is to be realised on a day, then which product should be manufactured on that day? (All the quantity that is manufactured is sold on that same day)
3. To get the maximum profit on a single day which of the following should be produced?
4. Considering the day on which the maximum profit is earned, the total idle time of all the machines put together is (in mins)

Directions for questions 5 to 8: Answer these questions on the basis of the information given below.

Dandia Times, a national daily, decided to conduct a poll regarding the qualities which the people expect their Prime Minister to have. For this, Dandia Times surveyed exactly 100 respondents from each of the six major cities, namely Delhi, Mumbai, Kolkata, Chennai, Bangalore and Hyderabad.

In each city mentioned, each of the 100 respondents was given a response sheet listing out the five qualities that the Prime Minister was expected to have. Each respondent could mark one or more of the five given qualities that he expected in the Prime Minister, otherwise the respondent should mark a special option provided, which read 'None of the five qualities'. The following table gives, for each of the six cities, the number of people who expected each of the five given qualities in the Prime Minister.

Cities \ Qualities	Integrity	Political experience	Academic qualification	Public speaking skills	Leadership qualities
Delhi	35	63	35	48	26
Mumbai	42	32	42	25	27
Kolkata	55	26	38	37	48
Chennai	62	18	83	41	33
Bangalore	47	15	41	28	25
Hyderabad	51	29	47	39	36

For example, of the 100 persons surveyed in Delhi, the table shows that 35 persons expect the quality of 'integrity' in the Prime Minister.

5. Among the people surveyed in all the six cities put together, what is the maximum number of people who expected all the five listed qualities in the Prime Minister?

6. At least how many of the people surveyed in Bangalore expected a minimum of two of the five listed qualities in the Prime Minister?

7. If in Hyderabad, none of the persons surveyed expected more than three of the five listed qualities in the Prime Minister, then what is the minimum number of people surveyed in Hyderabad who expected exactly three of the five qualities in the Prime Minister?

8. At most how many of the people surveyed in Delhi and Chennai, put together, expected at most two of the five listed qualities in the Prime Minister?

Directions for questions 9 to 12: These questions are based on the following data.

Twelve teams took part in a football tournament, which is conducted in three stages. In the first stage the teams are divided into two groups of six teams each. The teams within a group play with each other once and the top three teams of each group go to the second stage. In the second stage, the three teams of each group play with each other once and the top two teams from each group then go to the third stage. In this stage, the two teams in each group play with each other and the winners from each group play with each other to decide the winner of the tournament. All games produce results. In case of a draw, a penalty shootout is used to decide the winner. In case of a tie, at the end of any of the first two stages the winner is decided by a set of complex tie breaking rules to ensure that only one team goes into the next round.

9. What is the total number of matches in the tournament?

10. What is the minimum number of games a team should win to ensure that it goes into the second stage?

11. Of all the teams that reached the second stage, what is the minimum number of games a team could have won?

12. If a team gets ₹50,000 for each win in the first stage, ₹1,00,000 in the second stage and ₹1,50,000 in the third stage, find the maximum amount that any team can win.

Directions for questions 13 to 16: Answer these questions on the basis of the information given below.

Mr. Anand is planning to set up a small-scale unit to manufacture water tanks. He can manufacture three types of tanks – 250 L, 500 L and 1000 L tanks. The costs involved are machinery rent and a variable cost which depends on the type and number of tanks made. The rent for machinery for making the 250 L and 500 L tanks is ₹1.2 lakh per month and the variable costs involved are ₹500 and ₹700 for a 250 L tank and a 500 L tank, respectively. For the manufacture of a 1000 L tank, the machinery would cost ₹1.7 lakh per month and the variable cost is ₹900 for a tank. He also has the option of renting machinery for ₹2.5 lakh per month, which can manufacture all the three types of tanks with the variable costs being ₹250, ₹400 and ₹700 for a 250 L, a 500 L and a 1000 L tank, respectively.

13. What is the least cost incurred per tank if Anand has to manufacture 900 tanks of 250 L capacity each month?

14. Anand decides to manufacture only 250 L tanks. What is the minimum number of tanks that he should manufacture so that the machinery which can manufacture all the three types of tanks is the economically viable option?

15. If Mr. Anand manufactures 2,500 units of 1000 L tanks per month, then what is the lowest price (in ₹) at which he should sell each tank to make a profit of 15%?

16. If Mr. Anand sells tanks of 500 L capacity at a price of ₹1300 per unit and makes a profit of ₹200 per unit, then how many 500 L tanks did he sell?

Directions for questions 17 to 19: These questions are based on the information given below.

A family consists of four persons, namely Rama, Jaya (Rama's wife), Hari (Rama's son) and Harini (Hari's wife). Rama's salary and Harini's salary put together is ₹24,000. Rama's salary is 25% of his son's and Harini's salary put together. Harini's salary is ₹15,000 less than Hari's salary. Jaya doesn't work and takes good care of her family and each member of the family rewards her by giving 10% of his/her salary and she donates 10% of what she receives to an old age organization and saves the rest.

17. What is Hari's salary (in ₹)?

18. What is the savings of Jaya (in ₹)?

19. The amount Jaya donates to the old age organization is what percentage of the total salary of all the members of the family?

Directions for questions 20 to 23: Answer these questions on the basis of the information given below.

The famous business school, IIM-P, has six branches, one in each of six different cities, such as in Delhi, Hyderabad, Mumbai, Bangalore, Chennai and Kolkata with an intake of 100 students in each branch. During the placement week, all the 100 students at each of the six branches attended job interviews. The distribution of the number of students with different specialisations and the number of students placed in various sectors is given in the following tables. Table P.1 gives the distribution of the students at each of the branches, based on their specialization and Table P.2 gives the distribution of the students at each of the branches, based on the sector in which they got placed.

Table P.1

Specialization	Branch					
	Delhi	Hyderabad	Mumbai	Bangalore	Chennai	Kolkata
Retail	24	15	10	16	20	20
HR	10	12	14	22	16	10
Information Systems	12	17	25	14	15	22
Finance	24	14	16	10	18	22
Operations	16	22	17	25	14	10
Marketing	14	20	18	13	17	16

Table P.2

Specialization	Branch					
	Delhi	Hyderabad	Mumbai	Bangalore	Chennai	Kolkata
Retail	34	20	22	20	22	27
IT	10	14	14	18	10	14
ITES	10	18	12	10	25	13
Banking	16	16	10	18	18	22
Telecom	18	19	25	14	9	14
Automobile	12	13	17	20	16	10

Further, it is also known that,

(i) All the students who had specialized in Retail, got placed in the Retail sector.

(ii) None of the students, who got placed in the Automobile sector, specialized in marketing.

(iii) All students who had specialized in Information Systems, got placed in either the IT or ITES sector.

(iv) None of the students who got placed in the Banking sector, specialized in either Finance or Operations.

Note: All students had exactly one job offer and each one of them had taken up exactly one specialization.

20. The number of students, at all the branches put together, who specialized in HR but got placed in the Retail sector, is at most

21. The number of students, at all the branches put together, who specialized in Marketing but got placed in the Banking sector, is at least

22. If none of the students who specialized in Finance got placed in the Automobile sector, the number of students, at all the branches put together, who specialized in Operations but got placed in the IT sector, is at most

23. What percentage of students who got placed in IT or ITES sector did not specialize in information systems?

Directions for questions 24 to 27: Answer these questions on the basis of the information given below.

The following table gives the distance (in kms) between 10 cities which Mr. Anand plans to visit. The cities A to J, not necessarily in that order are in a straight line and he plans, to start his journey from his home in city G. The distances given are the distances from the southernmost city C.

	A	B	C	D	E
F	160	280	65	190	305
G	105	225	120	135	250
H	180	60	405	150	35
I	30	150	195	60	175
J	65	55	290	35	80

24. What is the distance between cities G and I (in kms)?

25. The northernmost city among the given ten cities is

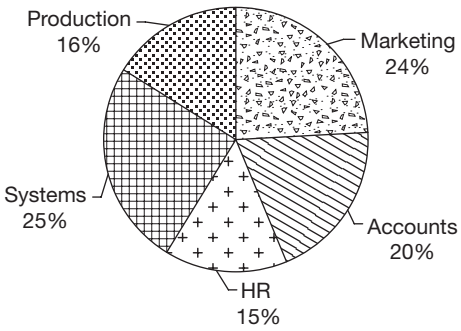
26. If Mr. Anand has to visit all the ten cities, then the total distance he has to travel is (in kms)

27. What is the least distance between any two of the given ten cities (in kms) is?

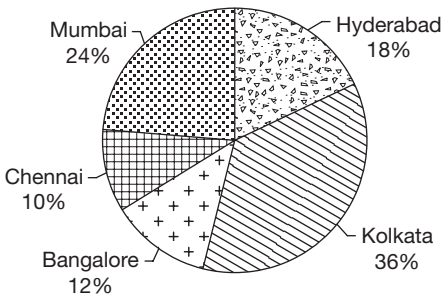
Directions for questions 28 to 30: Answer these questions on the basis of the information given below.

In company XYZ, which has a total of six franchisees, the head of the HR department wanted to find out the department wise as well as the franchisee wise distribution of all the employees in the company. The HR department started the task but as the number of employees working in the Operations department at the Delhi franchisee was not known, the employees of the Operations department at all the franchisees were left out while representing the department wise distribution. Further, all the employees at the Delhi franchisee were left out while representing the franchisee wise distribution of the total employees. The pie charts thus obtained were as follows.

Department wise distribution of employees

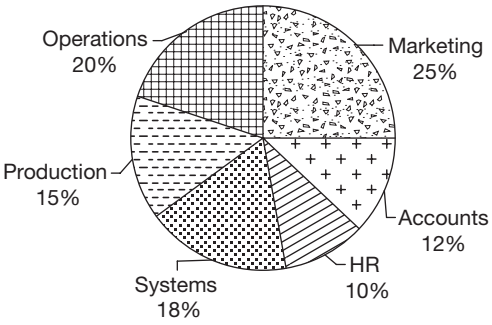


Franchisee wise distribution of employees

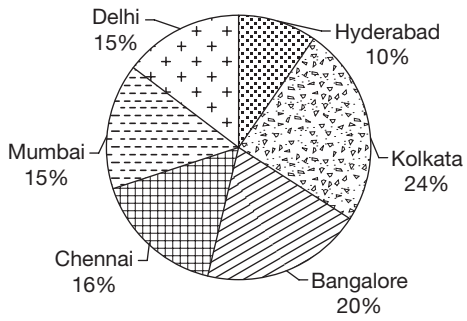


After the exact number of employees in the Operations department of the Delhi franchisee was known, two more pie charts, one for the department wise distribution of the employees at the Delhi franchisee and the other one for the franchisee wise distribution of the employees in the Operations department, were drawn as shown below.

Department wise distribution of employees at the Delhi Franchisee



Franchisee wise distribution of employees in the Operations department



28. If the total number of employees at the Delhi franchisee is the same as that of the Bangalore franchisee, then what percentage of the employees working at the Mumbai franchisee work in the Operations department?

29. If the total number of employees at the Mumbai franchisee forms 15% of the total number of employees at all the franchisees put together, what is the ratio of the number of employees working in the Accounts department at all the franchisees put together to that of the total number of employees working at the Chennai franchisee?

30. If the total number of the employees in the company XYZ is known, then which of the following additional statements can enable one to find the total number of employees in each department?

(1) The number of employees in the Marketing department at the Hyderabad franchisee.
(2) The number of employees in the Systems department at the Chennai franchisee.
(3) The number of employees in the Operations department at the Mumbai franchisee.
(4) The number of employees in the Accounts department at the Chennai franchisee.

Mark your answer as the number of the required statement.

ANSWER KEYS

1. 22	6. 14	11. 2	16. 300	21. 24	26. 535
2. (D)	7. 2	12. 7,50,000	17. 28,500	22. 51	27. 25
3. (C)	8. 184	13. 528	18. 4725	23. 37.5	28. 10
4. 618	9. 39	14. 520	19. 1	24. 75	29. 1.6
5. 139	10. 4	15. 920	20. 35	25. H	30. 3

SOLUTIONS

Solutions for questions 1 to 4:

1. Let us first calculate the time taken to produce a unit of each product.
Product – A – Machine 1 takes 10 minutes.
From the 11th to the end of 25th minute, machine 2 is working on product A.
From the beginning of the 26th minute to the end of 45th minute machine 3 works on product A and for the next 12 minutes machine 4 works on A.
1 unit of product A is completed in 57 minutes.
When machine 2 is working on a unit of product A, machine 1 can operate on the next unit of product A and so on.
After the first unit of product A is completed, every succeeding unit is produced in 20 minutes and this time is determined by the slowest unit in operation. (machine 3 in this case).
So, one unit of product A is manufactured after 57, (57 + 20), (57 + 20 + 20) minutes and so on.
That is 57, 77, 97, …
∴ In 480 minutes, 22 units can be produced.
Similarly, for B, each unit is produced in 72, (72 + 30) minutes and so on.
∴ In 8 hours, 14 units can be completed.
For machine C first unit is produced after 62 mins and each succeeding one after a 20 minutes interval.
∴ In 8 hours, 21 units can be produced.
For machine D each unit is produced in 67, (67 + 20) minutes and so on.
∴ In 8 hours, 21 units can be produced.

2. Revenues per day:
For A – $22 \times 275 = 6050$
For B – $14 \times 504 = 7056$
For C – $21 \times 234 = 4914$ and
For D – $21 \times 345 = 7245$
'D' realises maximum revenue.

3. The profit for each unit is as follows:
A – ₹25
B – ₹54
C – ₹54 and
D – ₹45
Profit for A – 25×22
Profit for B – 54×14
For C – 54×21 and
For D – 45×21
By observation we can say that the profit is maximum for C.

4. For maximum profit, product C has to be manufactured.
For 21 units of C, machine I needs to operate for $21 \times 20 = 420$ minute.
Idle time = 480 – 420 = 60 minutes
For 2, idle time = 60 minutes.
For 3, idle time = 270 minutes.
For 4, idle time = 228 minutes.
Total = 60 + 60 + 270 + 228 = 618 minutes.

Solutions for questions 5 to 8:

5. The maximum number of people who expected all the five listed qualities in the Prime Minister is at most 26 (Delhi) + 25 (Mumbai) + 26 (Kolkatta) + 18 (Chennai) + 15 (Bangalore) + 29 (Hyderabad) = 139.

6. The number of people who expected a minimum of two of the five listed qualities occurs when the number of people expecting exactly one quality and the rest expect all the five qualities.
Total in Bangalore = 47 + 15 + 41 + 28 + 25 = 156
If x people expected exactly one quality and y people expected all the five qualities.
$x + y = 100$ and $x + 5y = 156$
∴ $x = 86$ and $y = 14$.

7. As no person expected more than three qualities, to find the minimum number of people who expected exactly three of the five qualities occurs when the number of people expecting exactly two qualities is the maximum.
Total instances in Hyderabad
= 51 + 29 + 47 + 39 + 36 = 202.
If 'a' people expected exactly two qualities and 'b' people expected exactly three qualities,

$a + b = 100$ and $2a + 3b = 202$
$\therefore a = 98$ and $b = 2$
At least two people in Hyderabad expected exactly three of the five listed qualities in the Prime Minister.

8. The people who expected at most two of the listed qualities would be maximum when a maximum number of people expect two qualities and the rest, all the five qualities.
Total instances in Delhi = 207.
If 'a' persons expects two qualities and 'b' persons expect five qualities,
$a + b = 100$ and $2a + 5b \geq 207$.
The maximum value of 'a' is 97.
Similarly, in Chennai, $a + b = 100$ and $2a + 5b \geq 237$
The maximum value of 'a' is 87.
$\therefore$ Maximum persons at both the places combined
$= 97 + 87 = 184$.

Solutions for questions 9 to 12:

9. There are 30 matches in the first stage, six matches in the second stage and three matches in the next stage. A total of 39 matches.

10. The wins of different teams can be as follows. The teams are arranged in descending order of the number of wins. If a team wins 4 matches, there can't be 3 other teams with a better performance.

5	4	3	2	1	0
4	4	4	2	1	0
4	4	3	2	2	0
4	4	3	2	1	1
4	4	2	2	2	1
4	3	3	3	2	0
4	3	3	3	1	1
4	3	3	2	2	1
4	3	2	2	2	2
3	3	3	3	3	0
3	3	3	3	2	1

From the last row we see that there are five teams with three wins each. So, two teams with three wins will get eliminated. So, three wins are not enough.

11. If the top two teams win 5 and 4 matches, then out of the remaining 6 match results, a team which wins 2 matches can reach the second stage.

12. The top team can win at most 5 games in the first stage, 2 in the second and 2 in the third.
$\therefore$ The amount won by the top team in rupees
$= (5 \times 50{,}000) + (2 \times 1{,}00{,}000) + (2 \times 1{,}50{,}000)$
$= 7{,}50{,}000$

Solutions for questions 13 to 16:

13. The cost incurred would be
(a) 1.2 lakhs + 900×500 = 5.7 lakhs
(b) 2.5 lakhs + 900×250 = 4.75 lakhs
The least cost incurred per tank would be $\frac{4.75 \text{ lakhs}}{900}$
= ₹528

14. If he uses the machinery which costs 2.5 lakhs per month, he would incur an additional cost of ₹1.3 lakhs but his variable cost would be less by ₹250 per tank.
$\therefore$ Minimum tanks that has to be manufactured = $\frac{1.3 \text{ lakhs}}{250} = 520$.

15. For manufacturing 2500 tanks, the cost would be minimum if he rents the machinery which costs ₹2.5 lakhs. The cost incurred would be = 2.5 lakhs + 700×2500 = 20 lakhs.
$\therefore$ Amount per tank = $\frac{20 \text{ lakhs}}{2500} = 800$.
For a 15% profit he should sell it at ₹920.

16. The cost price of Mr. Anand = ₹1100 per tank.
In case he uses the first machinery, if x tanks are manufactured, 1.2 lakhs + $700x = 1100x$
$\therefore x = 300$
If he uses the second machinery, if x tanks are manufactured, 2.5 lakhs + $560x = 1100x$
$700x$ = 2.5 lakhs
x = (not an integer).

Solutions for questions 17 to 19:

17. Let the salary of Rama, Hari and Harini be R, A and H, respectively.
$R + H = 24000$ (1)
$R = 1/4(A + H)$
$\Rightarrow 4R = A + H$ (2)
$A - H = 15000$ (3)
Solving (1), (2) and (3), we get
A = ₹28,500.

18. A = ₹28,500, H = ₹13,500 and R = ₹10,500
Savings of Jaya (Mrs. Rama):
$\left(\frac{90}{100}\right)\left(\frac{1}{10}\right)[(28{,}500 + 13{,}500 + 10{,}500)] = 4725$

19. The amount Jaya donates is 10% of 10% of the salary of all the members of the family, i.e., 1%.

Solutions for questions 20 to 23:

20. Let us consider the HR students at each of the locations. As every Delhi student with a specialization in Retail got a job in Retail sector, 24 students who got jobs in Retail sector must have their specialization as Retail. Now of the 16 persons who got jobs in Banking sector, at most 14 can be from Marketing and the remaining 2 must be from

HR. Hence, a maximum of 8 persons of HR specialization got job in Retail sector.
Similarly,
Hyderabad = 5 students (i.e., 20 – 15 = 5)
Mumbai = 12 students (i.e., 22 – 10)
Bangalore = 4(20 – 16)
Chennai = 2 (i.e., 22 – 20)
Kolkata = As only 16 of the 22 students placed in Banking sector can be with Marketing specialization, remaining 6 must be with specialization in HR.
∴ Of the total 10 students placed in HR, only four can get the jobs in Retail sector.
∴ Total = 35

21. The minimum number of persons who specialized in Marketing and got a job in Banking sector at different locations is as follows.
(i) Delhi = 6
(ii) Hyderabad = 4
(iii) Mumbai = 0
(iv) Bangalore = 0
(v) Chennai = 2
(vi) Kolkata = 12
Therefore, there is a total of 24 students.

22. The required number of students at different locations is
Delhi = 8
Hyderabad = 14
Mumbai = 1
Bangalore = 14
Chennai = 10
Kolkata = 4
Therefore, there is a total of 51.

23. Total number of placements in IT or ITES sectors = 168
Number of students specializing not in information systems and placed in IT or ITES sector $= \frac{63}{168} \times 100 = 37.5\%$.

Solutions for questions 24 to 27: As C is the southernmost city and as the cities are in a straight line, we have to find the distance of each city from C.

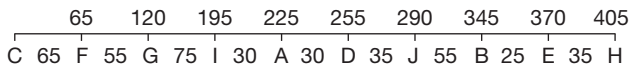
The corresponding distances are F – C = 65, G – C = 120, H – C = 405, I – C = 195, J – C = 290

To find the distance of cities A, B, D and E from C,
A – C
A – F = 160 and C – F = 65
A – G = 105 and C – G = 120
A – C = 160 – 65 = 95 or 160 + 65 = 225
and 120 – 105 = 15 or 120 + 105 = 225

As the common value is 225, the distance between A – C is 225.

Similarly, we can find the other values as B – C = 345, C – D = 255 and C – E = 370.

The ten cities according to their distance from C as



24. The distance between G and I is 75 kms.

25. As C is the southernmost city and the cities are in a straight line the city farthest from C would be the northernmost city, i.e., H

26. As he starts his journey from G, the shortest distance would be when he travels to C first and then travels northwards up to H, i.e., 405 + 120 = 525 kms

27. The least distance between any two cities is that between cities B and E, i.e., 25 kms.

Solutions for questions 28 to 35:

28. Given, 20% of the employees at the Delhi franchisee work in the Operations department and 15% of the employees in the Operations department work at the Delhi franchisee.
⇒ 20% of employees at the Delhi franchisee = 15% of the employees in the Operations department.

$$\frac{\text{Number of employees at the Delhi franchisee}}{\text{Number of employees in the Operations department}} = \frac{3}{4}$$

Let the number of employees in the company except at the Delhi franchisee be $100x$.
Total employees at the Bangalore franchisee = $12x$
Total employees at the Delhi franchisee = $12x$
Total employees at the Mumbai franchisee = $24x$
Total employees in the Operations department = $\frac{4}{3} \times 12x = 16x$
Of the employees in the Operations department, 15% of $16x = 2.4x$ work at the Mumbai franchisee.
Required percentage = $\frac{2.4x}{24x} \times 100 = 10\%$

29. Let the number of employees at all franchisee except at Delhi = $100x$
The employees working at the Mumbai franchisee = $24x$
The employees working at the Chennai franchisee = $10x$
Given that, employees at Mumbai form 15% of the total employees in the company.
Total employees in the company = $\frac{24x}{15} \times 100 = 160x$
Now the employees at the Delhi franchisee = $60x$
The employees in the Operations department = $80x$ (as 20% of the employees at the Delhi franchise form 15% of the employees in the Operations department)
Total employees in all the departments except Operations = $160x - 80x = 80x2$
Employees in the Accounts department = $\frac{20}{100}(80x) = 16x$
Required ratio = $16x : 10x = 8 : 5$

30. As the total number of employees in the company is known, we need either the number of employees in the Operations department or that at the Delhi franchisee. Hence, only (C) will be helpful in finding the required values.

Challenge Your Understanding
Practice Set 2

Directions for questions 1 to 4: Answer the questions on the basis of the information given below.

The table below gives the details about four different machines A, B, C and D. Each of the machines can produce four different types of products, X, Y, Z and W.

Machine \ Product	X	Y	Z	W
A	(20,2)	(30,3)	(40,1)	(30,2)
B	(30,3)	(40,2)	(60,1)	(30,2)
C	(30,1)	(40,2)	(80,4)	(30,1)
D	(15,1)	(20,1)	(40,2)	(80,4)

Each of the machines is allowed to operate for a total of 8 hours. The first figure in the bracket indicates the quantity (in units) of the product produced while the second numerical figure indicates the time taken (in hrs) to produce that quantity of that product. For example, machine A produces 20 units of X in 2 hrs.

Each machine operates independently and can produce only one type of product at any given point of time and produces the products X, Y, Z and W in that order and for the time period mentioned, i.e., machine A produces X for the first two hours, Y for the next three hours and so on. The same is the case with other machines. The machines produce any product at a uniform rate.

1. In the first 5 hours of operation, find the quantity of Z (in units) produced?
(A) 0 (B) 20
(C) 220 (D) 80

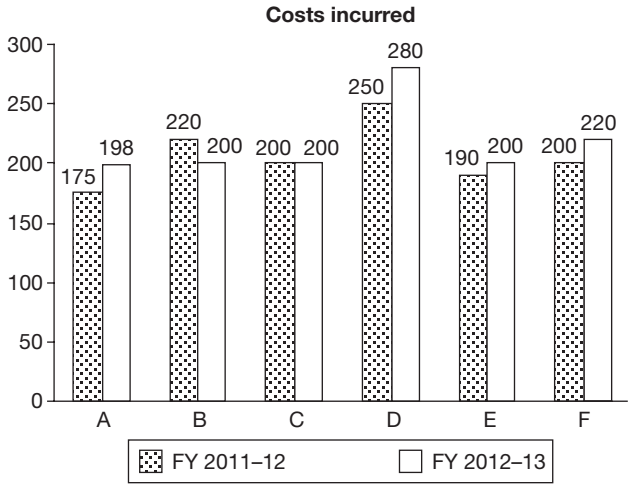
2. The quantity of W produced in the first x hours is at least 20. Which of the following is true?
(A) $x = 5$ (B) $x \geq 5$
(C) $x = 3$ (D) $x = 4$

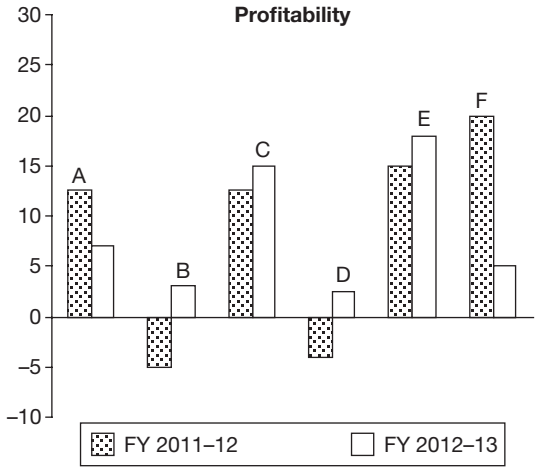
3. In the first four hours, by what percentage is the quantity of Y produced by B more or less than that of C?
(A) 50% less
(B) 50% more
(C) 100% more
(D) 62.5% less

4. What is the maximum quantity of any product produced in the first 4 hours?
(A) 90 (B) 95
(C) 100 (D) 110

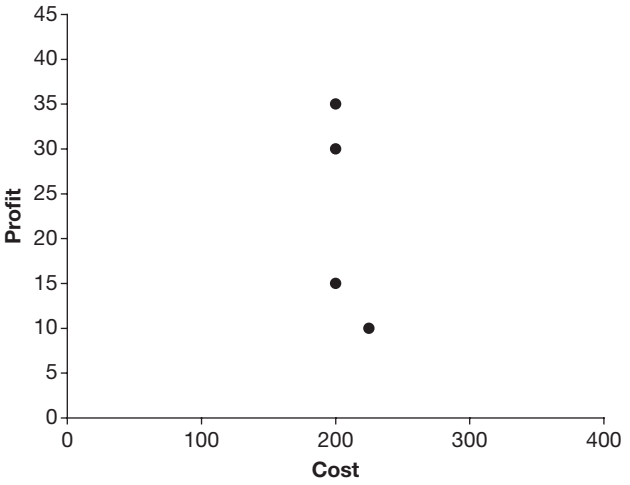
Directions for questions 5 to 8: Answer the questions on the basis of the information given below.

The following two charts show the costs (in ₹ cr) and the profitability of six companies in the financial years (FYs) 2011–12 and 2012–13. Profitability is defined as the ratio of profit obtained to the costs, incurred, typically expressed in percentage.





The profits of four of these companies are plotted against their respective costs for 2012–13.



5. Which of the following statements is not true?
(A) The company with the highest profitability in FY 2011–12 has the highest cost in FY 2012–13.
(B) The company with the highest cost in the two financial years combined has the highest cost in FY 2012–13.
(C) Companies with a higher cost in FY 2011–12 than in FY 2012–13 have higher profitability in FY 2012–13 than in FY 2011–12.
(D) Companies with profitability between 10% and 20% in FY 2011–12 also have costs between 150 crore and 250 crore in FY 2012–13.

6. Which company recorded the highest profit in FY 2012–13?
(A) A (B) E
(C) F (D) C

7. What is the approximate average profit in FY 2011–12 of the companies which are excluded from the third chart?
(A) –7.5 crore
(B) 3.5 crore
(C) –10.5 crore
(D) –12.0 crore

8. The average profit in FY 2012–13 of the companies with profitability exceeding 10% in FY 2012–13, is approximately
(A) 17.5 crore
(B) 25 crore.
(C) 27.5 crore
(D) 32.5 crore

Directions for questions 9 to 12: Answer the questions on the basis of the information given below.

The following table gives details about ten business groups in the country.

Business group	No. of companies in the group	Total group turnover (₹ crore)	% share in group turnover	
			of the largest company	of the smallest company
A	7	3000	25	8
B	5	2250	32	10
C	4	3100	40	15
D	8	2500	26	7
E	5	5200	32	6
F	6	3700	29	11
G	3	10200	45	25
H	5	6350	30	13
I	6	4200	27	11
J	4	4950	36	10

9. What could be the maximum turnover (in ₹400 crore) of the third largest company of business group A?
(A) 570 (B) 600
(C) 645 (D) 672

10. At most how many companies of group D had a turnover of more than ₹400 crore?
(A) 4 (B) 3
(C) 2 (D) 1

11. What is the maximum turnover (in ₹crore) of the second smallest company of business group I?
(A) 528 (B) 586
(C) 620 (D) 651

12. At most how many companies of business groups B, E or F had a turnover less than ₹500 crore?
(A) 6 (B) 9
(C) 8 (D) 10

Directions for questions 13 to 16: Answer the questions on the basis of the information given below.

Business process outsourcing (BPO) companies get their revenue from two sources, such as data processing and voice processing. The average revenue received from each hour of voice processing is called ABRH. In the table below, the revenue received from voice processing as a percentage of total revenue received and the ABRH in US Dollars (USD) are given for twenty companies from A through T.

Company	ABRH (in USD)	Revenue from voice processing as a percentage of total revenue
A	1	9
B	2	8
C	1	11
D	1	17
E	2	15
F	4	13
G	3	13
H	2	22
I	2	42
J	6	12
K	7	15
L	6	18
M	6	21
N	7	25
O	9	11
P	9	20
Q	8	23
R	9	28
S	10	23
T	11	20

13. If it is known that the number of hours of voice processing is the same for companies A and P, then which of the following statements is true?
(A) Total revenue is the same for both the companies.
(B) Total revenue of company P is about four times that of company A.
(C) Total revenue of company A is about four times that of company P.
(D) Total revenue of company A is about two times that of company P.

14. If the number of hours of voice processing is the same for all the companies given, then which company has the highest total revenue?
(A) A (B) J
(C) K (D) None of these

15. It is expected that in another two years, i.e., in 2011, revenue from voice processing as a percentage of total revenue will be tripled for company A and doubled for company L. Assume that in 2011, the total revenue of company A is twice that of company L and that the number of hours of voice processing is the same for both the companies. What is the percentage increase of ABRH of company A, if there is no change in ABRH of company L?
(A) 400 (B) 550
(C) 800 (D) 950

16. If the total revenue is the same for the pair of companies listed in the choices below, choose the pair that has approximately the same number of hours of voice processing.
(A) I and P (B) M and Q
(C) M and F (D) B and H

Directions for questions 17 to 19: Answer the questions on the basis of the information given below.

The following table provides the number of students writing MBA entrance exams in a year and the percentage of students, among those writing a particular exam, who write only that exam. The table gives data of all the MBA entrance exams in a year.

	Students writing	
Exam	That exam	Only that exam
CAT	1,95,000	56%
XAT	93,000	17%
IIFT	42,000	26%
SNAP	70,000	34%
CMAT	82,000	12%
MAT	36,000	24%

17. At most how many students wrote both CAT and XAT?
(A) 87,280 (B) 85,800
(C) 77,190 (D) None of these

18. The number of students who wrote all the six exams is at most _____.
(A) 31,080 (B) 37,180
(C) 24,820 (D) 27,360

19. What is the minimum number of students who wrote at least one of the six exams?
(A) 2,48,160 (B) 2,64,010
(C) 2,94,380 (D) None of these

Directions for questions 20 to 23: Answer these questions on the basis of the information given below.

There are 100 students in class XII of Model School. The following table gives the break-up of students with respect to the marks scored by them in the three core subjects, such as Maths, Physics and Chemistry and the two language subjects English and Hindi. The maximum marks in each subject is 100 and a student needs to score at least 50 marks to pass.

Number of students with marks	Maths	Physics	Chemistry	English	Hindi
90 or above	18	24	28	21	26
80 or above	35	42	39	42	38
70 or above	52	58	55	58	47
60 or above	61	75	72	65	60
50 or above	87	93	88	88	82

20. What is the maximum number of students who failed in all the five subjects?
(A) 5 (B) 7
(C) 9 (D) 12

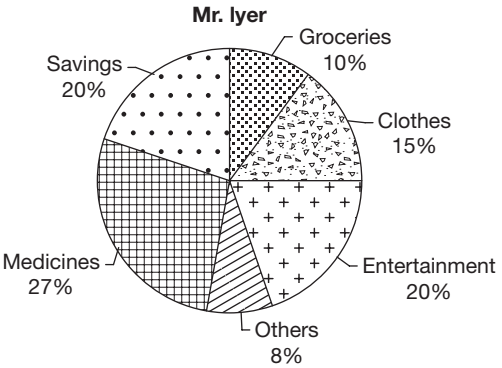
21. The number of students who passed in all the five subjects is at least _____.
(A) 93 (B) 87
(C) 82 (D) None of these

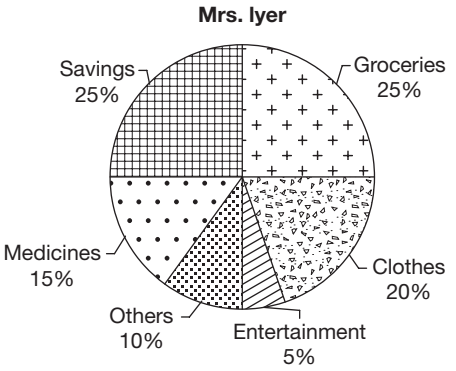
22. Students who score 90 or more marks in at least two of the core subjects and at least one of the language subjects are eligible for a scholarship. At most how many students would be eligible for the scholarship?
(A) 33 (B) 24 (C) 28 (D) 35

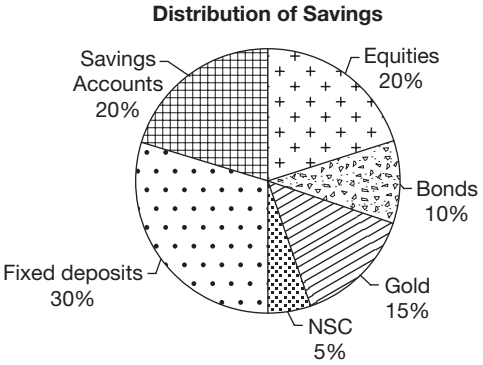
23. At most how many students scored 60 or more marks in at least four of the five subjects?
(A) 83 (B) 76 (C) 75 (D) 61

Directions for questions 24 to 27: These questions are based on the following information.

The pie charts show the distribution of the annual expenses and savings of Mr. and Mrs. Iyer and also the distribution of investment of their combined savings.







The total expenditure on any of the heads and also of the savings is the sum of the values of both the persons on that particular item.

24. If the total money invested by them in fixed deposits forms 15% of Mrs. Iyer's income, then what is the ratio of the incomes of Mr. and Mrs. Iyer?
(A) 4 : 5 (B) 3 : 2
(C) 7 : 5 (D) None of these

25. If the amount spent on clothes by Mr. Iyer is more than that by Mrs. Iyer, then the amount spent by Mr. Iyer on which of the following is definitely more than that by Mrs. Iyer?
(1) Groceries (2) Medicines
(3) Others (4) Entertainment
(A) Only 1 and 2 (B) Only 1, 3 and 4
(C) Only 2, 3 and 4 (D) Only 2 and 3

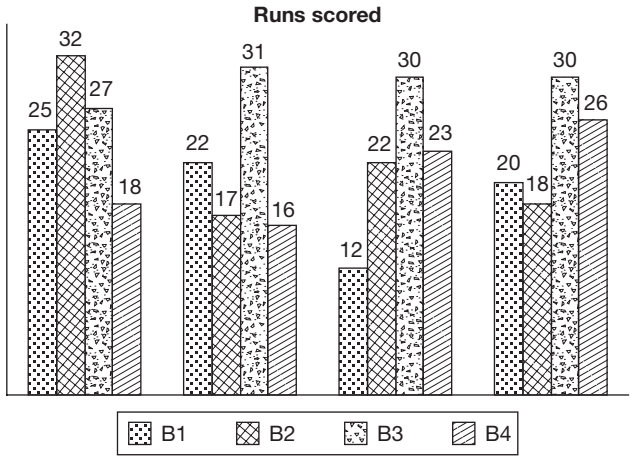
26. If the amount they invested in equities forms 4.55% of their combined total income, then Mrs. Iyer's salary is what percentage of Mr. Iyer's salary?
(A) 66.66 (B) 81.81
(C) 122.22 (D) 75

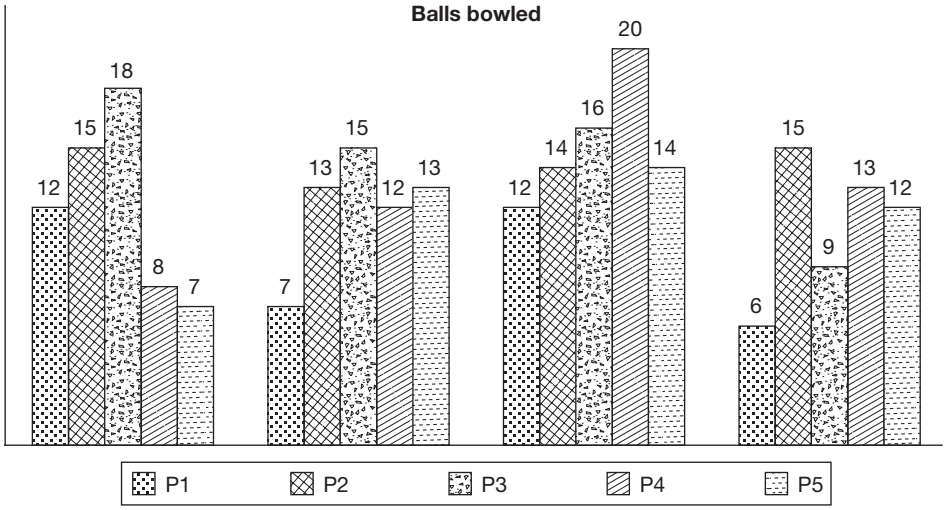
27. If the amount that is invested in savings accounts is the same as what Mr. Iyer spent on groceries, then the ratio of the amounts spent by Mr. and Mrs. Iyer towards entertainment is

(A) 10 : 3 (B) 3 : 1
(C) 5 : 3 (D) 2 : 1

Directions for questions 28 to 30: These questions are based on the following information.

While selecting the team for the Twenty20 World Cup, the selectors of the Indian team could not make up their mind regarding four batsmen namely B1, B2, B3 and B4 and five bowlers namely P1, P2, P3, P4 and P5 in the selection camp. Hence, they decided to conduct selection trials for these nine players. The trials were conducted in four sessions, such as S1, S2, S3 and S4 in a single day. The trials were conducted such that each batsman had to face the bowling of all the five bowlers in each of the four sessions. The following bar graphs exhibits the runs scored by the four batsmen in each session and the number of balls bowled by the five bowlers in each session.





Further, the following information is also known:

(1) Strike rate of a batsman = $\frac{\text{Runs Scored}}{\text{Balls faced}} \times 100$

(2) Only 0, 1, 2, 3, 4 or 6 runs can be scored off a single ball and if 0 runs are scored off a ball, it is called a dot ball.

(3) In none of the sessions did any of the bowlers bowl more than one dot ball to a batsman.

(4) The bowlers bowl only to these four batsmen and the batsmen face the bowling of only these five bowlers.

Directions for questions 28 to 30: Type your answer in the space provided below the question.

28. The number of sixers (6 runs off a ball) scored off the bowling of P1 was at most. _____

29. The number of balls faced by batsman B2 was at least _____ .

30. The number of balls off which a single run (i.e., 1 run) was scored was at least _____.

Directions for question 31: Select the correct alternative from the given choices.

31. If it is known that in each session, each of the bowlers bowled one dot ball to each batsman, then the minimum possible strike rate of B3 is_____.

(A) 80.5 (B) 85.5
(C) 89.0 (D) 92.2

Directions for questions 32 to 35: Answer these questions on the basis of the information given below.

The cricket magazine Wisden, in its survey of the best one-day batsmen of the century, shortlisted six players, and then ranked them based on seven different parameters. In any parameter, these persons were ranked from 1 to 6 based on the decreasing order of the corresponding values for the players. In the following table, some of the values have been intentionally removed.

Batsman	Parameter						
	Total innings played	Total runs scored	Total balls faced	Number of times not out	Number of times out	Average	Strike rate
Ponting		6	2	1		6	
Richards		5		6		4	
Sachin	6		1		3		2
Inzamam	4		6		4	2	4
Lara	2				6		3
Dravid		2	4	5			

In the above table, in any parameter, the person with rank 1 has the highest value and the person with rank 6 has the least value in the corresponding parameter. For example, Sachin faced the highest number of balls and Inzamam faced the least.

For any player:

(i) Total Innings played = Number of times out + Number of times not out

(ii) $\text{Average} = \frac{\text{Total runs scored}}{\text{Number of times out}}$

(iii) $\text{Strike rate} = \frac{\text{Total runs scored}}{\text{Total balls faced}}$

Further, these six players are allotted points such that the player with the highest 'Average' will get 12 points, the second highest is 10, the third highest is 8 and so on. Similarly, the person with the highest 'Strike Rate' will get 6 points, the second highest 5 points and so on.

In the end, the points obtained by them in both the parameters put together, are considered as total points.

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

32. Which player has the highest number of total points?
(A) Richards (B) Sachin
(C) Inzamam (D) Lara

33. Which player has the least number of total points?
(A) Ponting (B) Richards
(C) Lara (D) Inzamam

34. In how many of the given seven parameters did Sachin get rank 1? _____

35. In how many of the given seven parameters did Sachin get a better (numerically lower) rank than Dravid? _____

Directions for questions 36 to 39: Answer these questions on the basis of the information given below.

The following table gives the details of 100 boys and 100 girls who take a test. The test consisted of three areas, such as Quant, Reasoning and English. The tables give the breakup of the students according to their marks in each area. The maximum marks in each area is 100.

Quant

Boys	Girls
17 (7 – 25)	21 (6 – 20)
31 (26 – 49)	32 (24 – 60)
15 (54 – 75)	27 (63 – 80)
37 (76 – 100)	20 (81 – 98)

Reasoning

Boys	Girls
15 (11 – 27)	22 (7 – 32)
19 (29 – 48)	29 (35 – 61)
31 (51 – 72)	30 (62 – 78)
35 (74 – 95)	19 (80 – 97)

English

Boys	Girls
21 (7 – 27)	15 (11 – 32)
36 (29 – 53)	27 (34 – 58)
27 (57 – 74)	21 (62 – 77)
16 (77 – 88)	37 (78 – 92)

For example, the table under Quant shows that there are 17 boys who scored marks in the range of 7 to 25 with the lowest mark being 7 and the highest being 25 and there are 21 girls who scored marks in the range of 6 to 20, with the lowest marks being 6 and the highest being 20.

36. The average score of the given students in the quant section is at least
(A) 42.17 (B) 44.66
(C) 47.32 (D) 49.65

37. The number of students who scored more than 70 marks in each section is at most
(A) 88 (B) 92
(C) 99 (D) None of these

38. The average score of the girls in the English section is at most
(A) 67.26 (B) 69.93
(C) 61.84 (D) 72.35

39. The average score of the boys in the reasoning section is at least
(A) 48.13 (B) 48.76
(C) 49.64 (D) 50.27

Directions for questions 40 to 43: Answer these questions on the basis of the information given below.

A school has a total of 6720 students. The ratio of the number of boys to that of girls in the school is 9 : 7. All the students are enrolled in at least one of the three classes among painting, dancing and singing. One-twelfth of the boys are enrolled only for painting classes. Twenty-five per cent of the girls are enrolled in only singing classes whereas one-tenth of the boys are enrolled in only singing classes. Twenty per cent of the girls are enrolled in both painting and singing classes only. The number of girls enrolled only for painting classes is 100 per cent more than the number of boys enrolled in the same. One-ninth of the boys are enrolled in all the three classes together. The ratio of the number of boys enrolled in both singing and dancing classes only to the girls enrolled in the same is 7 : 5. One-tenth of the girls are enrolled in only dancing classes whereas $8\frac{1}{3}$ per cent of the girls are enrolled in both singing and dancing classes together but not in painting. None of the girls are enrolled in both painting and dancing classes only. The number of boys enrolled in both painting and singing classes only is equal to half the number of girls enrolled in the same. None of the boys are enrolled in both painting and dancing classes only.

40. Find the total number of boys enrolled in painting.
(A) 1008
(B) 996
(C) 1058
(D) None of these

41. The total number of boys enrolled in dancing forms approximately what percentage of the total strength of the school?
(A) 36% (B) 42%
(C) 48% (D) 54%

42. Find the total number of students enrolled in all the three classes.
(A) 820 (B) 836
(C) 848 (D) 868

43. The number of boys enrolled in only singing forms what percent of the girls enrolled in the same?
(A) 51.43% (B) 45.28%
(C) 56.57% (D) 62.63%

Directions for questions 44 to 46: These questions are based on the following information.

A car manufacturer has three race cars, such as car I, car II and car III. He fields them in car races. If car I wins he gets 80% more than the amount he had deposited on that car for the race. If car II wins, he gets 40% more and if car III wins he gets 40% more, then the respective amounts deposited.

If a car does not win a race, the manufacturer loses 20% of the money he had deposited on that car. In each race he fields only two cars and deposits an equal amount on each and in each race only one car wins. On a certain day there are three races. Car I wins race 1, car III wins race 2 and car II wins race 3. money deposited for races 2 and 3 is equal to the amount with the manufacturer at the end of races 1 and 2 respectively. He ends up with ₹31,460 in the end.

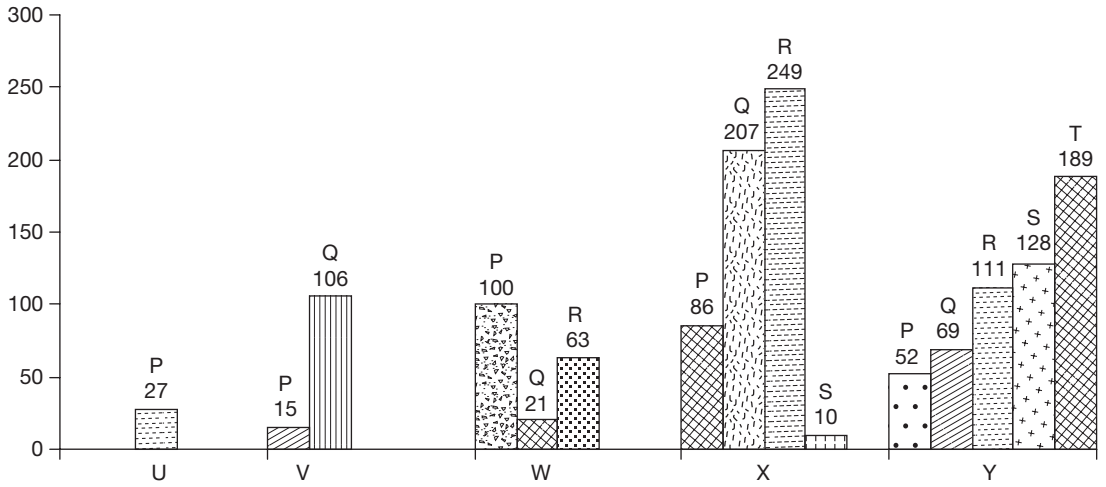
44. How much amount did the car manufacturer deposit for race 1?
(A) ₹10,000 (B) ₹30,000
(C) ₹15,000 (D) ₹20,000

45. In which race did the car manufacturer get the maximum amount as profit?
(A) Race 2 (B) Race 1
(C) Race 3 (D) Race 1 or Race 3

46. If the manufacturer had fielded only car I in race 1, only car II in race 2 and only car III in race 3 and the performance (winning or losing) of these cars that are fielded remains the same (as given earlier), what would be his net profit by the end of race 3? (Assume that in each race he deposits all the money he has)
(A) ₹1520 (B) ₹3040
(C) ₹4320 (D) ₹2160

Directions for questions 47 to 50: Answer these questions on the basis of the information given below.

The bar graph gives details of the marks scored by ten students – P, Q, R, S, T, U, V, W, and X in an exam. The graph gives details of the difference in marks of P, Q, R, S, and T with respect to U, V, W, X and Y.



It is known that student Q had the second highest marks among all the ten students.

47. Who scored the highest marks among the ten students?
(A) W (B) R
(C) P (D) Cannot be determined

48. If Q scored 450 marks, what is the sum of the marks scored by P and R?
(A) 821 (B) 786
(C) 852 (D) Cannot be determined

49. Who among U, V, W, X and Y scored the highest marks?
(A) U
(B) W
(C) Y
(D) Cannot be determined

50. If it is known that P scored 565 marks, which of the following can be the marks scored by U?
(A) 538
(B) 567
(C) 592
(D) Cannot be determined

Directions for questions 51 to 54: Answer these questions based on the following data.

In a hockey tournament, each one of the five teams named as A, B, C, D and E played exactly one match with every other team. For a team, if the number of goals made in a match is greater than that conceded, then the match is a win. If the number of goals made is equal to that conceded, then it is a draw. If the number of goals made is less than that conceded, it is a loss. For a win, a team gets 10 points, for a draw the team gets 4 points, while for a loss, the team loses 5 points. In addition, for every goal made, a team gets 2 points and for every goal conceded, it loses one point. The team getting the greatest number of total points wins the tournament.

		→ Goals conceded				
	Team	**A**	**B**	**C**	**D**	**E**
↓ **Goals made**	A	–	5	3	2	6
	B	3	–	4	2	3
	C	5	2	–	5	4
	D	3	4	3	–	2
	E	4	3	6	6	–

Note: For example, A made 3 goals against B while conceding 5 goals to it.

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

51. How many points did team E score in the tournament?
(A) 13 (B) 15
(C) 18 (D) 20

52. Which team won the tournament?
(A) A (B) B
(C) C (D) D

53. What is the total number of draws in the tournament?
_____

54. How many teams have two wins each? _____

Directions for questions 55 to 58: These questions are based on the following data.

A die, with the numbers 1 to 6 marked on its six faces was cast repeatedly. The table below gives the number of times that each individual number on the faces of the die turned up, in the first n casts, where $n = 20, 40, \ldots, 140$.

Casts	Number of times each number turned up					
	1	2	3	4	5	6
First 20	4	3	4	2	2	5
First 40	10	8	5	7	3	7
First 60	12	15	10	8	8	7
First 80	14	17	17	13	10	9
First 100	14	18	22	20	13	13
First 120	19	23	23	22	17	16
First 140	19	24	24	32	18	23

It was also observed that in no two consecutive casts did the same number turn up.

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

55. If the number 4 turned up in the 140th cast, then which number/s could not have turned up in the 131st cast?
(A) 2 (B) 1
(C) 4 (D) 3

56. Which of the following numbers must have turned up for the maximum number of times in the first 65 casts?
(A) 2 (B) 1
(C) 5 (D) 3

57. What is the least number of times the number 4 could have turned up in the first 95 casts? _____

58. What is the maximum number of times any of the even numbers could have shown up from the 81st cast to the 130th cast? _____

Directions for questions 59 to 62: These questions are based on the following information.

In an examination, there are 100 questions. A student is awarded 12 marks for each correct answer. He loses 3 marks for each wrong answer and loses 2 marks for each unanswered question.

The net score of Hari in that test is 625.

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

59. The number of ways in which Hari could have attempted the exam is _____ .

60. The maximum number of questions attempted by Hari could be _____ .

61. The number of questions that Hari got wrong if the number of correct answers that he got is a multiple of 5 is
(A) 12 (B) 15
(C) 20 (D) 25

62. Which of the following could be the number of questions Hari left unanswered?
(A) 5 (B) 15
(C) 25 (D) 35

Directions for questions 63 to 66: These questions are based on the following information.

Eight players from P to W take part in a double round robin chess tournament, in which each player plays every other player twice, once with white and once with black pieces. 3 points are awarded for a win, 1 point for a draw and 0 points for a loss. At the end of all the matches, the player with the highest points is awarded the first rank, the next one second and so on. If two or more players end up with the same number of points, they are given the same rank.

63. If it is known that player R was the sole winner of the tournament, then at least how many points did he score?
(A) 14 (B) 16
(C) 15 (D) 17

64. If all players end up with distinct points, what is the maximum points scored by player P, if it is known that he finished last?
(A) 16 (B) 15
(C) 14 (D) 17

65. Which of the following cannot be the points scored by all the players together at the end of the tournament?
(A) 108 (B) 121
(C) 132 (D) 164

66. If it is known that player R won the tournament and all players scored distinct points, then at least how many points did R score?
(A) 17 (B) 18
(C) 19 (D) 20

Directions for questions 67 to 70: The following table gives the national market share of an automobile company, ABC Ltd in different segments in the year 2011.

Segment	National share (%)
LCV	36
CV	42
Multi-axle	25
Hatchback	33
Sedan (compact)	56
Sedan (Luxury)	35
SUV	44

67. If the overall national sales of LCVs were 280% more than that of CVs, then for ABC Ltd, the sales of CVs was what percentage of LCVs?
(A) 40.5 (B) 38.1
(C) 35.2 (D) 30.7

68. If the sales of luxury sedans by ABC Ltd was 20% of its compact sedan sales, then the national sales of compact sedans forms what percentage of the national sales of compact and luxury sedans?
(A) 71.2% (B) 75.8%
(C) 68.2% (D) 67.2%

69. If all automobiles are classified in one of the seven segments and for ABC Ltd, multi-axle vehicles form 10% of its total sales, then the overall national sales of multi-axle vehicles form at least what percentage of the national sales of all vehicles?
(A) 15.1% (B) 12.8%
(C) 10% (D) 7%

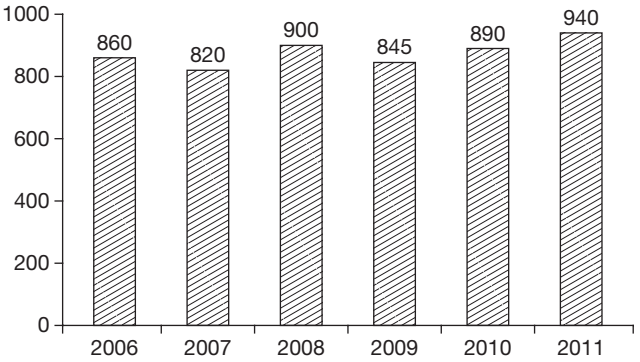
70. If only Hatchbacks, Sedans (both compact and Luxury) and SUVs come under the category of cars and the national share of ABC Ltd in cars is 47%, then what is the least percentage share of compact Sedans in total car sales in the country?
(A) 20 (B) 25
(C) $33\frac{1}{3}$ (D) 40

Directions for question 71 to 74: These questions are based on the following data.

The table shows the religion-wise break-up of the number of women per 1000 men in a locality in 2011.

Jains	802
Hindus	900
Muslims	875
Christians	795
Sikhs	1020

The line graph shows the number of women for every 1000 men in the locality, over the years.



71. If in 2011, the difference between the number of men and the number of women among Hindus is same as that among Muslims, then what is the ratio of the number of men who are Muslims to the number of women who are Hindus?
(A) 10 : 9 (B) 9 : 10
(C) 35 : 36 (D) 8 : 9

72. In 2011, at least what percentage of the people in the locality are Sikhs?
(A) 25 (B) 30
(C) $33^1/_3$ (D) 37.5

73. If the total number of Christians and Muslims in the locality in 2011 is the same, then by what percentage is the number of Christian men more then the number of Muslim men?
(A) 4.5 (B) 5.3
(C) 5.6 (D) 6.2

74. In 2011, the percentage of Sikhs in the locality was definitely less than _____.
(A) 52.8 (B) 59.6
(C) 64.4 (D) Cannot be determined

Directions for questions 75 to 78: These questions are based on the following data.

The following table gives the time taken (in hrs) by four machines, namely M_1, M_2, M_3 and M_4 to process four subtasks, such as T_1, T_2, T_3 and T_4 which constitute task T. Each machine can do any of the four subtasks and the only condition is that a machine cannot do more than one subtask at the same time and no subtask can be done simultaneously by two machines.

Machine \ Task	T_1	T_2	T_3	T_4
M_1	7	6	4	9
M_2	5	3	7	8
M_3	7	7	6	2
M_4	5	8	5	6

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

75. What is the minimum time (in hrs) in which the task can be completed if the subtasks can only be done one after the other in the order T_1, T_2, T_3 and T_4? _____

76. If machine M_3 is not working, then what is the minimum time required (in hrs) to finish the task, if the subtasks can be done simultaneously? _____

77. If only two machines can be used, then what is the shortest time (in hrs) in which all the subtasks can be completed? _____

(A) 10 (B) 9
(C) 8 (D) 7

78. If the subtasks can be done simultaneously, i.e., if two or more machines could work on a subtask at the same time, then what would be the approximate minimum time in which all the subtasks can be completed?
(A) 3.5 hrs (B) 3.7 hrs
(C) 4 hrs (D) 4.25 hrs

Directions for questions 79 to 82: Answer these questions on the basis of the following information.

50,000 units of brand X are being sold in the market at a price of ₹10 per unit. A competitive brand, Y enters the market. The courses of action available for the company marketing brand X are as follows:

(1) Cut the price of X by 50%, which would result in an increase in the number of units sold of X by 30% with a probability of 0.5 and by 20% with a probability of 0.5.
(2) Advertise, which would cost ₹2,00,000, but would result in an increase in the number of units of X sold by 50% with a probability of 0.1, by 20% with a probability of 0.5 and by 10% with a probability of 0.4.
(3) Remain silent, in which case, the probability of losing the market by 40% is 0.5 and the probability of retaining its market is 0.5.

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

79. Which is the best course of action to follow?
(A) Cut down the price (B) Advertise
(C) Remain silent (D) Insufficient data

80. In which of the cases does the market of X (number of units sold) increase the most?
(A) Cut down the prices
(B) Advertising
(C) Remain silent
(D) None of these

81. What is the net loss (in ₹) if course 1 is followed? (Net Loss = Money realized originally – Money realised now) _____

82. What is the revenue realised (net of advertising expenses) if course 2 is followed (in ₹)? _____

Directions for questions 83 to 86: Answer these questions on the basis of the information given below.

The following table gives the average scores of the students of classes I to V.

Class	Average score of top 20% of the students	Average score of the lowest 20% of the students
I	82	36
II	76	31
III	68	24
IV	86	19
V	80	38

83. If there are 60 students in class IV and the average score of the class is 60, then the score of the student who got the 48th rank in the class is at most.
(A) 30 (B) 45
(C) 55 (D) 65

84. For how many of the given classes can the average score of the remaining 60% of the class be more than 45, if the average score of each class is 50?
(A) 1 (B) 2
(C) 3 (D) 4

85. If each class has the highest possible average, then the highest average is for which class?
(A) I (B) II
(C) III (D) IV

86. The least possible average marks of any class would be at least
(A) 28.6 (B) 30.4
(C) 32.4 (D) 34.6

Directions for questions 87 to 90: These questions are based on the following information.

In a school there are 135 students who play at most three sports, such as cricket, football and hockey. There is at least one student who plays all the three, at least one student who plays exactly two, and at least one student who plays exactly one of the above-mentioned sports.

Directions: For the multiple choice questions, select the correct alternative from the given choices. For the non-multiple choice questions, write your answer in the space provided.

87. If the number of students who play all three sports is less than the number of students who play exactly two and if the number of students who play cricket is more than those who play hockey which in turn is more than the those who play football, while the number of students who play football is more than those who play exactly two sports, then what is the maximum number of students who do not play any of the given sports? _____

88. Using the data from the previous question, what is the maximum number of students who play all the three sports? _____

89. If the number of students who play the sports are as follows, only cricket < only hockey < only football < exactly two sports < exactly three sports, then the maximum number of people who play exactly two sports is
(A) 65 (B) 62
(C) 60 (D) 67

90. Using data from the previous question, the minimum number of people who play all the three sports is
(A) 1 (B) 2
(C) 3 (D) 4

ANSWER KEYS

1. (D)	**16.** (C)	**31.** (D)	**46.** (B)	**61.** (B)	**76.** 8
2. (B)	**17.** (C)	**32.** (D)	**47.** (B)	**62.** (C)	**77.** (C)
3. (A)	**18.** (D)	**33.** (A)	**48.** (A)	**63.** (B)	**78.** (B)
4. (C)	**19.** (B)	**34.** 2	**49.** (B)	**64.** (D)	**79.** (C)
5. (A)	**20.** (B)	**35.** 4	**50.** (D)	**65.** (A)	**80.** (A)
6. (B)	**21.** (D)	**36.** (B)	**51.** (B)	**66.** (C)	**81.** 187500
7. (C)	**22.** (D)	**37.** (A)	**52.** (B)	**67.** (D)	**82.** 395000
8. (D)	**23.** (A)	**38.** (B)	**53.** 1	**68.** (B)	**83.** (D)
9. (C)	**24.** (D)	**39.** (C)	**54.** 4	**69.** (B)	**84.** (C)
10. (B)	**25.** (C)	**40.** (D)	**55.** (B)	**70.** (B)	**85.** (A)
11. (D)	**26.** (C)	**41.** (B)	**56.** (A)	**71.** (D)	**86.** (C)
12. (D)	**27.** (A)	**42.** (D)	**57.** 17	**72.** (C)	**87.** 127
13. (B)	**28.** 30	**43.** (A)	**58.** 14	**73.** (A)	**88.** 68
14. (D)	**29.** 21	**44.** (D)	**59.** 3	**74.** (C)	**89.** (A)
15. (C)	**30.** 25	**45.** (B)	**60.** (C)	**75.** 14	**90.** (D)

SOLUTIONS

Solutions for questions 1 to 4:

1. The quantity of Z produced by different machines is as follows:

Machine	Quantity of Z
A:	0
B:	0
C:	$\frac{80}{4}(2)=40$
D:	$\frac{40}{Total:80}$

2. In the first 5 hours, the quantity of W produced by A, B, C is 0. 20 units of W is produced by D. Thus, $x \geq 5$.

3. In the first 4 hours,
the quantity of Y produced by B = 20
by C = 40.
Percentage less = $\frac{20}{40}(100)=50$

4. In the first 4 hours, the quantity of X produced
= 20+30+30+15 = 95
Quantity of Y produced
=20+20+40+20 = 100.

Solutions for questions 5 to 8:

5. By observation we can say that option 1 is not true.

6. Profit for company

$A=\frac{7.5}{100}\times 198 \cong 15$ crore

$C=\frac{15}{100}\times 200 = 30$ crore

$E=\frac{17.5}{100}\times 200 = 35$ crore

$F=\frac{5}{100}\times 220 = 11.0$ crore

$D=\frac{2.5}{100}\times 280 = 7.0$ crore

7. Required is the average profit of B and D profit in 2011–12 for

$B=\frac{-5}{100}\times 220 = -11$

$D=\frac{-4}{100}\times 250 = -10$

$\therefore$ Average profit $= -\frac{21}{2} = -10.5$ crore

8. Required is the average profit of C and E in 2012–13 which is $\frac{30+35}{2} = 32.5$ crore

Solutions for questions 9 to 12:

9. The maximum turnover for the third largest company occurs when the share of all companies from fourth to seventh has nearly the same values, i.e., 8% of group turnover and the remaining two companies, i.e., those ranked 2nd and 3rd have nearly the same share, i.e.,

$100 - (25 + 32) = \frac{43}{2} = 21.5$

$\therefore$ Maximum turnover $= \frac{21.5}{100} \times 3000$

$= 645$ crore

10. For maximum companies in group D to have a turnover of more than ₹400 crore, i.e., 16% of group turnover, we should assume that the smallest companies in the group have nearly the same turnover and those companies exceeding a turnover of 400 crores, had a turnover which is only slightly more than 400 crore. It can be seen that if we have four companies with 7% share, three companies with 16% share and one company with 26% share, the total adds up to 102% and so only two more companies (other than the largest company) can have turnover more than 400 crores.

11. For maximum turnover of the second smallest company, all companies of business group I ranked from second to fifth should have nearly the same turnover, i.e., $\frac{100-(27+11)}{4} = 15.5\%$.

$\therefore$ Maximum turnover $= \frac{15.5}{100} \times 4200 = 651$ crores

12. For business group B, 500 crore is 22.22% of the group turnover.

As the largest and smallest company accounts for 32 + 10 = 42% of the group turnover, the remaining 58% (100 – 42) can be distributed among the remaining three companies such that all the three are less than 22.22%.

$\therefore$ At most, four companies of business group B could have a turnover of less than ₹500 crore.

Similarly, we can find for others also.

For business group E, 500 crores is 9.65% of the group turnover.

$\therefore$ At most, two companies could have a turnover less than ₹500 crore.

For business group F, 500 crores is 13.5% of the group turnover.

$\therefore$ At most, four companies could have a turnover which is less than ₹500 crore.

$\therefore$ A total of 4 + 2 + 4 = 10 companies.

Solutions for questions 13 to 16:

13. Assume that the number of hours of voice processing for companies A and P is 1. The total revenue of company A would be 11.11. For company P it would be $\frac{9}{20} \times 100 = 45$.

Therefore, revenue for company P would be about four times that of company A.

14. Assume that the number of hours of voice processing in all the companies is one. The revenue earned by the companies would be equal to the ABRH. For company A, the revenue would be 9% of total revenue or the total revenue would be 11.11. Similarly, we can find the total revenue of all the companies and it can be found that the total revenue would be the highest for company 'O'.

15. In 2011, for company A, revenue from voice processing as a percentage of total revenue = 27.

For company L, it would be 36.

Let the total revenue in 2011 for companies A and L be 200 and 100, respectively. ABRH of company L = 6.

$\therefore$ Number of hours of voice processing for company L $= \frac{36}{6} = 6 hrs$

The revenue from voice processing for company A = $\frac{27}{100} \times 200 = 54$. $\therefore$ ABRH of company A = $\frac{54}{6} = 9$.

$\therefore$ Percentage increase = $\frac{9-1}{1} \times 100 = 800\%$

16. Given that the total revenue received is the same for the pair of companies given.

Choice (A) I and P: Let the total revenue be 100. The number of hours of voice processing for I and P are $\frac{42}{2}$ *and* $\frac{20}{9}$, respectively which is not equal.

Choice (B) M and Q: Let the total revenue be 100.

The number of hours of voice processing for M and Q are $\frac{21}{6} = 3.5$ and $\frac{23}{8} = 2.87$, respectively.

Choice (C) M and F: The values for M and F would be $\frac{21}{6} = 3.5$ *and* $\frac{13}{14} = 3.25$, respectively, i.e., nearly equal. It can be seen that the options in choice (D) do not give approximately equal value.

Solutions for questions 17 to 19:

17. The maximum number of students who wrote both CAT and XAT is the minimum of 44% of 1,95,000 and 83% of 93,000.

44% of 1,95,000 = 85,800 and

83% of 93,000 = 77190

18. The numbers of students who wrote the exams are as follows:

Exam	Total	Only	Others
CAT	1,95,000	1,09,200	85,800
XAT	93,000	15,810	77,190
IIFT	42,000	10,920	31,080
SNAP	70,000	23,800	46,200
CMAT	82,000	9,840	72,160
MAT	36,000	8,640	27,360

The maximum numbers of students who wrote all the six exams would be the minimum value in the 'others' column – 27360.

19. The minimum numbers of students who wrote at least one of the six exams would be the sum of the students who wrote only one exam and the maximum value in the 'others' column = 1,09,200 + 15,810 + 10,920 + 23,800 + 9,840 + 8,640 + 85,800 = 2,64,010.

Solutions for questions 20 to 23:

20. The number of students who failed in the different subjects are Maths – 13, Physics – 7, Chemistry – 12, English – 12 and Hindi – 18. The maximum number of students who failed in all the seven subjects is the minimum of these values, i.e., 7.

21. If we consider that the students who failed in the subjects are all unique, then we get the maximum number of students who failed, i.e., 13 + 7 + 12 + 12 + 18 = 62.
∴ At least 38 (100 – 62) students passed in all the five subjects.

22. The maximum number of students who scored 90 marks or more in at least two of the core subjects

$= \frac{18+24+28}{2} = 35$

The maximum number of students who scored 90 marks or more in at least one of the language subjects = 21 + 26 = 47
∴ Maximum number of students eligible for the scholarship = 35.

23. The number of students who scored 60 or more marks in at least four of the five subjects is the largest number less than $\frac{61+75+72+65+60}{4}$, i.e., 83.

Solutions for questions 24 to 27:

24. Let the total savings of the family be ₹100.
The money invested in fixed deposits = ₹30

Mrs. Iyer's income = $\frac{30}{15} \times 100 = ₹200$

∴ Savings of Mrs. Iyer = $\frac{25}{100} \times 200 = ₹50$

Savings of Mr. Iyer = ₹100 – ₹50 = ₹50

∴ Income of Mr. Iyer = $\frac{50}{20} \times 100 = ₹250$

Ratio of their incomes = 5 : 4

25. Let the income of Mr. Iyer be $100x$ and Mrs. Iyer be $100y$.
Given that, $15x > 20y$
$\Rightarrow 3x > 4y$
Multiplying the above inequality with 9, we get
$27x > 36y \Rightarrow 27x > 15y$ (medicines)
Multiplying $3x > 4y$ with 2.66, we get
$8x > 10.64y$
$\Rightarrow 8x > 10y$, (others)
Multiplying $3x > 4y$ with 6.66, we get
$20x > 26.66y$
$\Rightarrow 20x > 5y$ (Entertainment)

26. Let the total incomes of Mr. Iyer and Mrs. Iyer be $100x$ and $100y$, respectively.
Now their total savings will be
∴ 20% of $100x$ + 25% of $100y$
Now the amount invested in equities from 20% of total savings, i.e., 20% of $(20x + 25y) = 4.55\ (x + y)$

∴ $0.45y = 0.55x \Rightarrow \frac{y}{x} \times \frac{11}{9}$

∴ Mrs. Iyer's salary forms $\frac{11}{9} \times 100 = 122.22\%$ of that of Mr. Iyer's.

27. Let the total savings be ₹100.
Money invested in savings accounts = 20
∴ Money spent by Mr. Iyer on Groceries = 20

Total income of Mr. Iyer = $\frac{20}{10} \times 100 = ₹200$

Total savings of Mr. Iyer = ₹40
∴ Total savings of Mrs. Iyer = ₹60

Required ratio is $\frac{20}{20} \times 40 : \frac{5}{25} \times 60$

= 40 : 12 = 10 : 3

Solutions for questions 28 to 31:

28. The runs scored by the batsmen in the four sessions are 102, 86, 87 and 94, respectively. The number of balls bowled by the bowlers other than P_1 are 48, 53, 64 and 49, respectively. As a bowler bowled at most one dot ball to a batsman in a session, the number of balls off which runs were scored against bowlers other than P, was at least 48 – 16 = 32 (a bowler could have bowled at most four dot balls in a session. Therefore, four bowlers bowled at most 4 × 4 = 16 dot balls, 53 – 16 = 37, 64 – 16 = 48 and 49 – 16 = 33, respectively.

As at most 70 extra runs were scored in the first session it could have been due to a maximum of 11 sixers in the bowling of P_1, similarly it is 7, 6 and 6 in sessions 2, 3 and 4, respectively.
$\therefore$ At most 11 + 7 + 6 + 6 = 30 sixers were scored off the bowling of P_1.

29. The number of balls faced is the least when we assume that he has scored the maximum number of runs every ball, but as each batsman faced the bowling of each of the five bowlers in a session, he would have faced at least five balls in a session.
$\therefore$ The minimum number of balls faced by him was at least 6 (as he scored 32 runs) + 5 + 5 + 5 = 21 balls.

30. The number of runs scored, balls bowled and minimum number of balls in which runs were scored in different sessions are as follows.

Session	S_1	S_2	S_3	S_4
Runs	102	86	87	94
Balls	60	60	76	55
Min scoring balls	40	40	56	35

It can be seen that in all the sessions other than S_3, the minimum number of singles is zero, while in session 3, there were at least 25 singles.
$(31 \times 2 + 25 \times 1 = 87)$

31. For the minimum possible strike rate, we have to calculate the maximum number of balls he could have faced. As in each session each of the bowlers bowled a dot ball to each batsman, the minimum number of balls off which runs were scored in different sessions and the minimum number of balls faced by other batsmen in different sessions are as follows.

Session	S_1	S_2	S_3	S_4
Minimum scoring balls	40	40	56	35
Minimum balls faced by other batsmen	5 + 6 + 3 = 14	4 + 4 + 3 = 11	2 + 4 + 5 = 11	4 + 3 + 5 = 12
Maximum balls faced by B_3	40 – 14 = 26	40 – 11 = 29	30 (as he scored only 30 runs)	35 – 12 = 23

$\therefore$ Maximum number of balls faced by him = 26 + 5(dot balls) + 29 + 5 + 30 + 5 + 23 + 5 = 108 + 20 = 128

$\therefore$ Strike rate = $\frac{27+31+30+30}{128} \times 100 = \frac{118}{128} \times 100 =$ 92.2%.

Solutions for questions 32 to 35: Consider the 'strike rate' of Inzamam, i.e., rank 4. Now both Ponting and Richards scored less runs than Inzamam but faced more number of balls than Inzamam. Hence, both Ponting and Richards must be ranked worse (numerically higher) than Inzamam on 'strike rate'. Hence, Ponting and Richards must have ranks 6 and 5, respectively (since Ponting scored less runs, but definitely faced more number of balls than Richards). Now, Dravid must be ranked 1 in 'strike rate'.

Now, consider the total runs scored = Strike rate × Total balls faced. Though Inzamam faced the least number of balls, he was ranked 4th in strike rate. Therefore, at least three players must be ahead of Inzamam. Hence, Inzamam is ranked 4 in 'runs scored'. Similarly, it can be observed that Sachin and Lara must be ranked 1 and 3, respectively in 'runs scored'.

Now consider the 'Average'. Lara scored more runs than Inzamam and also was out for the least number of times. Hence, his average must be better than that of Inzamam. Hence, Lara is ranked 1 in 'average'. Therefore, Sachin and Dravid got ranks 3 and 5 (in any order) in 'average'.

Now the possible points for the six players are as follows:
Ponting = 2 + 1 = 3
Richards = 6 + 2 = 8
Sachin = (4 or 8) + 5 = 9 OR 13
Inzamam = 10 + 3 = 13
Lara = 12 + 4 = 16
Dravid = (8 or 4) + 6 = 14 OR 10
The final table obtained is as follows:

Batsman	Parameter						
	Innings played	Runs scored	Balls faced	Not outs	Outs	Average	Strike rate
Ponting	1	⑥	②	①	5	⑥	6
Richards	5	⑤	3/5	⑥	2	④	5

(*Continued*)

Batsman	Parameter						
	Innings played	Runs scored	Balls faced	Not outs	Outs	Average	Strike rate
Sachin	⑥	1	①	4	③	3	②
Inzamam	④	4	⑥	3	④	②	④
Lara	②	3	5/3	2	⑥	1	③
Dravid	3	②	④	⑤	1	5	1

Now points scored by them are as follows:

Player	Points
Ponting	3
Richards	8
Sachin	13
Inzamam	13
Lara	16
Dravid	10

Clearly, Lara and Ponting had the highest and the least number of points respectively. Using only this information, three of the questions (16, 17 and 18) can be answered. Now considering the relation 'Total innings played = Number of times out + Number of times not out' we get the ranks in 'number of times out', for Sachin, Inzamam and Lara as 4, 3 and 2, respectively.

Now considering the rank of Sachin in 'average', he got 3rd rank despite scoring the highest and getting out for the 3rd highest number of times. Hence, there are at least two players who scored less runs than Sachin and were out more number of times than Sachin. Hence, Sachin's rank in 'average' must be such that it has at least two ranks below it. Hence, Sachin is ranked 3 in 'average' and Dravid is ranked 5.

Now, similarly, it can be found that neither Richards nor Dravid can have fifth rank in 'number of times out'. Hence, Ponting is ranked fifth in 'number of times out'. Further, we get the ranks of Richards and Dravid in 'number of times out' as 2 and 1, respectively.

Hence, all the values, except the ranks of Richards and Lara in 'balls faced', are determined using which, the other two questions (i.e., 19 and 20) can be answered.

32. Lara got 16 points, which is the highest.

33. Ponting got 3 points, which is the lowest.

34. Sachin was ranked 1 in only 'runs scored' and 'balls faced'.

35. Sachin was ranked better than Dravid in 'runs scored', 'balls farced', 'not outs' and 'average'. Hence, four parameters.

Solutions for questions 36 to 39:

36. The minimum total score of the boys in the quant section is

$= 7 \times 16 + 25 \times 1 + 26 \times 30 + 49 \times 1 + 54 \times 14 + 75 \times 1 + 76 \times 36 + 100 \times 1$

$= 112 + 25 + 780 + 49 + 756 + 75 + 2736 + 100 = 4633$

The minimum total score of the girls in the quant section is

$= 6 \times 20 + 20 \times 1 + 24 \times 31 + 60 \times 1 + 63 \times 26 + 80 \times 1 + 81 \times 19 + 98 \times 1$

$= 120 + 20 + 744 + 60 + 1638 + 80 + 1539 + 98 = 4299$

The required average $= \frac{8932}{200} = 44.66$

37. The number of students who scored more than 70 marks in the different sections are

Quant

Boys	Girls
51	46

Reasoning

Boys	Girls
65	48

English

Boys	Girls
42	57

$\therefore$ At most 42 boys and 46 girls could have scored more than 70 marks in each section.

38. The maximum total marks scored by the girls in the English section is

$= 1 \times 11 + 14 \times 32 + 1 \times 34 + 26 \times 58 + 1 \times 62 + 20 \times 77 + 1 \times 78 + 36 \times 92$

$= 11 + 448 + 34 + 1508 + 62 + 1540 + 78 + 3312$

$= 69.93$

39. The minimum total marks of the boys in the reasoning section is

$14 \times 11 + 1 \times 27 + 18 \times 29 + 1 \times 48 + 30 \times 51 + 1 \times 72 + 34 \times 74 + 1 \times 95$

$= 154 + 27 + 522 + 48 + 1530 + 72 + 2516 + 95$

$= 4964$

Average = 49.64

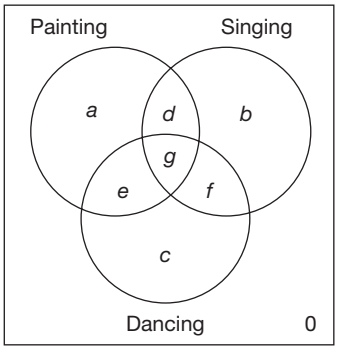
Solutions for questions 40 to 44:

Total number of boys = $\frac{9}{16}(6720) = 3780$

Total number of girls = 6720 – 3780 = 2940

Boys

Total = 3780



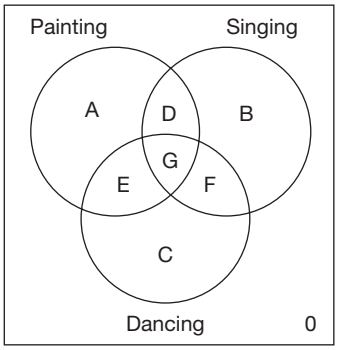
$a = \frac{3780}{12} = 315$

$b = \frac{3780}{10} = 378$

$g = \frac{1}{9}(3780) = 420$

Girls

Total = 2940



$B = \frac{25}{100}(2940) = 735$

$D = \frac{20}{100}(2940) = 588$

$A = \left(1 + \frac{10}{100}\right) = 2a = 630$

$\frac{f}{F} = \frac{7}{5}$

$C = \frac{1}{10}(2940) = 294$

$F = \frac{8\frac{1}{3}}{100}(2940) = \frac{2940}{12} = 245$

$f = \frac{7}{5}(245) = 343$

G = 2940 – (A + B + C + D + E + F) where E = 0

$\therefore$ G = 448

$d = \frac{D}{2} = 294$

$c = 3780 - (a + b + d + e + f + g)$ where $e = 0$

$\therefore c = 2030$

40. P = $a + d + e + g = 315 + 294 + 0 + 420 = 1029$

41. Required % = $\frac{c + e + f + g}{6720} \times 100\%$

$= \frac{2030 + 0 + 343 + 420}{6720} \times 100\% = 41.56\% \approx 42\%$

42. Total number of students enrolled in all the three classes together = g + G = 420 + 448 = 868

43. Percentage that b forms of B = $\frac{b}{B} \times 100\%$

$= \frac{378}{735} \times 100\% \approx 51.43\%$

Solutions for questions 44 to 46: Let ₹100x be the amount deposited by the car manufacturer on each car in race 1. Since car I won race1, he gets ₹180x on that and only ₹80x on the other car that participated. The amount he wins at the end of the race 1 = ₹180x + ₹80x = ₹260x. Then he deposits ₹130x on each of the two cars that participated in race 2. Since car II won the race 2, he gets 130x (1.4), i.e., ₹182x on that and only 130 × (0.8), i.e., ₹104x on the other car that participated. The amount with him at the end of the race 2 = ₹182x + ₹104x = ₹286x. Then he deposits ₹143x on each of the two cars that participated in the race 3. Since car II won race 3, he gets 143 (1.4), i.e., ₹200.2x on that and only 143(0.8), i.e., ₹114.4x on the other car that participated.

$\therefore$ The amount with him at the end of race 3 = ₹200. 2x + ₹114.4x = ₹314.6x. Given that ₹314.6x = ₹31460

$\Rightarrow x = 100$

44. The total amount he deposited in race 1 = ₹200x
= ₹200 × 100 = ₹20,000.

45. Amount gained in race1 = ₹260x – ₹200x = ₹60x
Amount gained in race2 = ₹286x – ₹260x = ₹26x
Amount gained in race3 = ₹314.6x – ₹286x = ₹28.6x
Hence, he gained the most in race 1.

46. At the end of race 3, he would have = 20000 (1.8) (0.8) (0.8) = ₹23040. Total money gained by the end of the three races would have been = ₹23040 – ₹20000
= ₹3040.

Solutions for questions 47 to 50: It is given that student Q had the second highest marks among all the students. As the difference between the marks of Q and R is always 42 with R being higher, it can be concluded that R scored the highest marks and it was 42 marks more than Q. Now comparing P and Q and as we know P scored less then Q, the difference between P and Q has to be 121, the common value among (106 + 15, 106 – 15), (100 + 21 or 100 – 21),(86 + 207 or 207 – 86) and (52 + 69 or 69 – 52).

In the same way we can get the value of S as Q – 197 (207 + 10 or 207 – 10), (69 + 128 or 128 – 69)

Similarly, V = Q – 106
W = Q – 21
X = Q – 207 and
Y = Q – 69.

Now taking the value of Q as A, we can get the other values as follows:

P – (A– 121)
Q – A
R – (A + 42)
S – (A – 197)
T – (A – 120) or (A – 258)
U – (A – 121) – 27 or (A – 121) + 27
V – (A – 106)
W – (A – 21)
X – (A – 207)
Y – (A – 69)

47. R scored the highest marks among the ten students.

48. If X = 450, P + R = X – 121 + X + 42 = 2X – 79 = 900 – 79 = 821.

49. Student 'W' scored the highest marks among U, V, W, X and Y.

50. U is P – 27, or P + 27, i.e., 538 or 592.

Solutions for questions 51 to 54:

51. Team E lost to teams C and D, drew against team B and won against team A.
∴ The points scored = 10 + 4 – (2 × 5) = 4 points.
For goals = 15 × 2 – 19 × 1 = 11.
∴ Total = 4 + 11 = 15 points.

52. Team A has conceded 16 goals.
16 × (–1) = –16 points
Team A made 15 goals.
15 (2) = 30 points
A has won against C and D.
Points won = 2 (10) = 20 points.
A loses two matches, points lost = (2) (5) = 10
Number of points won by A = 30 + 20 – 16 – 10 = 24
In this way.
The total points for B
= (14 × 2) – (12 × 1) + 2 (10) + (14) – 1 (5)
= 25 – 12 + 20 + 4 – 5 = 35
Total points for C
= (16 × 2) – 16 (1) + 2 (10) – 2 (5)
= 32 – 16 + 20 – 10 = 26
Total points for E
= (15 × 2) – (19 × 1) + (4 × 1) + (10 × 1) – (5 × 2)
= 30 – 19 + 4 + 40 – 10 = 15
Total points for D
= (15 × 2) – (12 × 1) + 2 (10) – 2 (5)
= 30 – 12 + 20 – 10 = 28
∴ B has won the tournament.

53. B has drawn with E. There is only one draw.

54. A, B, C and D have 2 win each.

Solutions for questions 55 to 58:

55. The number 4 appeared in cast 140.
The number 4 must appear 10 times from cast no. 121 to cast no. 140.
The cast numbers in which (4) must happen are
(1) 121, 123, 125, 127, 129, 131, 133, 135, 137,140.
(or)
(2) 122, 124, 126, 128, 130, 132, 134, 136, 138,140.
It can be observed that the number 4 may or may not appear in cast no. 131.
However, it is evident that the number 1 must not have appeared from cast no. 121 to 140.

56. The number 2 had already turned up for 15 times by the end of the first 60 casts. So, in the first 65 casts, the number 2 cannot appear for less than 15 times. However, other numbers must appear for less than 15 times.

57. To calculate the minimum possible number of times 4 turned up in 95 casts
= Number of times 4 turned up in 100 casts – Maximum possible number of times 4 could have turned up from cast 96 to cast 100 (both inclusive).
This maximum is 3 (i.e., in casts 96, 98 and 100).
⇒ Required answer = 20 – 3 = 17.

58. We only need to check for number 4 as it is the highest among 2, 4 and 6. 4 can turn up a maximum of 5 times between the 121st and 130th cast.
∴ The maximum possible value is (22 + 5) – 13 = 14 times.

Solutions for questions 59 to 62: Let x = Number of correct answers
z = Number of wrong answers
y = Number of unanswered questions
Given, $x + y + z = 100$ (1)
$12x - 2y - 3z = 625$ (2)
$3(1) + (2) : 15x + y = 925$
$y = 925 - 15x = 5(185 - 3x)$
∴ y must be divisible by 5. Least $y = 0$.
When $y = 0$ or 5, x is not an integer.

When $y = 10$, $x = 61$.
$\therefore$ Least $y = 10$. This also means greatest $x = 61$.
$\therefore$ $x \leq 61$.
When $x = 61$, $y = 10$ and $z = 29$.
When $x = 60$, $y = 25$ and $z = 15$.
When $x = 59$, $y = 40$ and $z = 1$.
For every decrease of 1 in x, y increases by 15 and z decreases by 14.
$\therefore$ For $x < 59$, $z < 0$, but this is not possible.
$\therefore$ $x \geq 59$.

59. $(x, z, y) = (59, 1, 40)$ or $(60, 15, 25)$ or $(61, 29, 10)$.
There are three ways in which Hari could have attempted the exam.

60. Number of questions attempted $= x + z$. This is 60 or 75 or 90.
$\therefore$ Max$(x + z) = 90$.

61. x is a multiple of 5 only when $x = 60$.
$\therefore$ $z = 15$.

62. The three ways by which Hari could have scored 625 marks is as follows.
(1) 60 correct, 15 wrong and 25 unanswered.
(2) 59 correct, 1 wrong and 40 unanswered.
(3) 61 correct, 29 wrong, and 10 unanswered.
$\therefore$ The number of unanswered questions could be 10, 25 or 40.

Solutions for questions 63 to 66:

63. The total points would be the minimum, when all the matches are draws and each player scores 14 points. If one player scores one win, he will have 16 points and the player who lost would have 13 points. Therefore, if R is the sole winner, he should have at least 16 points.

64. The maximum points happen when the maximum number of matches produce a result. So, try to keep the number of draws to minimum starting with 7 wins and 7 loses for each player and assigning, we get the points as 24(8W), 23(7W, 2D), 22(7W, 1D), 21(7W), 20(6W, 2D), 19(6W, 1D), 18(6W) and 17(5W, 2D), with only 4 draws.
Note: We cannot take maximum points (168) and distribute as the points would be of the form 25,24, 23, 22, 20, 19, 18 and 17 as points like 25, 23 and so on can be obtained only with draws and for 168 points in total, there cannot be any draws.

65. The total points has to be between 56 (2) = 112 and 56 (3) = 168. It cannot be 108.

66. The minimum points for the winner would be 19 as follows:

3W	1L	10 D = 19
2W	0L	12 D = 18
2W	1L	11 D = 17
2W	2L	10 D = 16
1W	1L	12 D = 15
OW	OL	14 D = 14
OW	2L	12 D = 12
OW	3L	11 D = 11
10W	10L	

Solutions for questions 67 to 70:

67. Let the national sales of LCVs be 380 units and that of CVs be 100 units.
Sales of LCVs by ABC Ltd = 36% of 380 = 136.8
Sales of CVs by ABC Ltd = 42% of 100 = 42

$$\text{Required percentage} = \frac{42}{136.8} \times 100 = 30.7$$

68. Let the sales of luxury sedans by ABC Ltd be 35 units.
$\therefore$ Sales of compact sedans by ABC Ltd = 175 units
National sales of luxury sedans = 100
National sales of compact sedans

$$= \frac{175(100)}{56} = 312.5$$

$$\text{Required percentage} = \frac{312.5}{312.5 + 100} (100)$$

$$= \frac{312.5}{412.5} (100) = 75.8$$

69. Let the number of units of multi-axle vehicles sold by ABC Ltd be 10.
$\therefore$ National sales of multi-axle vehicles = 40.
The vehicles sold by ABC Ltd in all other segments (other than multi-axle) is 90. As the share of all other segments of vehicles sold by ABC Ltd is at least 33, the national sales of all vehicles (other than multi-axle) would be a maximum of $\frac{90}{33} \times 100 = 273$

$\therefore$ Multi-axle vehicles form at least $\frac{40}{313} \times 100$

$= 12.8\%$

70. If the number of SUVs sold is much more than hatchbacks and luxury sedans, then the national share of ABC Ltd in these three categories together would be very close to 44%. In this case the share of compact sedans can be as low as 25% and still the total share would be 47.

Solutions for questions 71 to 74:

71. Let the number of men and women among Hindus be $1000x$ and $900x$, respectively. And let the number of men and women among Muslims be $1000y$ and $875y$, respectively.
$\Rightarrow 1000x - 900x = 1000y - 875y$
$\Rightarrow 100x = 125y$

$$\Rightarrow \frac{x}{y} = \frac{5}{4}$$

$\therefore$ Required ratio 1000y : 900x

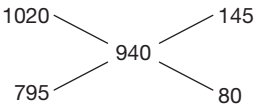
$$= 1000\left(\frac{4}{5}\right)x : 900x = 8 : 9.$$

72. Assume that in 2011, the number of Christians, Muslims and Jains in the locality is negligible compared to that of Hindus and Sikhs.
∴ The number of women per 1000 men (excluding Sikhs) would be 900 (same as that of Hindus). As the overall value is 940, the number of Sikhs and Hindus here should be in the ratio 1 : 2 or Sikhs form 1/3rd of the total number of people in the locality.

73. Let the number of Christian men be $100x$ and the number of Muslim men be $100y$.
Given $179.5x = 187.5y$

$x = \frac{187.5}{179.5}y$ or $x = 104.46$.

74. For the percentage of Sikhs to be maximum, we have to assume that Christians and Sikhs are significant in number while all others are close to zero.
The required percentage would be



$\frac{145}{145+80} \times 100 = \frac{145}{225} \times 100 = 64.4\%$

Solutions for questions 75 to 78:

75. To complete the task in the minimum time we should assign each subtask to the machine which will do it in the least possible time, i.e., $T_1 - M_4$, $T_2 - M_2$, $T_3 - M_1$ and $T_4 - M_3$. The time taken is 5 + 3 + 4 + 2 = 14 hrs.

76. If machine M_3 is not working, to do in the shortest possible time, M_2 must be assigned subtasks T_1 and T_2, with M_1 doing T_3 and M_4 doing T_4. The total time would be the time taken by M_2 to finish T_1 and T_2 by which time the other machines would have finished T_2 and T_4, i.e., 8 hrs.

77. We have to select two machines which could finish the four subtasks in the shortest possible time. Since M_2 does task T_2 and M_3 does task T_4 in much less time compared to other machines, these two machines must be selected. So M_2 would do tasks T_1 and T_2 and M_3 would do tasks T_3 and T_4. Time taken = 5 + 3 = 8 hrs.

78. First assign T_1 to M_4, T_2 to M_2 T_3 to M_1 and T_4 to M_3. After 2 hrs T_4 would be over and M_1 and M_3 can finish T_3 in 3.2 hrs. T_2 would be over in 3 hrs and M_2 can join in doing T_1 and it would be completed in slightly under 3.7 hrs.

Solutions for questions 79 to 82: Originally money realised by sales = 10 × 50000 = 5,00,000
Money realised from (3)
= 5,00,000 – 0.5 × 0.4 × 5,00,000 = 4,00,000
Money realised from (2)
= 5,00,000 [0.1 × 0.5 + 0.2 × 0.5 + 0.1 × 0.4] – 2,00,000 + 5,00,000 = 3,95,000
Money realised from (1)
= 0.5 × 50000 [1 + 0.5 × 0.3 + 0.5 × 0.2] = 3,12,500

79. Hence, the most profitable option would be to remain silent.

80. Decreases in (3); increases by 19% in (2); increases by 25% in (1).

81. Loss = 5,00,000 - 3,12,500 = 1,87,500

82. As calculated above, it is ₹3,95,000.

Solutions for questions 83 to 86:

83. The total score of the class = 60 × 60 = 3600
The total score of top 20% and the bottom 20% students

$= (86 + 19) \times \frac{20 \times 60}{100} = 105 \times 12$

∴ The total score of other students = 3600 – 105 × 12
The 48th ranker will get the maximum possible rank when all these (except for 20% and bottom 20%) students get equal marks.

∴ Required score = $\frac{3600 - 105 \times 12}{36} = 65$.

84. Average scores of 40% students (i.e., top 20% and bottom 20%) for class.

I – $\frac{82+36}{2} = 59$
II – 53.5
III – 46
IV – 52.5
V – 59
For I, let the remaining students get an average score of x.

∴ $\frac{59 \times 2 + x \times 3}{5} = 50$

$\Rightarrow x = 44$
Similarly, we can find the values for other classes among which classes II, III and IV have an average more than 45.

85. For I, the highest possible average of the remaining 60% students is 82.

∴ Average of the class = $\frac{82(4)+36}{5} = 72.8$

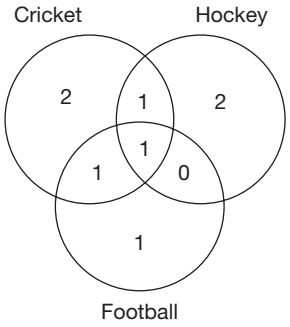
Similarly, the averages for II, III, IV and V are 67, 59.2, 72.6 and 71.6.

86. The least possible average of I = $\frac{82+36(4)}{5} = 45.2$.

The values for II, III, IV and V are 40, 32.8, 32.4 and 46.4.

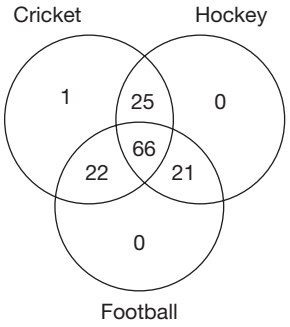
Solutions for questions 87 to 90:

87. There must be at least one student who played all the three. The Venn diagram for the minimum possible case satisfying all the given conditions can be as follows.



So, at least 8 students must play at least one of the three games. Maximum number of students who do not play any of the games is 135 – 8 = 127.

88. Since a maximum of 135 students play, considering the number of people playing all the sports is the least, it should be less than half. Maximum possible value is 66. 67, it is not possible as there should be 68 playing exactly two and at least one playing exactly one, making a total of 67 + 68 + 1 = 136. The following is one of the many possible cases that satisfy the above conditions.



Students playing all the three sports = 66
Students playing two sports = 68
Students playing football = 110
Students playing hockey = 112 and
Students playing cricket = 114, which satisfies all the conditions, including the condition that there are students who play exactly one sport.

89. The number of students who play only cricket can be zero, the number of students who play only hockey can be 1 and only football can be 2. Of the remaining 132, as people playing exactly two is less than people playing exactly three, the maximum number of people playing exactly two games is 65.

90. Here, consider the students who play only cricket to be 0, only hockey is 1, only football is 2 and exactly two is 3.
∴ The minimum value of students who play all the three is 4.

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Unit 3

Logical Reasoning

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1 Linear Arrangement

CHAPTER

Learning Objectives

In this chapter, we will:

- Understand how to interpret the information/statements given in the question and get a final arrangement out of it
- Learn to make arrangement of people/objects in horizontal rows
- Gain an understanding of arrangement of people/objects in vertical columns
- Grasp the concept of arrangement of people in rows and columns
- Learn to make linear arrangement with a distribution of multiple parameters
- Acquire knowledge of linear arrangement with people facing different directions

Linear Sequencing

LINEAR SEQUENCING is essentially arranging the items in a sequence (in a single line). Questions of this type are also referred to as **seating arrangement**. The word seating arrangement should not be misconstrued and it should not be treated as questions involving only people sitting as per specified conditions. Essentially, these questions involve arranging subjects (people or things) according to the given conditions. The arrangement is done only on one axis, and hence, the position of the subjects assumes importance here in terms of order, like first position, second position, etc.

Let us look at the examples.

SOLVED EXAMPLES

Directions for questions 1.01 to 1.05: Read the data given below carefully and answer the questions that follow.

Seven people Paul, Queen, Rax, Sam, Tom, Unif and Vali are sitting in a row. Rax and Sam sit next to each other. There are exactly four people between Queen and Vali. Sam sits to the immediate left of Queen.

1.01: If Paul and Tom are separated by exactly two person, then who sits to the immediate right of Vali?

(A) Paul (B) Tom
(C) Unif (D) Rax

1.02: If Queen is not sitting at either ends of the row, then who among the following has as many persons on the left as on the right?

(A) Sam (B) Unif
(C) Rax (D) Vali

1.03: If Queen sits at one end of the row, then who sits at the other end?

(A) Paul
(B) Tom
(C) Vali
(D) Cannot be determined

1.04: If Tom sits to the right of Queen, and Paul is separated from Tom by exactly three people, then who sits to the immediate right of Vali?
(A) Sam (B) Paul
(C) Tom (D) Unif

1.05: In how many different ways can this seven people sit in a row?
(A) 3 (B) 2
(C) 10 (D) 12

Solutions for questions 1.01 to 1.05: Let us write down the conditions given in short form and then represent them pictorially. Also, let us treat the people sitting at left as 'left' and their right as 'right' for interpreting the conditions.

Rax and Sam sit next to each other ➔ RS or SR.

There are exactly 4 people between Queen and Vali ➔ Q — — — — V or V — — — — Q.

Sam sits to the immediate left of Queen ➔ SQ.

Now let us analyse the data/conditions that we are given and then put the three conditions together. Let us number the seats from our left to right as Seat 1 to Seat 7.

Since S is to the left of Q and since R and S have to be next to each other, R can only be to the immediate left of S. Thus, R, S and Q, will be in the order RSQ. Since there are four people between Q and V, Q can be placed in seats 1, 2, 6 or 7. But if Q is in Seat 1 or 2, then there are no seats for R and S. Hence, there are only two seats available for Q. Let us fix the positions of R, S and V in each of these two positions of Q and write them down. The directions left and right is as shown below.

◀L ▶R

Arrangement I:

1	2	3	4	5	6	7
	V			R	S	Q

Arrangement II:

1	2	3	4	5	6	7
V			R	S	Q	

These are the only two arrangements possible for the four persons V, R, S and Q. The other three persons Paul, Tom and Unif can sit in the three vacant seats in any order, as no information is given about them. Now let us look at each of the questions.

1.01: Paul and Tom are separated by exactly two persons. Arrangement I is the only one possible as in Arrangement II, Paul and Tom cannot have exactly two persons between them. So, we have the arrangement as follows: T/P, V, U, P/T, R, S, Q
So, Unif must be sitting to the immediate right of Vali.

1.02: If Queen is not at the end, then only Arrangement II mentioned above is possible. The person who has as many people seated on the left as on the right can only be the person who is sitting in the middle seat, i.e., Seat 4. In this arrangement, Rax is sitting in Seat 4.

1.03: 'Queen sits at one end' means that we should look at Arrangement I. In this arrangement, any one out of the three person Paul, Tom and Unif can be in Seat 1.

1.04: If Tom and Paul are separated by exactly three people, then only Arrangement II is possible. So, Tom and Paul have to be in seats 3 and 7. Since, it is also given that Tom is to the right of Queen. Tom has to be in Seat 7 and Paul in Seat 3. So, the arrangement must be as follows: V, U, P, R, S, Q, T
The person sitting to the immediate right of Vali is Unif.

1.05: We have two possible arrangements, such as 'Arrangement I and Arrangement II' that we have already looked at. In each arrangement, the remaining three people can sit in the remaining three seats in 6 ways. Thus, a total of 12 ways of seating the seven people is possible.

Directions for questions 1.06 to 1.10: These questions are based on the following information.

A group of eight people, namely G, H, I, J, K, L, M, and N are sitting in a row but not necessarily in the same order. Some of them are facing south and the remaining are facing north. No two person is sitting adjacent to each other facing south.

- J sits two places away from H and they both face different directions.
- M sits second to the right of G.
- The number of people to the right of M is one less than the number of people to the right of K.
- K sits to the immediate right of H, who faces the same direction as I face.

- I sits to the immediate left of N and one of them sits at an end.
- G sits to the left of N, who sits to the left of L.
- K and L face the same direction which is different from the direction which M faces.

1.06: Who sits second to the right of J?
(A) K (B) M
(C) L (D) N

1.07: Three of the following are alike in a certain way, and hence form a group. Which is the one that does not belong to that group?
(A) JH (B) IH
(C) MG (D) MK

1.08: Which of the following is/are definitely true?
(A) M and G face different directions.
(B) K sits three places away from J.
(C) Two people sit between L and H.
(D) Both (A) and (B).

1.09: Who sits to the immediate right of G?
(A) K (B) L
(C) H (D) J

1.10: How many people are facing north?
(A) Five
(B) Three
(C) Two
(D) Cannot be determined

Solutions for questions 1.06 to 1.10: It is given that M sits second to the right of G, who sits to the left of N. Thus, if N sits at the right end, N must face north, since I sits to the immediate left of N. As J sits two places away from H and they both face different directions and K sits to the immediate right of H, J must be sitting at the third place from the left end and H sits two places away from I. It is given that H and I face the same direction. For the above conditions to satisfy, I must face north. Thus, H also faces north and K sits adjacent to I. Since H and J face different directions, J faces south. Thus, the neighbours of J must face north as no two people sitting adjacent to each other face south. It is also given that M sits second to the right of G and the number of people to the right of M is one less than the number of people to the right of K. Hence, M must be sitting to the immediate left of J and G to the immediate right of J. As K and L face the same direction which is different from the direction in which M faces, K and L must face south as M faces north and L sits at the left end. Hence, the possible final seating arrangements are as below.

L↓ G↑ J↓ M↑ H↑ K↓ I↑ N↑

or

↓N ↓I ↑K ↓H ↓M ↑J ↓G ↑L

1.06: L sits second to the right of J.

1.07: Except MK, in all other options the second person sits second to the left of the first person.

1.08: K sits three places away from J.

1.09: J sits to the immediate right of G.

1.10: Since there are two arrangements, we cannot determine

EXERCISE-1

Directions for questions 1 to 9: Select the correct alternative from the given choices.

1. Five people L, M, N, O and P sit in a row, not necessarily in the same order. P sits exactly in between M and N. If L sits exactly in between M and O, then which of the following must be true?
(A) O sits to the immediate right of M.
(B) L and N always sit together.
(C) M sits exactly at the centre of the row.
(D) P sits between M and L.

2. Six people, namely Tanmay, Sanjay, Ganpat, Dhruv, Nagraj and Jivan are standing in a queue at a railway ticket counter. Further it is known that
(i) Ganpat is two positions ahead Jivan.
(ii) Only Nagraj is ahead Tanmay.
(iii) Neither Sanjay nor Jivan is standing at the end of the queue.
How many people are ahead of Dhruv but behind Tanmay?
(A) Zero (B) Two
(C) Three (D) Four

3. The Principal called five people, namely Srinivas, Murali, Raghu, Vijay and Krishna who are working as the Director, Secretary, Treasurer, Professor and Student Leader of a college, not necessarily in that order. They are seated in the five seats facing the Principal.
The Treasurer sat to the immediate left of Krishna who is one seat away from the Director.
Murali is two places away from the Secretary.
Vijay, who is the Student Leader, is one place to the right of Murali.
What is the position of Krishna with respect to the Professor?
(A) To the immediate right.
(B) Three places away to the left.
(C) Two places away to the left.
(D) None of the above

4. Seven men, A, B, C, D, E, F and G have parked their cars in a row. The cars of E and F should be next to each other. The cars of D and G should be parked next to each other. Whereas A and B cannot park their cars next to each other. But B and D must park their cars next to each other and C's car is parked to the immediate right of G's car. If E parks his car to the left of F, then which of the following statements is false?
(A) There are two cars in between B and G's cars.
(B) B and C's cars are not parked together.
(C) G's car is the only car in between D and C's cars.
(D) A's car is at the left extreme end.

5. Five people A, B, C, D and E are sitting in a row facing the same direction. A is two places away to the right of B. C is two places away to the left of D. E is not sitting at the extreme right. Who is sitting in the middle of the row?
(A) A (B) B
(C) C (D) Cannot be determined

6. Five people A through E are sitting in a row facing the same direction. A is three places away to the right of C. Two people are sitting between. B and D. who is sitting in the middle of the row?
(A) A (B) C
(C) E (D) D

7. A group of five people, namely Arnab, Ankur, Adi, Anush and Asraf are sitting in a row facing the same direction. There are at least two people sitting between Arnab and Asraf. There is at most one person sitting between Ankur and Anush. If Anush is sitting to the immediate right of Adi, who is adjacent to Arnab, then which of the following is true?
(A) Arnab is sitting at the extreme right.
(B) Asraf and Anush are adjacent to each other.
(C) Asraf is sitting between Anush and Arnab.
(D) Asraf and Ankur are adjacent to each other.

8. There are seven people, named M, N, O, P, Q, R and S sitting in a row, facing the same direction.
M is five places to the right of O.
P is four places to the right of Q.
R is three places to the right of S.
Who is sitting in the middle of the row?
(A) P (B) N
(C) S (D) R

9. A group of six people, namely Alpana, Brahma, Chetana, Drona, Ena and Fanna are sitting in a row. Alpana and Fanna are sitting adjacent to each other. Chetana is two places to the right of Ena and neither of them is sitting at the extreme ends. There is one person sitting between Alpana and Brahma. Who is sitting to the immediate right of Ena?
(A) Alpana (B) Fanna
(C) Drona (D) Brahma

Directions for questions 10 to 12: These questions are based on the following information.

A group of five people, namely Amit, Balram, Chetan, Deepak and Eswar are sitting in a row facing North. The following information is known about them.

(i) Only Deepak is sitting between Amit and Balram.
(ii) Neither Amit nor Balram is at the ends.
(iii) Chetan is sitting to the immediate left of Balram.

10. Who is sitting at the right end of the row?
(A) Amit (B) Balaram
(C) Chetan (D) Eswar

11. How many people are sitting between Amit and Chetan ?
(A) Zero (B) One
(C) Two (D) Three

12. What is the position of Eswar with respect to Balram?
(A) Immediate right (B) Second to the left
(C) Third to the right (D) Immediate left

Directions for questions 13 to 15: These questions are based on the following information.

Six people, namely P, Q, R, S, T and U are sitting in a row facing north. Further it is known that:
(i) Exactly two people are sitting between P and Q.
(ii) Exactly one person is sitting between T and U.
(iii) Q is sitting at the right end of the row.

13. If U is sitting adjacent to S, then how many people are sitting between U and R?
(A) One (B) Two
(C) Three (D) Cannot be determined

14. If S is sitting to the immediate right of T, then who is sitting second to the right of R?
(A) P (B) T
(C) U (D) S

15. Who among the following cannot be adjacent to T?
(A) P (B) R
(C) S (D) None of these

Directions for questions 16 to 18: These questions are based on the following information.

Eight books on different subjects, such as Biology, Chemistry, Physics, Maths, English, Hindi, Zoology, and Economics are stacked together. Further it is known that:
(i) Economics is above Biology which is just above Hindi, which is not at the bottom.
(ii) There are only two books between the Zoology and the English books.
(iii) Number of books above Chemistry is less than the number of books below it.
(iv) Only Maths book is above Zoology.

16. Which book is at the bottom of the stack?
(A) Physics (B) Hindi
(C) English (D) Economics

17. How many books are there between Economics and Hindi?
(A) Three (B) Two
(C) Four (D) Cannot be determined

18. Find the pair that does not exhibit a similar relationship as the other three pairs.
(A) Biology – Hindi
(B) Economics – Chemistry
(C) English – Hindi
(D) Maths – Zoology

Directions for questions 19 to 21: These questions are based on the following information.

Six buildings of different colours red, yellow, white, blue, green and orange are in a row. Each of these buildings belongs to a different person among Dubey, Sharma, Roy, Sanyal, Tiwari and Reddy. Following is the information known about them.
(i) Green building is three places to the right of Dubey's building.
(ii) Red building is three places to the right of Sharma's building.
(iii) White building is three places to the right of Reddy's building.
(iv) Roy's building is adjacent to the orange building.
(v) Sanyal's building is not green. Sharma's building is not blue.
(vi) Tiwari's building is not adjacent to Roy's building but three places away from Reddy's building.

19. What is the colour of Dubey's building?
(A) Blue (B) Yellow
(C) Green (D) Red

20. The red building belongs to
(A) Roy (B) Sanyal
(C) Tiwari (D) Dubey

21. Which of the following is true?
(A) There is at least one building between the orange and green coloured building.
(B) Reddy's building is to the left of Sharma's building.
(C) Reddy's and Sharma's buildings are not adjacent
(D) Sanyals' building is to the right of Sharma's building.

Directions for questions 22 and 23: These questions are based on the following information.

In a school there are five classes (Class I to Class V) and each class has two sections A and B. Each section is accommodated in a different classroom. The class rooms are in a row.
(i) The two sections, A and B of any class are not adjacent to each other.
(ii) Any four consecutive classrooms, accommodate two A sections and two B sections.
(iii) Class V A is three places away from Class I A and neither of these two is at any of the extreme ends.
(iv) Class III B is three places away from Class IV B and neither of these is at any of the extreme ends.

(v) Class II B is not at any of the extreme ends.
(vi) Class II A is at the extreme right.
(vii) Class V A is to the right of Class III B.

22. Which class is at the extreme left?
(A) I (B) V
(C) III (D) Cannot be determined

23. Which class is to the immediate right of Class III B?
(A) I A (B) II B
(C) V A (D) I B

Directions for questions 24 to 27: These questions are based on the following information.

Seven friends P, Q, R, S, T, U and V sit on a bench facing north. Each of them is of a different weight (in kg), their random bodily weights are 79, 83, 85, 87, 89, 92 and 96. The following information is known about them.

P sits third to the right of the heaviest person. The heaviest person sits exactly between R and the lightest person, who sits at an end. The third lightest person sits adjacent to R and that person is neither P nor adjacent to P. Q sits third to the left of the person whose weight is the next higher to R. R's weight is neither 83 kg nor 87 kg. P's weight is neither 92 kg nor 79 kg. T's weight is 83 kg. S is heavier than V but is not the heaviest.

24. Who is the third lightest?
(A) P (B) Q
(C) R (D) S

25. How many people sit between R and U?
(A) One (B) Two
(C) Three (D) Five

26. Who sits second to the right of the heaviest person?
(A) P
(B) S
(C) The person whose weight is 89 kg
(D) The person whose is weight is 87 kg

27. How many persons are lighter than S?
(A) Four (B) Five
(C) Three (D) Two

Directions for questions 28 to 30: These questions are based on the following information.

In a conference, five delegates A, B, C, D and E who are from different countries hailing from India, Pakistan, Sri Lanka, Bangladesh and Nepal are sitting in a row facing North.

(i) The delegate from Bangladesh is to the immediate left of the delegate from Sri Lanka.
(ii) A is the only person sitting between C and D. D is to the immediate right of E.
(iii) B, the delegate from Pakistan is sitting at one of the extreme ends.
(iv) The delegate from Nepal is sitting at the middle of the row.

28. In B is not adjacent to E, then who is the delegate from Nepal?
(A) D (B) C
(C) A (D) B

29. If D is not the delegate from Sri Lanka, then who is sitting at the extreme left end of the row?
(A) The delegate from Sri Lanka.
(B) The delegate from Pakistan.
(C) The delegate from Bangladesh.
(D) Cannot be determined

30. Which of the following is false?
(A) A is the delegate from Bangladesh.
(B) E is sitting at the extreme left end.
(C) C is the delegate from Nepal.
(D) None of these

Directions for questions 31 to 33: These questions are based on the following information.

Seven people, namely Akhil, Bhavya, Chaitra, Dinker, Eashan, Fallon and Geet are sitting in a row. The total number of people in the row is 28.

(i) Akhil is the eighth person from the left end.
(ii) Among the seven people Geet is in the right most position.
(iii) Eashan and Dinker are adjacent to each other. Except these two person no two among the given seven people are adjacent to each other.
(iv) There are thirteen people between Geet and Akhil.
(v) There are two people between Akhil and Chaitra.
(vi) Dinker and Eashan are sitting to the right of Chaitra and left of Fallon.
(vii) There are four people between Fallon and Geet.

31. If fourteenth position from the left is Bhavya, then at the most, how many people are there between Dinker and Chaitra?
(A) Five (B) Seven
(C) Six (D) Four

32. If Chaitra and Fallon interchange their positions, then how many people are there between Chaitra and Akhil?
(A) Eight (B) Ten
(C) Nine (D) Cannot be determined

33. If the people in the6th, 10th and 16th positions from the left leave the row, then how many people are there between Chaitra and Fallon?
(A) Five (B) Nine
(C) Six (D) Cannot be determined

Directions for questions 34 to 36: These questions are based on the following information.

Eight people, namely A, B, C, D, E, F, G, and H are sitting in a row facing north. There are exactly two people sitting between D and E. A is sitting third from the left end. B, A,

C and G are sitting in that order from left to right but no two of them are in adjacent positions. D, F and H are sitting from left to right in that order, but not necessarily in adjacent positions.

34. If H and D interchange their positions and then D and E interchange their positions, who sits second to the right of A?
(A) H (B) D
(C) E (D) Cannot be determined

35. How many people sit between B and C?
(A) Three (B) Four
(C) Five (D) Cannot be determined

36. Which of the following pair of people sits at the ends?
(A) B, H (B) G, D
(C) B, G (D) H, D

Directions for questions 37 to 40: These questions are based on the following information.

There are six floors in an apartment (The ground floor is named as the first floor, the floor above the ground floor is named as the second floor and so on). There are 12 rooms from A through L. Each floor contains two rooms, which are adjacent to each other. These 12 rooms have two columns, with six rooms in each column.

(i) There are three floors between rooms H and G. G does not live on the top floor.
(ii) The rooms H and E are in the same floor.
(iii) Rooms B and E are in consecutive floors.
(iv) Room C is on the sixth floor and room D is on the first floor.
(v) The number of floors between room A and room C is equal to the number of floors between room G and room K.
(vi) Room F is above room G and in the same column.
(vii) Room A is in the odd numbered floor. Room I is above room L and below room F.
(viii) Room L is above room D in the same column and below room I in the same column.

37. Which of the following rooms are on the second floor?
(A) L, A (B) B, J
(C) L, J (D) Cannot be determined

38. How many floors are there between rooms H and J?
(A) One (B) Two
(C) Three (D) Cannot be determined

39. The room which is right above room J is
(A) I (B) A
(C) L (D) Cannot be determined

40. Which room is exactly between rooms I and D in the same column?
(A) L (B) J
(C) G (D) Cannot be determined

EXERCISE-2

Directions for questions 1 to 3: These questions are based on the following information.

Seven flags of different colours, such as Violet, Indigo, Blue, Green, Yellow, Orange and Red are placed in a row from left to right, not necessarily in that order. The Indigo flag and the Yellow flag have four flags between them. The Orange flag is not between the Indigo flag and the Yellow flag. The Violet flag and the Red flag cannot be next to the Blue flag.

1. What is the total number of possible arrangements?
(A) 12 (B) 8
(C) 4 (D) None of these

2. If the Black flag and the White flag are also to be placed in the row, such that they are adjacent to each other but neither of them is next to the Violet flag or the Red flag, and also neither of them is at any of the ends, then what is the total number of possible arrangements?
(A) 24 (B) 48
(C) 96 (D) None of these

3. Which of the following statements is true?
(A) Yellow flag is at one of the ends.
(B) The Indigo flag and the Orange flag are adjacent to each other.
(C) The Blue flag is adjacent to the Green flag.
(D) The Yellow flag or the Indigo flag is/are adjacent to both the Orange flag and the Blue flag.

Directions for questions 4 to 6: These questions are based on the following information.

A group of seven people, namely A, B, C, D, E, F, and G are standing in a queue in front of a ticket counter. The following information is known about them.

(i) The number of people standing in front of A is same as the number of people standing behind C.
(ii) The number of people standing in front of G is same as the number of people standing behind D.
(iii) Three people are standing between B and F.
(iv) B is standing behind A, but ahead of E.

4. Who is standing in the middle of the queue?
(A) A (B) E
(C) B (D) F

5. Who is standing at the front end of the queue?
(A) A (B) B
(C) C (D) D

6. Who is standing at the rear end of the queue?
(A) B (B) F
(C) D (D) C

Directions for questions 7 to 10: These questions are based on the following information.

A group of seven friends, namely Bipul, Lalita, Mihir, Naina, Deepa, Sushmita and Pradeep were sitting in a row in that order facing same direction. They rearrange themselves in another order, such that in the new arrangement,

(i) For any one of them neither of the neighbours is same as in the previous arrangement.
(ii) Only Mihir and Deepa remain at their previous positions.
(iii) Sushmita and Lalita do not sit adjacent to each other in the new arrangement.

7. How many people are sitting between Bipul and Pradeep?
(A) 0 (B) 1
(C) 2 (D) 3

8. The number of people sitting between Sushmita and Lalita is
(A) 1 (B) 2
(C) 3 (D) 4

9. Who among the following are adjacent to each other?
(A) Pradeep and Laltia
(B) Bipul and Deepa
(C) Deepa and Pradeep
(D) Sushmita and Mihir

10. Who is sitting at the right end of the row?
(A) Naina (B) Lalita
(C) Sushmita (D) Cannot be determined

Directions for questions 11 to 13: These questions are based on the following information.

A group of seven people, namely Amol, Bimal, Komal, Tamal, Kajol, Gopal and Mrinal were standing in a queue, not necessarily in the same order.

(i) Gopal is standing in front of only one person, i.e., Mrinal.
(ii) Kajol is the only person standing infront of Tamal.
(iii) Komal is standing immediately in front of Bimal.

11. If Tamal and Komal are adjacent to each other, then what is the position of Amol in the queue?
(A) Fourth (B) Fifth
(C) Third (D) Sixth

12. Who is/are definitely standing between Bimal and Tamal?
(A) Komal (B) Gopal and Amol
(C) Komal and Amol (D) Amol

13. Who is standing immediately behind Amol?
(A) Gopal (B) Bimal
(C) Komal (D) Cannot be determined

Directions for questions 14 to 16: These questions are based on the following information.

A group of nine people, namely A, B, C, D, E, F, G, H and I are seated in a row, not necessarily in the same order. Following is some information regarding the seating arrangement.

(i) A is seated as many places to the left of C as D is seated to the right of B.
(ii) The only person seated between F and H is seated two places to the left of I.
(iii) Neither C nor D is seated at any of the ends.
(iv) G, who is not seated at any of the ends is seated to the right of E.
(v) E and F are seated together.

14. In how many ways can these nine people be seated?
(A) Two (B) Four
(C) One (D) Three

15. Which of the following is definitely true?
(A) D and E are seated together.
(B) C is seated to the left of D.
(C) F and G are seated together.
(D) A and B are seated together.

16. Which one of the following may be a valid representation of the seating positions of the person?

(a)	B	A	D	C	E	F	G	H	I
(b)	B	D	A	C	E	F	G	H	I
(c)	A	B	C	D	E	F	G	H	I
(d)	A	C	B	D	E	F	G	H	I

(A) (a), (b), (c) and (d)
(B) (a) and (d) only
(C) (b) and (c) only
(D) (a), (b) and (d) only

Directions for questions 17 to 19: These questions are based on the following information.

A group of nine people from A to I are standing in a row. Each of E and G is next to exactly one person. There are two people between C and A. F is between I and B. B is to the immediate right of E and C is to the immediate left of G.

17. Which of the following additional statements is sufficient to determine the order of the person standing in the row from left to right?
(A) I is to the immediate left of A and C is to the immediate right of H.
(B) A is to the left of D and H.

(C) There are two persons between F and D.
(D) C is sitting to the left of G.

18. If I is to the immediate right of A, then who is to the immediate left of C?
(A) D (B) F
(C) H (D) Either D or H

19. How many arrangements are possible, given that, F is to the immediate right of B?
(A) Three (B) Four
(C) Six (D) Eight

Directions for questions 20 to 23: These questions are based on the following information.

A group of eight people from A through H sit on a bench in a multiplex and each of them has to go to a different screen among I to VIII, but not necessarily in the same order.

A sits second to the right of C, neither of them will be going to screen VIII and one of them is at an end. The person who will be going to screen VII is adjacent to C, but not to A. C will be not going to screen IV. B will be going to screen III and is to the immediate right of E. E is three places away from the person, who will be going to screen II and is second to the left of the person, who will be going to screen V. D will be going to screen II, but is not adjacent to F, who is two places away from H. H sits second to the left of the person who is going to screen I.

20. Who sits to the immediate right of D?
(A) H
(B) The person who will be going to screen V.
(C) The person who will be going to screen VI.
(D) G

21. Who is going to screen VI?
(A) A (B) C
(C) E (D) F

22. Who sits second from the right end?
(A) B
(B) F
(C) The person who sits to the immediate right of A
(D) The person who will be going to screen VIII

23. Three of the following four are alike in a certain way based on the given information and so form a group. Find the one which does not belong to that group.
(A) E, G
(B) H, the person who will be going to screen V
(C) The person who will be going to screen I, H
(D) F, D

Directions for questions 24 to 27: These questions are based on the following information.

Ten cars were parked in a parking lot which are of different colours among Red, Black, Green, White, Yellow, Pink, Blue, Gray, Violet and Orange, but not necessarily in the same order. These ten cars were parked in two rows in such a way that five cars in each row and each car from one row is exactly opposite a car from the other row. The cars were numbered from 1 to 10 and parked in such a way that odd numbered car is not opposite another odd numbered car and no two even numbered cars are adjacent to each other. Further information related to positions of the cars is given below.

The right and left are to be considered as if the driver is sitting in the car and these directions are as per the driver's left and right.

(i) Pink coloured car is numbered eight which is not in the same row as that of the cars numbered four or six.
(ii) White and yellow coloured cars are adjacent to the car numbered six, but white car is not at an end.
(iii) Blue coloured car is numbered 5 which is not in the same row as that of the cars numbered 3 or 6.
(iv) Red coloured car is neither adjacent nor opposite to Blue or Green coloured car.
(v) Pink coloured car is at the right end of the row.
(vi) The car numbered 6 is second from the right in its row.
(vii) Black coloured car is even numbered and is opposite to the car numbered 1.
(viii) Violet and Orange coloured cars are parked in the same row. The car numbered 6 is not to the left of car numbered 7.
(ix) Green coloured car is odd numbered but not 1 and is in the same row with Blue coloured car.
(x) Yellow coloured car is opposite to car numbered 2 and is numbered neither 3 nor 1.

24. Which of the following is the correct combination of cars parked in a row?
(A) 2, 3, 8, 9, 10 (B) 1, 3, 4, 6, 9
(C) 5, 7, 8, 2, 9 (D) 4, 1, 9, 7, 10

25. If Green coloured car is adjacent to Gray coloured car, then which numbered car is opposite to car number 4?
(A) 5
(B) 7
(C) 1
(D) Cannot be determined

26. Which pair of cars is adjacent to Black coloured car?
(A) Pink, Black (B) Black, Gray
(C) Blue, Gray (D) Blue, Green

27. Which pair cars is parked at the middle?
(A) Car numbered 10, Orange coloured car.
(B) Car numbered 1, Black coloured car.
(C) Car numbered 9, White coloured car.
(D) Cannot be determined

Directions for questions 28 to 30: Answer these questions based on the information given below.

Eight houses of eight different colours, such as red, yellow, green, blue, violet, pink, brown and white are on two sides of a road. There are four houses on each side of the road and each house is facing another house on the other side of the road. Further the following information is known about the houses.

(i) The pink coloured house is diagonally opposite to the brown coloured house.
(ii) The red coloured house is opposite to the yellow coloured house and is on the same side as the green coloured house.
(iii) The violet coloured house is opposite to the white coloured house but is not on the same side as the blue coloured house.
(iv) The blue and brown coloured houses are on the same side of the road.

28. What is the colour of the second pair of diagonally opposite houses?
(A) Yellow and green (B) Blue and red
(C) Blue and green (D) Red and white

29. Which of the following mentions the colours of two houses, which are on the same side of the road?
(A) Violet and yellow (B) Red and brown
(C) Brown and violet (D) Pink and green

30. How many houses are there in between the blue and brown coloured houses?
(A) None (B) One
(C) Two (D) Cannot be determined

Directions for questions 31 to 34: These questions are based on the given information.

A group of eight people, namley K, L, M, N, O, P, Q and R are sitting in a row (not necessarily in the same order).

Four of them are facing north and the remaining four are facing south. They belong to different professions, such as Professor, Scientist, Musician, Beautician, Teacher, Lawyer, Architect and Principal.

(i) P faces north and sits at the right end.
(ii) Either the Lawyer or Principal (but not both) is adjacent to Musician whose neighbours face south.
(iii) M is a Professor and sits adjacent to the Scientist. Beautician sits three places away to the right of the Lawyer.
(iv) N, the Principal, sits second to the right of O.
(v) Musician faces the same direction as P and sits second to the left of P.
(vi) R is the Scientist who is to the immediate left of the Architect and faces south.
(vii) K is neither a Principal nor a Lawyer. L and Scientist are neighbours of the Architect.
(viii) Q, the Musician, sits three places away from the Architect and is to the immediate right of K.

31. Who sits second to the left of N?
(A) The Architect (B) The Teacher
(C) O (D) K

32. Who are the neighbours of the Lawyer?
(A) N and Architect (B) O and Scientist
(C) O and Principal (D) Both (A) and (C)

33. Which among the following statements is true?
(A) Teacher sits at the left end.
(B) L is a not a Beautician.
(C) O is an Architect.
(D) Both (B) and (C)

34. Three of the following are alike in a certain way, and hence form a group. Which is the one that does not belong to that group?
(A) O – Architect (B) P – Beautician
(C) N – Principal (D) R – Scientist

Directions for questions 35 to 38: These questions are based on the following information.

Four boys K, L, M, and N sit in Row I facing north and they are from different professions, such as Engineer, Doctor, Professor and Actor. Four girls P, Q, R, and S sit in Row II facing south and they are of different professions, such as Lawyer, Teacher, Director and Collector. They sit in such a way that the distance between any two adjacent persons in a row is the same such that one person in one row faces the other person in the other row, but not necessarily in the same order

Collector sits opposite to the person who sits third to the right of N. Doctor and Teacher sit opposite to each other. Engineer sits opposite to the person who sits third to the left of R. Only one person sits between K and L. R sits second to the right of S, the Director. P does not sit opposite to Engineer and K is neither an Engineer nor a Doctor. Lawyer does not sit opposite to Actor.

35. Who is the Doctor?
(A) K (B) M
(C) L (D) N

36. Who sits opposite to the Director?
(A) Actor (B) Professor
(C) L (D) K

37. Which of the following 'person–profession' combination is correct?
(A) P – Director (B) S – Collector
(C) M – Actor (D) N – Engineer

38. What is the position of P with respect to R?
(A) Immediate right
(B) Immediate left
(C) Second to the right
(D) Second to the left

EXERCISE-3

Directions for questions 1 and 2: These questions are based on the following information.

Aksha, Bindu, Chandana, Deeksha, Harsha and Lasya have different number of years of work experience. They worked between the years 1988 to 2000. Each person has at least one-year experience. The following information is known about them.

(i) Harsha started working in 1988 and has 8 years of experience.
(ii) Aksha started working in 1991 and has 6 years of experience.
(iii) Bindu has 7 or 6 years of experience and her experience is overlapped with Harsha.
(iv) Chandana started working in 1988 and stopped in the same year when Deeksha started working.
(v) Lasya started working in 1989 and has 1 year more experience than Chandana.
(vi) No two persons stopped working in the same year.
(vii) Deeksha has one year less experience than Chandana.

1. How many pairs of persons stopped working in the consecutive years?
(A) 5 (B) 4
(C) 3 (D) 6

2. How many years are there in which more than three persons started working?
(A) 1 (B) 2
(C) 3 (D) None of these

Directions for questions 3 to 5: These questions are based on the following information.

A group of seven friends, namely Asha, Lata, Mahesh, Madhu, Mahima, Sandhya and Kavita are sitting in a row facing North. Lata is two places away to the left of Sandhya. Mahima has Kavita to her left and Madhu to her right. Asha is sitting to the immediate left of Madhu but not to the immediate right of Mahima. Mahesh is not sitting adjacent to Kavita.

3. If Madhu is not sitting at any of the ends, then how many people are sitting between Mahesh and Mahima?
(A) 0 (B) 1
(C) 2 (D) 3

4. Who among the following can be the one sitting to the left of Lata?
(A) Kavita (B) Madhu
(C) Asha (D) Mahesh

5. If Sandhya is sitting at the middle of the row, then who is sitting at the left end?
(A) Lata (B) Mahesh
(C) Kavita (D) Madhu

Directions for questions 6 to 8: These questions are based on the information given below.

A group of four friends, namely Aravind, Bharat, Chandrapaul and Daniel went for an excursion with their wives Preeti, Revati, Sravani and Vanita, not necessarily in the same order. Each couple hails from a different city, they are from Mumbai, Chennai, Kolkata and Hyderabad, not necessarily in that order. They went to Agra to visit the Taj Mahal, where they sat in a row. Each wife always sat to the immediate right of her husband.

(i) Bharat sat to the immediate right of Preeti.
(ii) Daniel is from Hyderabad and Preeti is not from Mumbai.
(iii) Revati and her husband were sitting to the immediate right of the couple that hailed from Chennai.
(iv) Chandrapaul and his wife were sitting to the immediate left of the couple from Kolkata and Chandrapaul was sitting to the immediate right of Sravani.
(v) Aravind sat to the immediate right of Revati, who is not from Mumbai.

6. Who is Daniel's wife?
(A) Sravani (B) Preeti
(C) Vanita (D) Revati

7. Which couple is from Chennai?
(A) Vanita and Bharat
(B) Daniel and Revati
(C) Chandrapaul and Preeti
(D) Aravind and Sravani

8. Which husband from the pair of couples was seated second in the row from left to right?
(A) Aravind (B) Bharat
(C) Chandrapaul (D) Daniel

Directions for questions 9 to 11: These questions are based on the following information.

A group of seven people, namely A, B, C, D, E, F and G wearing seven different coloured shirts, such as Red, Blue, Green, Yellow, Pink, White and Violet are sitting in a row not necessarily in the same order facing North. We know the following additional information.

(1) D is sitting as many places away to the right of the person wearing red coloured shirt as the person wearing white coloured shirt is sitting to the left of A.
(2) The person wearing pink coloured shirt is four places away to the right of G.
(3) The number of people to the left of C is same as the number of people to the right of the person wearing white coloured shirt.

(4) The person wearing blue coloured shirt is four places away to the left of the person wearing green coloured shirt.
(5) The people wearing violet coloured shirt and yellow coloured shirt are sitting at the second and seventh positions from the extreme left, respectively.
(6) F is sitting to the immediate left of E, who is adjacent to C.

9. Who is wearing green coloured shirt?
(A) A (B) C
(C) B (D) D

10. Who is wearing pink coloured shirt?
(A) B (B) F
(C) E (D) A

11. Who is sitting at the extreme right?
(A) D (B) A
(C) C (D) B

Directions for questions 12 to 14: Read the information given below and then answer the questions that follow.

Seven boxes of different colours, such as White, Indigo, Blue, Red, Yellow, Green and Violet have to be arranged in a row on a shelf in such a way that the Blue box and the Indigo box have only four boxes in between them, whereas the White box is not in between the Blue and the Indigo boxes and the Yellow box is to the immediate left of the Indigo box.

12. If the White and the Red boxes have two boxes between them, then which of these would be exactly in the middle of the row of boxes?
(A) Yellow box (B) Red box
(C) Violet box (D) Green box

13. If the green box is placed to the immediate left of the violet box and next to the blue box, wherein the white box is to extreme left, then which of the following boxes will be the fourth from the right end?
(A) Red box (B) Yellow box
(C) Green box (D) Violet box

14. Which of the following statements is definitely false?
(A) The violet box is exactly in the middle of the row.
(B) The white box is not at any of the extreme ends.
(C) The yellow box is in the third place from the right end.
(D) Each of the white and the indigo boxes are at the extreme ends.

Directions for questions 15 to 17: Read the data given below and then answer the questions that follow.

M, N, O, P, Q, R, S, T, U, V and W are eleven persons in a team. O is elected as their captain. O makes them sit in a row. P and R must sit together and V and W also sit together, whereas there are exactly four seats between the two pairs P, R and V, W. T and U sit together and T is to the immediate right of S, who is next to Q. M and N sit in that order only at one extreme end and no one sits to the left of P.

15. Who sits exactly at the fourth place to the right of U?
(A) N (B) M
(C) Q (D) P

16. How many people sit between S and N?
(A) 4 (B) 3
(C) 5 (D) 6

17. How many ways of arrangements are possible in the row with the given conditions?
(A) 2 (B) 3
(C) 4 (D) 5

Directions for questions 18 to 20: These questions are based on the following information.

Seven persons A through G sit in a row, not necessarily in the same order, some face north and the remaining face south. No two adjacent persons face the same direction. The following information is known about them.

Two persons sit between D and E, and E is at one of the ends. G is two places away to the right of E. B faces the same direction as C faces and is adjacent to both D and F. G faces north.

18. What is the position of D with respect to G?
(A) Immediate right (B) Immediate left
(C) Second to the left (D) Second to the right

19. Four of the following are alike in a certain way and so form a group. Find the one which does not belong to that group.
(A) E G (B) G C
(C) F D (D) A B

20. Which of the following is/are 'definitely true'?
(A) A sits adjacent to G
(B) E and C are not at the ends
(C) B is second to the left of C
(D) More than one of the above

Directions for questions 21 and 22: These questions are based on the following information.

Ten people are sitting in two parallel rows, which have five people each, in such a way that there is an equal distance between adjacent people. In Row I, A, B, C, D, E are seated (not necessarily in the same order) and all of them are facing north. In Row II, P, Q, R, S, and T are seated facing south. Therefore, each member seated in Row I faces exactly one member of Row II.

R and T are not sitting at any end. S is sitting opposite to the person who is not a neighbour of A or C. C is not sitting opposite to S. Neither B nor E is sitting opposite to T. Only one person is sitting between C and A. But neither of them is

sitting at the left end. T is not a neighbour of S or R. E is not sitting opposite to S. A is not sitting opposite to the person who is sitting at the left end. At least one person sits to the left of Q.

21. Who is sitting opposite to the person who is not a neighbour of either S or Q?
(A) D (B) C
(C) E (D) A

22. If R and T interchange their positions, then who among the following will sit opposite to T?
(A) E (B) A
(C) B (D) D

Directions for questions 23 to 25: These questions are based on the following information:

A group of eight people K, L, M, N, O, P, Q and R are sitting in two rows facing each other, i.e., four people in each row not necessarily in the same order. They hail from various professions, such as Principal, Beautician, Doctor and Teacher, and they are facing south. Whereas, the other group of professionals, such as Architect, Politician, Singer and Scientist are facing north.

(i) The doctor is sitting opposite to the person, who is to the immediate right of Q, the politician.
(ii) Neither M nor O is a teacher.
(iii) Either R or K is the doctor.
(iv) The teacher and the scientist are sitting opposite to each other at an end.
(v) Neither Q nor O sits at an end.
(vi) The politician and the architect are adjacent to each other.
(vii) L is the singer and is sitting to the immediate left of P, who is a scientist.
(viii) K is the principal and he is sitting opposite to the architect.

23. Who among the following is the teacher?
(A) N (B) O
(C) R (D) K

24. Which of the following statements is definitely true?
(A) P is the scientist and sitting at left extreme.
(B) R is the doctor and sitting opposite the singer.
(C) N is the teacher and sitting to the immediate left of R.
(D) More than one of the above.

25. If Q interchanges his place with K, then who sits to the immediate left of Q?
(A) Architect (B) Singer
(C) Principal (D) Beautician

ANSWER KEYS

Exercise-1

1. (C)	8. (B)	15. (D)	22. (D)	29. (B)	36. (C)
2. (C)	9. (D)	16. (A)	23. (C)	30. (C)	37. (C)
3. (C)	10. (D)	17. (D)	24. (B)	31. (C)	38. (B)
4. (A)	11. (C)	18. (C)	25. (A)	32. (A)	39. (B)
5. (D)	12. (C)	19. (A)	26. (C)	33. (D)	40. (A)
6. (C)	13. (B)	20. (B)	27. (B)	34. (B)	
7. (D)	14. (A)	21. (D)	28. (C)	35. (B)	

Exercise-2

1. (D)	8. (D)	15. (C)	22. (B)	29. (D)	36. (A)
2. (D)	9. (C)	16. (A)	23. (D)	30. (C)	37. (C)
3. (C)	10. (D)	17. (A)	24. (B)	31. (D)	38. (B)
4. (B)	11. (B)	18. (D)	25. (A)	32. (D)	
5. (A)	12. (A)	19. (C)	26. (D)	33. (D)	
6. (D)	13. (D)	20. (A)	27. (B)	34. (B)	
7. (B)	14. (B)	21. (B)	28. (C)	35. (D)	

Exercise-3

1. (B)	5. (C)	9. (B)	13. (D)	17. (A)	21. (B)	24. (D)
2. (D)	6. (A)	10. (D)	14. (B)	18. (A)	22. (A)	25. (D)
3. (D)	7. (C)	11. (A)	15. (A)	19. (D)	23. (A)	
4. (A)	8. (C)	12. (B)	16. (C)	20. (D)		

SOLUTIONS

EXERCISE-1

1. Five people L, M, N, O, and P sit in a row, not necessarily in the same order.
P sits exactly between M and N which means that the following arrangements can be obtained:
M/N P M/N L/O L/O
(or)
L/O M/N P M/N L/O
(or)
L/O L/O M/N P M/N
It is also given that L sits exactly between M and O, which means that M sits at the center of the row.
N P M L O
(or)
O L M P N
'M sits exactly at the center of the row' is true.

2. From (ii), we can say that Nagraj is the first person in the queue while Tanmay is the second.
Now, from (i) and (iii) we can say that Ganpat is the 3rd person and Jivan is 5th.
Thus, Sanjay is the 4th person and Dhruv is the last person in the queue. Hence, the queue is as follows.

Nagraj
Tanmay
Ganpat
Sanjay
Jivan
Dhruv

There are 3 people (Ganpat, Sanjay and Jivan) ahead of Dhruv but behind Tanmay.

3. It is given that:
_____ Krishna _____
Treasurer Director
As Murali is two places away from the Secretary, hence, Krishna must be the Secretary, as Vijay must sit to the immediate right of Murali.
Hence, we get the following arrangement:
_____ Krishna _____ Murali Vijay
Treasurer Secretary Director Professor Student Leader

4. A, B, C, D, E, F and G are seven people who parked their cars in a row. E's car and F's car should be next to each other, i.e., EF or FE. Similarly, the cars of D and G should be next to each other, i.e., DG or GD. A's car and B's car should not be next to each other, whereas the cars of B and D are parked next to each other, i.e., BD or DB. C's car is parked to the immediate right of G's, i.e., G → C. Hence, they can be parked in the following order.
(i) E F or F E
(ii) D G or G D
(iii) B D G
(iv) B D G C
As A and B are not parked together, the arrangement can be as follows.
(i) A __ __ B D G C
(ii) __ A __ B D G C
(iii) __ __ B D G C A
(iv) __ B D G C A __
(v) __ B D G C __ A
(vi) B D G C A __ __
(vii) B D G C __ A __
(viii) B D G C __ __ A
But as E and F must be together, the arrangement can be as follows. AFEBDGC or AEFBDGC,
FEBDGCA (or) EFBDGCA,
BDGCA (EF or FE) or BDGC (EF or FE) A.
If E and F park in that order only, i.e., E first and then F, then the order is EFBDGCA (or) BDGCAEF. In any case B and D have only one car between their cars. Choice (A) is FALSE. B and C do not park together. Choice (B) is TRUE. D and C have only G's car between their cars. Choice (C) is TRUE. A is at the extreme. Choice (D) is partly true.

5. As A is two places to the right of B and C is two places to the left of D, the possible arrangements are as follows.
(i) B C A D __
(ii) __ B C A D
(iii) C B D A __
(iv) __ C B D A
As E is not sitting at extreme right arrangements, the options (i) and (iii) are not possible. Hence, C or B is sitting at the middle.

6. Given that, A is three places away to the right of C. The possible arrangements are as follows.
(i) C __ __ A __
(ii) __ C __ __ A
Given that, two people are sitting between B and D. By combining with the above, we get the following possible arrangements.
(i) C B/D __ A D/B
(ii) B/D C __ D/B A
In either case E is the one who is sitting in the middle of the row.

7. As Anush is to the immediate right of Adi who is adjacent to Arnab, the possibilities are as follows:
(i) Arnab Adi Anush ____ ____
(ii) ____ Arnab Adi Anush ____
(iii) ____ ____ Arnab Adi Anush
As there is at most one person between Ankur and Anush, (iii) is not possible.
In (ii), Ankur must sit at the extreme right.
∴ There cannot be at least two people between Arnab and Asraf.
∴ Only case (i) is possible.
Arnab Adi Anush Asraf/Ankur Asraf/Ankur
The only choice (D) is true.

8. From the first two statements the possibilities are as follows:
(i) O _ Q _ _ M P
(ii) Q O _ _ P _ M
From the third statement the possible arrangements are as follows.
(i) O S Q N R M P
(ii) Q O S N P R M
∴ In either case N is sitting in the middle of the row.

9. As, Chetan is two places to the right of Ena neither of them is sitting at the extreme ends and Alpana and Fanna are adjacent to each other, the possibilities are as follows:
(i) _ E _ C A / F A / F
(ii) A / F A/ F E _ C _
As there is one person between Alapana and Brahma, the possibilities are as follows.
(i) D E B C A F
(ii) F A E B C D
∴In either case Brahma is sitting to the immediate right of Ena.

Solutions for questions 10 to 12: From (i) and (ii), we have
_ A/B D B/A ____
From (iii), we can say that C must be at the left end of the row. Thus, we get the following arrangement.
C B D A E

10. Eswar is sitting at the right end.

11. Two people are sitting between Amit and Chetan.

12. Eswar is third to the right of Balram.

Solutions for questions 13 to 15: From (i) and (iii), we get
_ _ P _ _ Q
Now, from (ii) and the above, we can say that the person sitting between T and U is P. Hence, we get 4 possible arrangements which are as follows.
R T P U S Q — Case (a)
R U P T S Q — Case (b)
S T P U R Q — Case (c)
S U P T R Q — Case (d)

13. U is adjacent to S in case (a) and (d), and in both the cases there are two people sitting between U and R.

14. S is sitting to the immediate right of T in case (b), Hence, P is sitting second to the right of R.

15. Any one of the three P, R and S, can be adjacent to T.

Solutions for questions 16 to 18: From (ii) and (iv), we can say that Maths is on the top, Zoology is 2nd from the top, and English is 5th from the top. Now from (i), we can say that Hindi is 2nd from the bottom and Biology is 3rd from the bottom. Now, from the above information and (iii), Economics and Chemistry are the 3rd and 4th from the top. Thus, Physics is the bottom one in the stack. Hence, we have the following arrangement.

Maths
Zoology
Economics/Chemistry
Chemistry/Economics
English
Biology
Hindi
Physics

16. Physics is at the bottom.

17. Position of Economics book is not certain, and hence, it cannot be determined.

18. Except English and Hindi all other pairs are in adjacent positions.

Solutions for questions 19 to 21:
From (i), Dubey's _____ _____ _____.
Green
From (ii), Sharma _____ _____ _____.
Red
From (iii), Reddy _____ _____ _____.
White
∴ The owners of the left three buildings are Dubey, Sharma and Reddy and the colours of the right three buildings are green, white and red.
The colours of the left three buildings are blue, yellow and orange.
The owners of the right three buildings are Roy, Sanyal and Tiwari.
From (iv), Roy's building is adjacent to the orange building. From the above explanation the arrangement will be as follows.
_____ _____ _____ Roy _____ _____
Orange

From (vi), as Tiwari's building is three places away from Reddy's building, the following arrangement is possible.

		Reddy	Roy	Sanyal	Tiwari
Orange	White				

From (v), since Sanyal's is not green, as well it is not white, it must be red.

Roy's building is green.

∴ The arrangement is as follows.

Dubey	Sharma	Reddy	Roy	Sanyal	Tiwari
Blue	Yellow	Orange	Green	Red	White

19. The colour of Dubey's building is blue.

20. The red building belongs to Sanyal.

21. Only choice (D) is true.

Solutions for questions 22 and 23: From (ii), as any four consecutive classrooms accommodate two A sections and two B sections, the following arrangements are possible.

	1	2	3	4	5	6	7	8	9	10
Arrangement A	A	B	B	A	A	B	B	A	A	B
Arrangement B	B	A	A	B	B	A	A	B	B	A

But it is given that Class II A is at the extreme right. Hence, arrangement (a) is not possible.

From (iv): III B/IV B _____ _____ IV B/III B

But neither of III B and IV B is at the extreme end.

∴ They have to be in positions 5 and 8 in any order.

From (vi), Class II A is in position 10.

From (v), Class II B has to be in position 4 or 9. But it is given that both sections A and B of the same are not adjacent to each other. Since, II A is in position 10, II B cannot be in position 9.

∴ II B is in position 4.

The arrangement obtained so far is as follows.

1	2	3	4	5	6	7	8	9	10
II	III/IV		IV/III		II				
B	A	A	B	B	A	A	B	B	A

From (vii), V A is to the right of III B.

∴ III B must be in position 5 and V A must be in position 6 or 7.

⇒ IV B is in position 8.

From (iii), V A is three places away from I A.

This is possible only when I A is in position 3 and V A in position 6.

The arrangement obtained so far is as follows.

1	2	3	4	5	6	7	8	9	10
I	II	III	V	IV	II				
B	A	A	B	B	A	A	B	B	A

Since, IV B is in position 8, IV A must be in position 2.

⇒ III A is in position 7.

∴ I B and V B are in positions 1 and 9 in any order.

∴ The final arrangement is as follows.

1	2	3	4	5	6	7	8	9	10
I/V	IV	I	II	III	V	III	IV	V/I	II
B	A	A	B	B	A	A	B	B	A

22. I B or V B can be at the extreme left.

23. V A is to the immediate right of class III B.

Solutions for questions 24 to 27: It is given that P sits third to the right of the person who is the heaviest. The heaviest person sits exactly between R and the lightest person, who sits at an end. P's weight is neither 92 kg nor 79 kg. Hence, the lightest person, i.e., the person who is of 79 kg should sit at the left end and R sits either third from the left end or third from the right end. Given the person whose weight is the third lowest (i.e., 85 kg) sits adjacent to R is neither P nor adjacent to P. Hence, we get the following arrangement.

				R	P	
79		96	85			

It is given that Q sits third to the left of the person whose weight is the next highest after R. R's weight is neither 83 nor 87 and P's weight is not 92. Hence, R's weight is 89, Q's weight is 85 and Q sits to the immediate left of R. The person whose weight is 92 kg sits at the right end. As T's weight is 83 and S is heavier than V, but is not the heaviest, the final arrangement is as follows.

V	T	U	Q	R	P	S
79	83	96	85	89	87	92

24. Q is the third lightest.

25. Only one person.

26. The person who is 89 kg.

27. Five persons

28. Form (ii), the arrangement of A, C, D and E must be in the order of E, D, A, C …. (a)

From (iv), we get:

Nepal				

From (iii) and (a), we get the following cases.

Case (i):

B	E	D	A	C
Pakistan			Nepal	

Case (ii):

E	D	A	C		B
Nepal			Pakistan		

From (i), the final representations are as follows.

Case (i):

B	E	D	A	C
Pakistan	India	Nepal	Bangladesh	Sri Lanka

Case (ii):

E	D	A	Bangladesh	Sri Lanka	Nepal
C	B				
India	Pakistan				

If B is not adjacent to E, then A is the delegate from Nepal (Case (ii)).

29. If D is not the delegate from Sri Lanka, then the delegate from Pakistan is at the extreme left end of the row.

30. Choice (C) is false.

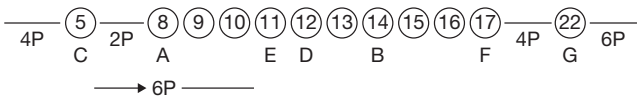
Solutions for questions 31 to 33: Let us represent the names of the seven people with their first letter.

From the given information the possible cases are,

(i)

(ii)

31. From the given information, case (i) is not possible. In case (ii), we have



∴ Six people.

32. In both cases, if Chaitra and Fallon interchange their positions, 8 people sit between Chaitra and Akhil.

33. In case (i), there are four persons.
In case (ii), there are eight persons.

Solutions for questions 34 to 36: Given that, A is sitting third from the left end. B, A, C and G are sitting from left to right in that order but not in adjacent positions. Hence, B is sitting at the left end and the possible arrangements are as shown below.

(i) _ _ _ _ _ _ _ _
(ii) _ _ _ _ _ _ _ _
(iii) _ _ _ _ _ _ _ _

Given that, there are exactly two people sitting between D and E. Hence, case (i) and case (ii) are eliminated, as we cannot place D and E. In case (iii), D sits to the immediate right of B and E sits to the immediate left of C.

Given that D, F and H are sitting from left to right, in that order but not necessarily in adjacent positions.

Hence, the final row arrangement is as shown below.

B D A F E C H G

34. D sits second to the right of A.

35. Four people sit between B and C.

36. B and G.

Solutions for questions 37 to 40: From (iv), (ii) and (i), we can say that rooms H and E are on the fifth floor in any order. D and G are on the first floor in any order.

From (vii), we can say that room A is on the third floor.

From (iii) and (v), we can say that B and K are on the fourth floor.

From (vi), (viii) and (ix) and above, the possible arrangements are as shown below.

Floor Number	Rooms			
	Case (i)		Case (ii)	
6	C	F	F	C
5	H/E	E/H	H/E	E/H
4	B/K	K/B	B/K	K/B
3	I	A	A	I
2	L	J	J	L
1	D	G	G	D

37. L and J are on the second floor.

38. Two floors.

39. Room A.

40. Room L.

EXERCISE-2

1. In each arrangement above, we get 4 possibilities. Hence, the total number of possible arrangements is 16.

2. Let us consider Black and White flags as one single unit, they are represented as X. Now, X is not next to Violet or Red.

(i) I/Y B G V/R R/V Y/I O
↑
X

(ii) O I/Y B G V/R R/V Y/I
↑
X

(iii) I/Y V/R R/V G B Y/I O
↑
X

(iv) O I/Y V/R R/V G B Y/I
↑
X

Hence, the total number of arrangements
$= 8 \times 4 = 32$

3. (A) Yellow flag may or may not be at an extreme end as shown in various arrangements.
(B) Similarly, as shown in the figures above, Indigo and Orange flags may not be together.

(C) The Blue flag is always adjacent to the Green flag, as seen in every possible arrangement.

(D) This statement again may or may not be true, as it can be observed in the arrangements.

Solutions for questions 4 to 6: Let us indicate the positions in the queue from the front end to the rear end as follows.

1 –
2 –
3 –
4 –
5 –
6 –
7 –

From (i), the possible positions of A and C are positions (1 and 7) or (2 and 6) or (3 and 5).

From (ii), the possible positions of G and D are same as above.

From (iii), the possible positions of B and F are (1 and 5) or (2 and 6) or (3 and 7).

From the above discussion it is clear that any of A, B, C, D, F and G cannot be in position 4.

∴ E is in position 4.

If B and F are in positions 1 and 5, then A and C must be in positions 2 and 6. In such case we can find positions for G and D. Similar will be the situation if B and F are in positions 3 and 7.

Hence, B and F must be in positions 2 and 6.

Now, if A and C are in positions 1 and 7, then G and D must be in positions 3 and 5.

From (ii), B is standing ahead of E. Since, E is in position 4, B must be in position 2. It is given that B is standing behind A. Hence, A must be in position 1.

∴ The final arrangement is as follows.

1 A
2 B
3 G/D
4 E
5 D/G
6 F
7 C

4. E is standing in the middle of the queue.

5. A is standing at the front of the queue.

6. C is the last person in the queue.

Solutions for questions 7 to 10: Let the name of any person be represented with the first letter. The initial arrangement of the persons is as given below.

B L M N D S P

From (ii), the positions of M and D remain the same as given below.

_ _ M _ D _ _

Since, no person retained the previous positions and neither of the neighbours of any person remain same, N has to sit at one of the ends.

If N sits at the extreme left, then L can be at any of the two right positions at the extreme right and from (iii), S must be sitting to the immediate right of N as follows:

N S M P D L B

N S M B D P L

But the first case is not possible, as Bipul and Lalita are sitting adjacent to each other. Only the second case is possible.

Similarly, when N is sitting at the extreme right end, the possible arrangement is as follows:

S B M P D L N

∴ The possible arrangements are:

1) S B M P D L N
2) N S M B D P L

7. There is one person between Bipul and Pradeep in both the cases.

8. Four people are sitting between Sushmita and Lalitha in both the cases.

9. In both the cases Deepa and Pradeep are adjacent to each other.

10. Naina or Lalita is sitting at the right end of the row.

Solutions for questions 11 to 13: From (i): Mrinal is the last person in the queue and Gopal is the last but one person in the queue.

From (ii): Kajol is the first person in the queue and Tamal is the second person in the queue.

From (iii) and the above information the possible arrangements are as follows.

Case (A)	**Case (B)**
Kajol	Kajol
Tamal	Tamal
Komal	Amol
Bimal	Komal
Amol	Bimal
Gopal	Gopal
Mrinal	Mrinal

11. The given condition is satisfied in case (a), in which Amol is the fifth person in the queue.

12. In both the cases Komal is standing between Bimal and Tamal.

13. Gopal or Komal is standing immediately behind Amol.

Solutions for questions 14 to 16:

_ _ _ _ _ _ _ _ _

1 2 3 4 5 6 7 8 9

(a) Position 1 ≠ C, D, G, I

Position 9 ≠ A, B, C, D, E, F, H, G

(b) F – HI

OR

H – FI

(c) Since A, B, C, D, E, F, G, H are not seated at the extreme right ends, I must be seated there.

	__	__	__	__	__	__	__	__	I
(d)	__	__	__	__	__	F	__	H	I

or

	__	__	__	__	__	H	__	F	I

Hence, position 1 ≠ C, D, G, H, F, E, I, L so it is either A or B.

Since E and F are seated together, the following possibilities can exist.

(i)	A	C	B	D	E	F	G	H	I
(ii)	A	B	C	D	E	F	G	H	I
(iii)	B	D	A	C	E	F	G	H	I
(iv)	B	A	D	C	E	F	G	H	I

14. There are four ways.

15. Choice (A): D and E are not seated together in (iii) and (iv). Choice (B): C is to the right of D in (iii) and (iv). Choice (C): F and G are seated together in all the cases from (i) to (iv). Choice (D): A and B are not seated together in case (i) and (iii).

16. By observing the cases (i) through (iv), all the four are valid representations.

Solutions for questions 17 to 19: Both E and G are next to exactly one person.

⇒ E and G are at extreme ends of the row.

There are two persons between A and B and also between C and A.

⇒ A is at the middle place of the row.

B is to the immediate right of E.

⇒ G is at the extreme right end.

⇒ C is next to G.

1	2	3	4	5	6	7	8	9
E	B	__	__	A	__	__	C	G

F is between I and B.

⇒ F could be at 3, 4 or 6 and I could be at 4, 6 or 7.

17. From (A), we know that I is to the immediate left of A and C is to the immediate right of H, which gives us the following arrangement.

EB __ IA __ HCG

We already know that F is between I and B, which gives us the following arrangement.

EBFIADHCG

∴ Choice (A) is enough to determine the order of the persons from left to right, whereas, the other choices do not lead to a fixed and definite arrangement.

18. If I is to the immediate right of A, we get the following arrangement.

EB __ __ AI __ CG

1 2 3 4 5 6 7 8 9

This means that F is at either 3 or 4 which means that one of the remaining persons, i.e., D or H is at 7.

19. F is to the immediate right of B as given in the following arrangement.

E B F __ A __ __ C G

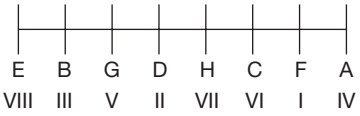
1 2 3 4 5 6 7 8 9

Positions 4, 6 and 7 are to be filled up by I, D and H. I can be placed at 4, 6 or 7, i.e., 3 ways. The remaining two D and H can then be placed in two ways.

∴ Total ways = 3 × 2 = 6.

Solutions for questions 20 to 23: Given, A sits second to the right of C, neither of them is going to screens VIII and one of them is at an end. The person who is going to screen VII is adjacent to C, but not to A. C is not going to IV. Hence, A sits at the right end, C sits third from the right end and the person who is going to screen VII sits fourth from the right end. Given, B is going to screen III and is to the immediate right of E. E is three places away from the person, who is going to screen II and is second to the left of the person, who is going to screen V. Hence, E sits at the left end, B sits second from the left end, the person who is going to screen V sits to the immediate right of B and the person who is going to screen II sits second to the right of B. Given, D is going to screen II, but is not adjacent to F, who is two places away from H. Hence, F is adjacent to C and A, H sits to the immediate left of C and G sits to the immediate left of D. Given, H sits second to the left of the person who is going to screen I. Hence, F is going to screen I, E is going to screen VIII, A is going to screen IV and C is going to screen VI.

∴ The final arrangement is as shown below.



20. H sits to the immediate right of D.

21. C is going to screen VI.

22. F sits second from the right end.

23. Except in choice (D), in the remaining groups, there is exactly one person sitting between the first person and the second person.

Solutions for questions 24 to 27: It is given that, odd numbered cars are not opposite each other and no two even numbered cars are adjacent to each other. Hence, we can say that an odd numbered car is opposite to an even numbered car.

From (i), (ii), (v), (vi) and (x) and above, we get:

Pink	White	Yellow		
____	____	____	____	____
8	4	6	× 3, × 1	
____	____	____	____	____

From (vii), the only possibility is Black coloured car is numbered 10 and is opposite to White coloured car, which is numbered 1.

From (iii) and (ix), Blue and Green coloured cars are opposite to cars numbered 4 and 6 in any order.

From (iv), Red coloured car is opposite to Pink coloured car.

From (viii), a Violet and Orange coloured cars are numbered 4 and 6 in any order.

Hence, Gray coloured car is numbered 2.

Red coloured car is numbered 3.

Yellow coloured car is numbered 9 and Green coloured car is numbered 7.

The final arrangement is as shown below.

Pink	Blue/Green	Black	Green/Blue	Gray
8	5/7	10	7/5	2

Red	Voilet/Orange	White	Orange/Voilet	Yellow
3	4	1	6	9

24. 1, 3, 4, 6, 9.

25. Car numbered 5.

26. Blue and Green.

27. Car numbered 1 and the Black coloured car.

Solutions for questions 28 to 30: From (ii), the red and yellow coloured houses are opposite to each other. The red and green coloured houses are on the same side.

From (iii), the violet and white coloured houses are opposite to each other. Blue and white colour houses are on the same side of the road.

From (i), the pink and brown coloured houses are at diagonally opposite positions, the blue, white and yellow coloured houses must be on the same side of the road.

∴ The red, green and violet are on the other side.

The red and yellow coloured houses are opposite to each other and the violet and white coloured houses are opposite to each other, the green and blue coloured houses are diagonally opposite to each other.

From (iv) we get,

blue white yellow brown/blue yellow white brown

or

pink violet red green/pink red violet green

28. The blue and green coloured houses are diagonally opposite to each other.

29. The pink and green are on the same side.

30. There are two houses between the blue and brown coloured houses.

Solutions for questions 31 to 34: It is given that, P faces the north and sits at the right end. Musician faces the same direction as P and sits second to the left of P. From (4), we come to know that Q is the Musician and sits three places away from the Architect. Thus, Q also faces north. From (3), (4) and (5) we come to know that, K is to the immediate right of P and he is neither the Principal nor the Lawyer. Both the neighbours of Q face south.

				↓	Q↑	K↓	P↑
		Architect			Musician		

From (5), L and the Scientist are neighbors of the Architect. Suppose, Scientist sits second to the left of the Q, from (8), Professor sits to the immediate left of Q. It is not possible because either Principal or Lawyer sits to the immediate left of Q (from (3) and (5)). Hence, R who is the Scientist who sits four places away from Q and faces south. M is the Professor who sits to the immediate right of R, and L sits second to the left of Q.

M	R↓		L
Professor	Scientist	Architect	

↓	Q↑	K↓	P↑
	Musician		

From (6), N who is the Principal, sits second to the right of O. So, N sits to the immediate left of Q and O is an Architect and he faces north. From (8), Beautician sits three places away to the right of the Lawyer. Thus, L is the lawyer and faces north and K is the Beautician. Hence, M has to face south and P must be the Teacher.

The final arrangement is as follows.

M↓	R↓	O↑	L↑
Professor	Scientist	Architect	Lawyer

H↓	Q↑	K↓	P↑
Principal	Musician	Beautician	Teacher

31. K, the Beautician, sits second to the left of N.

32. N, is the Principal and O, the Architect, are neighbours of the Lawyer.

33. L is the Lawyer and O is the Architect. Hence, both (B) and (C) are true.

34. Except in option (B), in all other the options person and their profession combination is true.

Solutions for questions 35 to 38: It is given that the Collector sits opposite to the person who sits third to the right of N, and the Engineer sits opposite to the person who sits third to the left of R and only one person sits between K and L.

R _ _ _ _ Collector

N K/L M L/K Engineer

R sits second to the right of S and P does not sit opposite to the Engineer and S is the Director.

R P S Q

N K/L M L/K

Doctor sits opposite to the Teacher and K is neither an Engineer nor a Doctor. Hence, the final arrangement is as follows.

Teacher Lawyer Director Collector

R P S Q

K M L

Doctor Professor Actor Engineer

35. N is the Doctor.

36. Actor sits opposite to the Director.

37. 'M – Actor' combination is true.

38. P sits to the immediate left of R.

EXERCISE-3

Solutions for questions 1 and 2: From (i), we can say that Harsha stopped working in the year 1996.

From (ii), we can say that Aksha stopped working in the year 1997.

From (ii) and (iii), we can say that Bindu has 7 years of experience. Since each person has different number of years of experience and Bindu started working in 1988 and stopped in 1995. From (iv) and (v), we can say that, Chandana and Lasya stopped working in the years 1989 and 1991 or 1990 and 1992 or 1991 and 1993 or 1992 and 1994 or 1993 and 1995 or 1998 and 2000, respectively.

Chandana did not stop working in 1994 or 1995, since no two persons stopped working in the same year. From (vii) and from (v), and above we can say that Deeksha started working in 1989 or 1990 or 1991 or 1992 or 1993 or 1998.

From (vii), we can say that Chandana did not have one-year experience. Hence, we can say that Chandana did not stop working in 1989. Since she started working in 1988 (from (iv).

If Chandana stopped working in 1991 (i.e., 3 years of experience) then Deeksha has 2 years of experience, i.e., Deeksha stopped working in 1993, which is not possible since Lasya stopped working in 1993. Similarly, Chandana did not stop working in 1992 or 1993 or 1997.

Hence, Chandana stopped working in 1990 and Lasya stopped working in 1992, and hence, Deeksha stopped working in 1991.

∴ The arrangement is as shown below.

Let us represent the names with their starting letters.

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Started working	H, C, B	L	D	A									
Stopped working			C	D	L			B	H	A			

1. (Chandana, Deeksha), (Deeksha, Lasya), (Bindu, Harsha) and (Harsha, Aksha) stopped working in the consecutive years.

2. More than three persons started working in none of the years.

Solutions for questions 3 to 5: From the given information it is clear that Asha and Madhu are sitting adjacent to each other and Mahima is sitting to the left of Asha and at least there is one person sitting between them. Kavita is to the left of Mahima. As, it is given that Lata is two places away to the left of Sandhya, there is one person between Lata and Sandhya and the person can be Kavita or Mahima. As Mahesh is not sitting adjacent to Kavita.

If they are sitting adjacent to Kavita, then the possible case is:

I. Lata Kavita Sandhya Mahima Mahesh Asha Madhu
If they are sitting adjacent to Mahima, then the possible cases are:

II. Kavita Lata Mahima Sandhya Asha Madhu Mahesh

III. Kavita Lata Mahima Sandhya Mahesh Asha Madhu
If they are sitting adjacent to Mahesh, then the possible case is:

IV. Kavita Mahima Lata Mahesh Sandhya Asha Madhu

3. There are 3 people between Mahesh and Mahima, if Madhu is not sitting at any end (i.e., II).

4. Kavita can sit to the left of Lata (i.e., II, III and IV).

5. Kavita is sitting at the extreme left end, if Sandhya is at the middle of the row (II and III).

Solutions for questions 6 to 8: Males: Aravind, Bharat, Chandrapaul and Daniel

Females: Preeti, Revati, Sravani and Vanita

Cities: Mumbai, Chennai, Kolkata and Hyderabad

With reference to the couples, the wife always sits to the immediate right of her husband.

From (i), Bharat is not the husband of Preeti.
From (ii), Daniel is from Hyderabad.
From (iii), Revati is not from Chennai.
From (iv), Chandrapaul is not from Kolkata and he is not the husband of Sravani.
From (v), Aravind is not married to Revati and Revati is not from Mumbai.
Let us represent the persons with the first letter in their names.
From (iv),

$$[\underline{\text{Husband} - \text{S}}]\ [\underline{\text{C} - \text{Wife}}]\ \left[\frac{\text{Husband} - \text{Wife}}{\text{Kolkata}}\right]$$

From (iii) and (v),

$$\left[\frac{\text{Husband} - \text{Wife}}{\text{Chennai}}\right]\left[\frac{\text{Hubsane} - \text{R}}{\text{Not Mumbai}}\right]\ [\underline{\text{A} - \text{Wife}}]$$

By combining the above two arrangements, we obtain the following arrangement.

$$[\underline{\text{Husband} - \text{S}}]\left[\frac{\text{C} - \text{Wife}}{\text{Chennai}}\right]\left[\frac{\text{Hubsand} - \text{R}}{\text{Kolkata}}\right]\ [\underline{\text{A} - \text{Wife}}]$$

From (ii), we know that Daniel is from Hyderabad. Hence, he cannot be Revati's husband.
⇒ He is the husband of Sravani.
From (i), we know that Bharat is to the immediate right of Preeti.
⇒ Preeti is the wife of Chandrapaul and Bharat is the husband of Revati.
⇒ Vanita is the wife of Aravind. Thus, we obtain the following arrangement.

$$\left[\frac{\text{D} - \text{S}}{\text{Hyderabad}}\right]\left[\frac{\text{C} - \text{P}}{\text{Chennai}}\right]\left[\frac{\text{B} - \text{R}}{\text{Kolkata}}\right]\left[\frac{\text{A} - \text{V}}{\text{Mumbai}}\right]$$

6. Daniel is married to Sravani.

7. Chandrapaul and Preeti are from Chennai.

8. Chandrapaul and his wife are seated second in the row.

Solutions for questions 9 to 11: From (2), (5) and (6), we get:

____	G	____	___	_____	_____	_____
Blue	Violet			Green	Pink	Yellow

From (7), we have: F E C
From (3), we come to know that C must be wearing green coloured shirt.
∴ From (2), A is to the immediate right of C.
From (1), B is wearing blue coloured shirt and A and D are sitting adjacent to each other.
The final distribution is as follows:

B	G	F	E	C	A	D
Blue	Violet	White	Red	Green	Pink	Yellow

9. C is wearing green colour shirt.

10. A is wearing pink colour shirt.

11. D is sitting at extreme right.

Solutions for questions 12 to 14: The Blue box and the Indigo box have 4 boxes between them. The Yellow box is to the immediate left of the Indigo box. So, the possible arrangement may be as follows.
Yellow, Indigo, _ _ _ _ Blue.
(OR)
Blue, _, _, Yellow Indigo, White
(OR)
White, Blue, _ _ _ , Yellow, Indigo.
But the White box is not between the Blue and Indigo boxes. So, the arrangement can be as follows:
Blue, _, _, _, Yellow, Indigo, White
(OR)
White, Blue, _, _, _ , Yellow, Indigo.

12. If the White and Red boxes have two boxes between them, then the arrangement must be as follows:
White Blue – Red – Yellow Indigo.
The Red box must be in the middle of the row.

13. If the White box is to the left extreme end, then the Green box is placed to the immediate left of the Violet box and next to the Blue box, then the order of colours is White, Blue, Green, Violet, Red, Yellow, Indigo. The fourth box from the right end is the Violet box.

14. The arrangement can be as follows:
Blue, –, –, –, Yellow, Indigo, White
(or)
White, Blue, –, –, –, Yellow, Indigo.
Now, the Violet box may or may not be in the middle of the row. So, choice (A) is ruled out.
The Yellow box can be placed third from the right end. Now, choice (C) is ruled out.
White and Indigo boxes can be at the extreme ends. Choice (D) is ruled out. But the White box must be at one of the extreme ends.
So, choice (B) is definitely false.

Solutions for questions 15 to 17: Let us analyse all the given conditions. M, N, P, Q, R, S, T, U, V and W ten people sitting in a row. O is the eleventh person who makes them sit. It is also given that P and R sit together, whereas V and W sit together. There are exactly 4 seats between the two pairs P, R and V, W. Q, S and T, U sit in pairs together with T to the immediate right of S. Q, S, T, U must be the order of their sitting. M and N sit in that order only at one extreme end. No one sits to the left of P. So, P must be at the left extreme end.
P - - - - - - - M N
P R - - - - - - M N
P, R and V, W have exactly 4 seats between them.
P R - - - - V W M N
P R - - - - W V M N
The four spaces should be occupied by Q, S, T, U in that order only. So, the seating arrangement is, P, R, Q, S, T, U [V, W or W, V] M, N.

15. The order is as follows.
P R Q S T U V W M N or P R Q S T U W V M N
N is exactly at the fourth place to the right of U.

16. The order of seating is as follows.
P R Q S T U [V W or W V] M N
Between S and N there are 5 people and they are (T, U, V, W, M).

17. The possible arrangements of seating are as follows.
(i) P R Q S T U V W M N
or
(ii) P R Q S T U W V M N
Therefore, two possible arrangements can be made.

Solutions for questions 18 to 20: It is given that no two adjacent people face the same direction that means alternate people face the same direction. Two people sit in between D and E, and E sits at one of the ends. G is two places away to the right of E. We get the following cases.

Case (i):

E↑	↓	G↑	D↓	↑	↓	↑

Case (ii):

↓	↑	↓	D↑	↓	↑	E↓

Given that B faces the same direction as C faces and it is adjacent to both D and F.

Then the possibilities are as follows.

Case (i):

E↑	A↓	G↑	D↓	B↑	F↓	C↑

Case (ii):

C↓	F↑	B↓	D↑	G↓	A↑	E↓

Since G faces North, case (ii) is eliminated and the final row arrangement is shown below.

E↑	A↓	G↑	D↓	B↑	F↓	C↑

18. 'D' is to the immediate right of 'G'.

19. Except AB, in the remaining options both are facing the same direction.

20. A sits adjacent to G and B is second to the left of C are definitely true.
Therefore, more than one is true.

Solutions for questions 21 and 22: It is given that T and R are not sitting at any end and T is not adjacent to both S and R. Hence, we have the following possible seating arrangement.

____	T/R	____	R/T	____
____	____	____	____	____

S is sitting opposite to the person who is not a neighbour of both A and C. And only one person is sitting between A and C and neither of them is sitting at the left end. Hence, the arrangement is as follows.

S	R	____	T	____
____	____	A/C	____	C/A

A is not sitting opposite to the person who sits at the left end and at least one person is sitting to the left of Q. Neither B nor E is sitting opposite to T, hence, D has to sit opposite to T. E is not sitting opposite to S and C is not sitting opposite to S. Hence, the final seating arrangement is as follows.

S	R	Q	T	P	↓ Row II
B	E	A	D	C	↑ Row I

21. C is sitting opposite to P, who is not a neighbour of both S and Q.

22. If R and T interchange their positions, then E will sit opposite to T.

Solutions for questions 23 to 25: From (iv) and (vii), we come to know that P is a scientist and he is sitting opposite to the teacher at an end.

L is the singer and is sitting to the immediate left of 'P'.

From (i) and (vi), we come to know that Q is a politician and sits adjacent to the architect. From (v), we come to know that neither Q nor O sits at ends. Hence, the arrangement is as follows:

Teacher

____	____	____	____
____	Q	L	P
Architect	Politician	Singer	Scientist

From (viii), we know that K is the principal and is sitting opposite to the architect. From (iii), either R or K is the doctor. Hence, R is the doctor.

From (ii), neither M nor O is the teacher and from (v) neither Q nor O sits at ends.

From (i), the doctor is sitting opposite to the person who is to the immediate right of Q.

Hence, R is the doctor and he must be sitting opposite to L.

Therefore, M is the Architect, O is the beautician and N is the teacher.

Hence, the final arrangement is as follows:

Principal	Beautician	Doctor	Teacher
K	O	R	N
M	Q	L	P
Architect	Politician	Singer	Scientist

23. N is the teacher.

24. Both the third and the fourth options are definitely true.

25. When Q interchanges his place with 'K', the beautician sits to the immediate left of Q.

2 Circular Arrangement

CHAPTER

Learning Objectives

In this chapter, we will:

- Extend the knowledge of solving linear arrangement puzzles to circular arrangement puzzles.
- Learn how to interpret the statements given and convert them into a circular arrangement.
- Understand the arrangement of even number of people/objects sitting diametrically opposite each other, around a circle.
- Apply knowledge to understand arrangement of odd number of people/objects around a circle.
- Understand and solve circular arrangement puzzles with multiple parameters.
- Understand and solve circular arrangement puzzles where people face different directions.

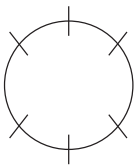
Questions on circular arrangement involve seating of people around a table or arrangement of things in a circular manner (for example, different coloured beads strung to form a necklace).

In case of people sitting around a table, the table could be of any shape, such as rectangular, square, circular or any other.

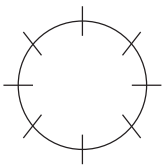
The data given in such sets of questions specify the positions of some or all of the individuals (or things) in the arrangement. The positions are specified through conditions involving specified people sitting (or not sitting) opposite to each other or a particular person sitting to the right or left of another person, etc.

Once you read the data, first draw the shape specified in the data and then draw the slots in the seating arrangement.

Six people around a circular table



Eight people around a circular table



Statements like 'A and B are sitting farthest from each other' or 'A and B sit across the table' imply that A and B sit opposite to each other.

On the other hand, you should remember that, unlike in straight-line arrangement, the words 'immediately' and 'directly' do not play any role in circular arrangement. In general, there is no left side or right side (unless we are talking of 'immediate right' or 'immediate left').

So, if it is given that C sits to right of B, then it is clear that C must be to the immediate right of B. A person's left is in clockwise direction and right is in anti-clockwise direction, when he or she sits facing the centre of a circular table.

To understand better, please go through the solved examples and try to solve them without going through the solution first.

SOLVED EXAMPLES

Directions for questions 1 to 5: These questions are based on the following information.

P, Q, R, S and T sit around a table.

P sits two seats to the left of R and Q sits two seats to the right of R.

2.01: If S sits in between Q and R, then who sits to the immediate right of P?

(A) T (B) S
(C) Q (D) R

2.02: Which of the following cannot be the correct seating arrangement of the five people in either the clockwise direction or the anti-clockwise direction?

(A) P, Q, R, S, T (B) P, S, R, T, Q
(C) P, Q, S, R, T (D) P, T, R, S, Q

2.03: If S is not sitting next to Q, then who is sitting between Q and S?

(A) R (B) P
(C) T (D) Both (R) and (P)

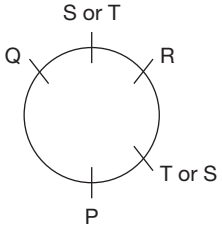
2.04: If a new person U joins the group such that the initial conditions for the seating arrangement should be observed and also a new condition that U does not sit next to R be satisfied, then which of the following statements is true?

(A) U sits to the immediate right of S.
(B) U sits to the immediate left of T.
(C) U sits to the immediate left of P.
(D) Either (A) or (B) above.

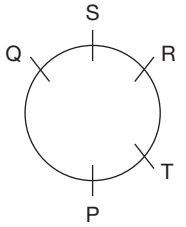
2.05: If a new person U joins the group such that the initial conditions for the seating arrangement should be observed and also a new condition that U does not sit next to P, S or T be satisfied, then who will be the neighbours of P (one on either side)?

(A) S and T (B) S and Q
(C) T and R (D) R and Q

Solutions for questions 2.01 to 2.05: P sits two seats to the left of R and Q sits two seats to the right of R. We can represent this information in the diagram below.

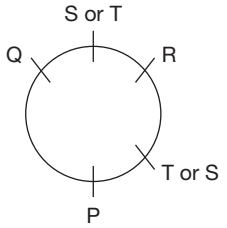


2.01: If S sits between Q and R, then the arrangement is as follows.



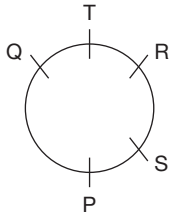
As can be seen from the diagram, T is to the immediate right of P.

2.02: We will take each choice and see whether it fits in the arrangement that we represented through a diagram in the analysis of the data (the same diagram is reproduced below).



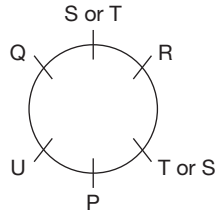
We can see that the arrangement given in choice (A) is not possible and hence, the answer choice is (A).

2.03: If S is not next to Q, then the seating arrangement is fixed as follows.



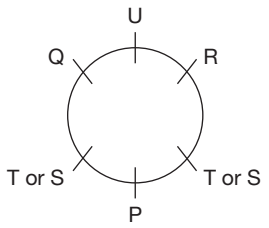
Now P is between Q and S.

2.04: On the basis of the diagram that we drew, we find that to accommodate U we have to create a new slot between P and Q.



Hence, choice (C) is the correct answer.

2.05: We create a new slot for the sixth person. But since U will not sit next to P, S or T, he will have to sit between R and Q. The arrangement will then look as follows:



As we can see from the diagram that the neighbours of P will be T and S.

Directions for questions 2.06 to 2.09: These questions are based on the following information.

There are 10 people at a round table conference, consisting of a Professor, a Lawyer, a Doctor, a Scientist, an Accountant, a Grocer, two Computer Specialists and two Marketing Executives. The Professor sits opposite to the Lawyer. The Scientist and the Doctor sits opposite to each other. The two Marketing Executives sit opposite to each other with one of them sitting to the immediate left of the scientist. The Professor sits to the immediate right of the Scientist.

2.06: If the two Computer Specialists sit opposite to each other but neither of them is immediately next to any Marketing Executive, who sits to the immediate right of the professor?
(A) Computer Specialist
(B) Marketing Executive
(C) Grocer
(D) Accountant

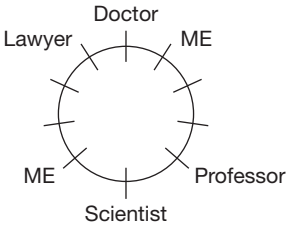
2.07: If the Grocer and Accountant do not sit opposite to each other, then which of the following must be TRUE?
(A) The Computer Specialist cannot sit beside the Lawyer.
(B) One of the Computer Specialists is next to a Marketing Executive.
(C) The Professor cannot have the Scientist and a Computer Specialist on his either side.
(D) The Computer Specialists must sit next to one another.

2.08: If a Computer Specialist is the immediate neighbour of a Marketing Executive and the Grocer is the immediate neighbour of the Lawyer, then how many different kinds of seating arrangements are possible? (Assume that the two Computer Specialists are indistinguishable from each other and the two Marketing Executives are indistinguishable from each other.)
(A) 3 (B) 6
(C) 16 (D) 8

2.09: The maximum number of persons you can count if you start counting with the Scientist and end with a Marketing Executive (excluding both) is
(A) 0 (B) 8
(C) 5 (D) 6

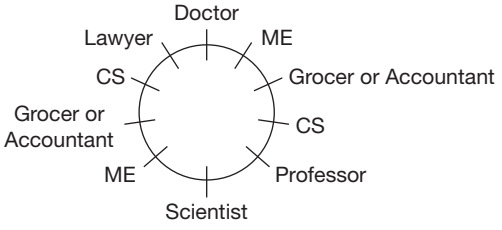
Solutions for questions 2.06 to 2.09: The Professor sits to the immediate right of the Scientist and opposite to the Lawyer. The Scientist sits opposite to the Doctor and one Marketing Executive is to the immediate left of the Scientist.

Choosing to place the Scientist in one of the 10 seats, we have the arrangement as follows.



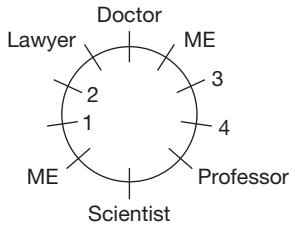
The vacant seats are one each for the two Computer Specialists, one for the Grocer and one for the Accountant.

2.06: The two Computer Specialists sit opposite to each other. Neither of them is next to any Marketing Executive. So, the arrangement must be as follows.



So, the Computer Specialist sits to the immediate right of the professor.

2.07: The Grocer and the Accountant do not sit opposite to each other. Then the arrangements can be as follows:

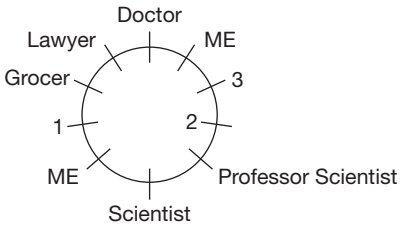


The Grocer and the Accountant can occupy the following pairs of seats: 3 and 4, 1 and 4, 1 and 2 or 2 and 3.

Then, the two computer specialists may occupy one of the pairs of seats 1 and 2, 2 and 3, 3 and 4 or 4 and 1.

We check for the choices given in the question, one by one, and find that whichever combination is taken, there is a Computer Specialist in Seat 1 or Seat 3, both of, which are next to the Marketing Executives seats. So, choice (B), which states that one of the Computer Specialists is next to a Marketing Executive is true.

2.08: Given that the Grocer is the immediate neighbour of the Lawyer, we have the three seats numbered 1, 2 and 3 (in the following diagram) free for the two Computer Specialists and the Accountant. Since a Computer Specialist has to be next to a Marketing Executive, he should be in Seat 1 or 3. By fixing the Accountant in any one of the three seats 1, 2 or 3, we can ensure that there is a Computer Specialist next to a Marketing Executive. Hence, there are three possible seating arrangements.



2.09: Based on the seating arrangement that we discussed, the number of persons between the Scientist and a Marketing Executive can be 3 or 8 (counted clockwise) or 0 or 5 (counted anti-clockwise). Maximum number that can be counted is 8.

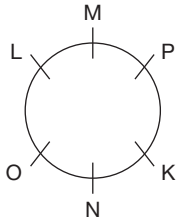
Directions for question 2.10: Select the correct alternative from the given choices.

2.10: Six people K, L, M, N, O and P are sitting around a table. K and L do not sit next to each other. O and P are opposite to each other. M is sitting to the immediate right of P. If K is not between O and M, then N is not next to P. Which of the following is not an arrangement (in clockwise direction) satisfying the conditions given above?

(A) NKOLMP (B) PKNOLM
(C) LNOKMP (D) KMPNLO

Solution for question 2.10:

2.10: O and P are opposite to each other. M is to the right of P. Then we have two possible arrangements. In one case, when K is between O and M, the other two seats can be occupied by N and L. So, we cannot uniquely determine the seats of L and N. In the second case, if K is not between O and M (then, L has to be between O and M), then N is not next to P. This means that K has to be next to P and the only seat left is for N which is to the right of O.



From the choices, we can clearly see that choice (A) is the correct answer because that arrangement is not possible.

EXERCISE-1

Directions for questions 1 to 9: Select the correct alternative from the given choices.

1. Six people from A through F are seated around a circular table. A is opposite to D, who is two places to the right of F. If B is adjacent to A, then who is seated between E and C?
(A) B (B) A
(C) D (D) F

2. Six delegates are seated around a rectangular table such that two delegates are seated along each of the longer sides and one along each of the shorter sides. Vaibhav is seated at one of the shorter sides. Neither Vasu nor Varun is seated at any shorter side. Only one person is seated between Vasu and Vijay. Vallabh is opposite to Vagdev. If Varun is to the immediate right of Vagdev, then who is opposite to Vasu?
(A) Vijay (B) Vaibhav
(C) Varun (D) Vallabh

3. A group of six people from P through U are seated around a circular table. Among them three are boys and three are girls. No two girls are seated in adjacent places. S is three places away to the left of U. Q is neither adjacent nor opposite to P. Which of the following may represent the group of boys?
(A) S, T, U (B) Q, P, R
(C) Q, R, T (D) S, T, R

4. At buffet, six sweets are arranged in a circular order on a table. Burfi is opposite to Kova. There is one sweet between Laddu and Kaju Katli. Gulab Jamoon is to the immediate right of Kova. Rasagulla is one of the sweets. Which sweet is two places away to the left of Gulab Jamoon?
(A) Laddu (B) Rasagulla
(C) Kaju katli (D) (A) or (B)

5. Six people from A through F are sitting around a circular table such that C is sitting to the right of E and F is to the right of A. If B is sitting to the left of D, and A and C are sitting adjacent to each other, then who is sitting opposite to D?
(A) A (B) B
(C) C (D) E

6. A group of six friends from P through U are sitting around a hexagonal table. S is sitting adjacent to T and Q. Q is sitting to the left of U and P is sitting to the right of R. Who is sitting opposite to R?
(A) T (B) Q
(C) S (D) U

7. A group of six people from A through F are sitting in a circular table such that A is sitting two places away to the left of E, who is not adjacent to C and F. D is to the right of E and A is sitting between B and F. Now, who is sitting opposite to D?
(A) A (B) B
(C) C (D) F

8. A group of eight boys, namely A, B, C, D, E, F, G and H sit around a circular table, not necessarily in the same order. B and D sit neither adjacent to C nor opposite to C. A sits in between E and D, and F sits in between B and H. Which of the following is definitely true?
(A) H sits in between C and E.
(B) B sits in between A and G.
(C) C sits opposite to G.
(D) None of these

9. P, Q, R, S, T and U are the six corners of a table which has six sides, not necessarily in the same order. A group of six people, namely A, B, C, D, E and F are sitting along the sides joining the corners, not necessarily in that order. S is to the right of P and R is to the left of T. A is sitting opposite to E and to the immediate right of F. D is sitting between the corners of P and T and is opposite to C. If F is sitting between R and U, then who sits between Q and S?
(A) A (B) E
(C) C (D) B

Directions for questions 10 to 12: These questions are based on the following information.

Sameer, Sameep, Sandeep, Sangeet, Sanskar and Saarang are sitting around a hexagonal table in a library studying a book each. The cover of the book in their hands is of different colours, such as Red, Green, Blue, Orange, White and Yellow not necessarily in that order. Further, it is known that Sameer sits opposite to Sameep, who sits to the immediate left of the person holding the Blue cover book, who sits two places away from the person holding the White cover book. Sangeet sits two places away from the person holding the Yellow cover book and sits opposite to the person holding the white cover book. Sandeep and Saarang sit next to each other.

10. What is the colour of the book with Sanskar?
(A) Yellow (B) White
(C) Blue (D) Red

11. If the person holding the Orange cover book sits opposite to the person holding the Red cover book, then which statement among the following cannot be true?
(A) Sanskar does not hold the White cover book.
(B) Sangeet is not holding a Green cover book.
(C) Saarang holds the Yellow cover book.
(D) Sandeep holds the Yellow cover book.

12. If Sandeep sits opposite to the person holding the Green cover book, then who is sitting opposite to the person holding the Red cover book?
(A) Sandeep (B) Sameer
(C) Sanskar (D) Cannot be determined

Directions for questions 13 and 14: These questions are based on the following information.

Among the seven people, namely Maggi, Cherry, Prachi, Toto, Saxena, Gaddar and Basanti, sitting around a circular table.

(i) Toto is adjacent to neither Prachi nor Basanti.
(ii) Maggi is two places away to the right of Saxena.
(iii) Cherry is adjacent to both Basanti and Saxena.
(iv) Gaddar is not adjacent to Basanti.

13. Who is sitting four places away to the left of Cherry?
(A) Gaddar (B) Maggi
(C) Toto (D) Prachi

14. In which of the following combination is the second person sitting two places away to the left of the first person?
(A) Gaddar, Cherry (B) Maggi, Prachi
(C) Saxena, Basanti (D) Both (B) and (C)

Directions for questions 15 to 17: These questions are based on the following information.

Eight people A, B, C, D, E, F, G, and H are sitting around a rectangular table not necessarily in the same order. One person sits along the shorter side and three persons sit along the longer side.

A and G are sitting diagonally opposite to each other. D and E are sitting opposite to each other.

A is sitting to the immediate left of F, who is sitting at one of the shorter sides of the table.

15. If C is sitting to the immediate right of H, then who is sitting opposite to F?
(A) B (B) C
(C) H (D) D

16. If C is sitting opposite to A, then who among the following must be sitting on the same side as C?
(A) G and E (B) G and D
(C) G (D) H or B

17. If H is not sitting at one of the shorter sides, then how many arrangements are possible?
(A) 24 (B) 8
(C) 4 (D) 16

Directions for questions 18 to 20: These questions are based on the following information.

Each of the six people, namely John, Ted, Humpty, Dumpty, Jack and Jill is from one different country among India, Japan, China, Australia, America and England and are sitting around a circular table, they may not be in the same order. John, who is from China is sitting adjacent to an American, who is not Humpty. Ted is not an Indian, and the Chinese is not sitting adjacent to the Indian. The person from England is sitting one place away to the left of the Australian. Humpty is sitting opposite to the Indian, who is adjacent to the Japanese. The Australian and Dumpty are sitting opposite to each other. Jack is not from India and Ted is not from Japan and both are not adjacent to each other.

18. Who among them is from India?
(A) Jill (B) Dumpty
(C) Humpty (D) None of these

19. If Jack is the Japanese, then who is sitting opposite to the American?
(A) Jill (B) Ted
(C) Jack (D) Dumpty

20. To which country does, Humpty belong?
(A) Japan (B) Australia
(C) America (D) England

Directions for questions 21 to 23: These questions are based on the following information.

Eight friends, A through H are sitting around a circular table, playing a game of cards. They belong to two different teams X and Y. No two persons of the same team sit in adjacent seats.

(i) A sits neither opposite to D nor to H but is sitting in between C and G.
(ii) B sits neither opposite to A nor to G but is sitting in between F and D.
(iii) B and H belong to team X and D sits opposite to E.
(iv) A scored two points more than D, who scored three points more than F, who scored four points more than E. B scored twice as that of G, who scored twice that of C, who scored twice that of H.

21. Who are the members of team X?
(A) A, D, F and E (B) B, H, C and E
(C) B, D, H and G (D) B, H, C and G

22. If E and H scored one point each, then which team wins the game, given that the team with the minimum points wins the game?
(A) Team X
(B) Team Y
(C) Both teams scored the same points
(D) Cannot be determined

23. If team Y scores 92 points and team X scores 90 points, then which among the following is definitely true?
(A) H and D scores equal points.
(B) B scores twice as many points as F.
(C) A scores three points less than G.
(D) D scores one point more than G.

Directions for questions 24 to 26: These questions are based on the following information.

Eight people from A through H are sitting around a circular table, not necessarily in the same order. The following information is known about them.

(i) If C and F interchange their places, then each of them will have only one new neighbour.
(ii) H is sitting two places away to the left of A.
(iii) Two persons are sitting between C and G.
(iv) The one, who is adjacent to both C and F is not B. B is sitting opposite to G.

24. If A is not sitting adjacent to B, then who will be sitting three places away to the right of F?
(A) E (B) B
(C) D (D) Cannot be determined

25. If C is to the immediate left of E, then who will be sitting opposite to H?
(A) C (B) D
(C) F (D) Either (B) or (C)

26. If A is sitting between G and D, then who is sitting two places away to the right of B?
(A) A (B) F
(C) E (D) D

Directions for questions 27 to 29: These questions are based on the following information.

12 erasers named A through L are placed at a different hour division of a clock. B is at 7th hour division, E is opposite to K. L is at 60° from A. K is to the immediate left of H. H is at 90° from C which is 60° from D. F is at 11th hour division which is adjacent to K and J. G is at 30° from I.

27. What is the angle between E and H?
(A) 135° (B) 150°
(C) 120° (D) 170°

28. If A is at 5th hour division, then which is placed at 3rd hour division?
(A) L (B) G
(C) I (D) Cannot be determined

29. Which is opposite to G?
(A) C (B) D
(C) B (D) Cannot be determined

Directions for questions 30 to 33: These questions are based on the following information.

Among seven people, namely Tanuja, Divya and Vasudha are females and Srikanth, Ganesh, Sateesh and Appu are males and they are sitting around a circular table, but not necessarily in the same order. The following information is known about their seating.

No two females are adjacent to each other. Ganesh and Appu are not adjacent to each other. Srikanth is sitting to the immediate left of Vasudha, who is third to the left of Appu. Tanuja is not adjacent to Sateesh. Appu and Sateesh are adjacent to each other. All are facing the centre.

30. Who is sitting second to the right of Appu?
(A) Divya (B) Tanuja
(C) Srikanth (D) Ganesh

31. Who is sitting adjacent to Vasudha?
(A) Sateesh (B) Appu
(C) Divya (D) Ganesh

32. In a certain way, Vasudha is related to Divya. Sateesh is related to whom in the same way?
(A) Srikanth (B) Ganesh
(C) Tanuja (D) Appu

33. Three out of the following four follow a particular pattern and so form a group. Find the one which does not belong to the group.
(A) Appu, Divya (B) Vasudha, Ganesh
(C) Divya, Vasudha (D) Vasudha, Tanuja

Directions for questions 34 to 37: These questions are based on the following information.

A group of 12 people, from M through X are sitting around a circular table, but not necessarily in that order.

Starting from P in clockwise direction, O, V, W, N and Q are sitting in that order. Further, starting from P in anticlockwise direction, M, T, R, S, U and X are sitting in that order. Also, M is between P and Q, T is between Q and N, R is between N and W, S is between W and V and U is between V and O.

34. Who is sitting adjacent to both V and W?
(A) U (B) R
(C) S (D) Cannot be determined

35. Who is sitting opposite to R?
(A) O (B) P
(C) X (D) Cannot be determined

36. How many people sit between T and V when counted from the clockwise direction with respect to T?
(A) Five (B) Six
(C) Four (D) Cannot be determined

37. If all the persons are facing away from the centre, then who sits third to the left of R?
(A) V (B) Q
(C) U (D) Cannot be determined

Directions for questions 38 to 40: These questions are based on the following information.

There are two circular tables in a room. Six Russians, namely A, B, C, D, E and F are sitting at one table and six Frenchmen, such as M, N, O, P, Q and R are sitting at the other table. A and D are sitting opposite to each other. B and

E are sitting opposite to each other. C sits to the right of D. B is the only person who can translate Russian to French; C is the only person who can translate French to Russian, and none of them does the vice-versa, unless so stated. E and F sit adjacent to each other. Also, M sits opposite to P; Q sits to the right of R and R sits opposite to O. N and P sit adjacent to O. On the table, any person can talk to another person, only as stated below. The only conversations that took place are as given below:

A spoke to B; B to R; R to C; R to Q; Q to P; P to O; O to N; N to M; C to D; D to E; F to A; M to R; and E to F.

The conversations are one-sided, i.e., A spoke to B implies that A is the speaker and B is the listener and not vice-versa.

38. If C wants to send a message to M, then how many people must the message pass through? (excluding the first and the last)

(A) 1 (B) 6
(C) 10 (D) None of these

39. If the order of conveying messages is reversed at both the tables (i.e., 'A speaks to B' now becomes 'B speaks to A' and so on) and also B and C exchange their interpretory skills, then which of the following will be true?

(A) A can send a message to Q involving only 2 people.
(B) The person sitting to the right of F can send a message to the person sitting to the left of N, by involving only five people.
(C) The person sitting to the right of C, on the same table, can translate Russian into French.
(D) The maximum number of people involved in the longest message in this new arrangement is more than that in the previous arrangement.

40. If the person sitting to the right of B wants to send a message to the person sitting two places to the left of D, then what is the maximum possible number of people involved between them? (excluding the two people)

(A) 11 (B) 10
(C) 4 (D) None of these

EXERCISE-2

Directions for questions 1 to 5: These questions are based on the following information:

Six sofas of different colours are arranged in a circular order. On each sofa, a boy among O, P, Q, R, S and T and a girl among U, V, W, X, Y and Z are sitting.

(i) The red coloured sofa is in between the yellow coloured sofa and blue coloured sofa.
(ii) X is sitting on white sofa, which is opposite to the sofa where Z is sitting.
(iii) The orange coloured sofa is adjacent to the sofa where both O and V are sitting.
(iv) The sofa, where W is sitting is adjacent to the blue and pink coloured sofas.
(v) P is to the left of S, who is opposite to Y.

1. Who among the following is sitting on the sofa which is opposite to the pink coloured sofa?

(A) S (B) X
(C) Y (D) U

2. Who are sitting on the blue coloured sofa?

(A) Z, P (B) W, S
(C) O, V (D) T, Z

3. What is the colour of the sofa which is opposite to the sofa where Y is sitting?

(A) Yellow (B) Orange
(C) White (D) Blue

4. Which of the following represents the people sitting on the same sofa?

(A) Z, Q (B) W, P
(C) X, T (D) W, S

5. Which of the following represents the correct order of the colours of the sofas?

(A) Pink, Orange, Blue, Red, White, Yellow
(B) Pink, Blue, Red, Yellow, Orange, White
(C) Red, Blue, Orange, Pink, White, Yellow
(D) Pink, Orange, Yellow, Red, Blue, White

Directions for questions 6 to 9: These questions are based on the following information.

Seven children of a family are seated around a circular table to have their lunch. No two children finish their lunch at the same time and no two adjacent children finish their lunch immediately one after the other.

(i) Sujatha finishes her lunch immediately before Bhuvan finishes his lunch. Bhuvan is to the immediate left of Srilatha.
(ii) Pranav is three places away to the left of Anand but finishes his lunch after Anand finishes his lunch.
(iii) Krupa is to the immediate left of the child who finishes his/her lunch before two children.
(iv) Kruti finishes her lunch immediately after Bhuvan finished his lunch but not after Pranav finished his lunch.
(v) The number of children who finish their lunch before Srilatha finishes her lunch is same as the numbers of children who finish their lunch after.

6. How many children finish their lunch before Pranav finishes his lunch?
(A) 1 (B) 2
(C) 4 (D) 5

7. Who finishes his/her lunch immediately after Kruti finishes his lunch?
(A) Bhuvan (B) Krupa
(C) Sujatha (D) Srilatha

8. Who is to the immediate right of Pranav?
(A) Sujatha (B) Kruti
(C) Krupa (D) Srilatha

9. Which of the following represents the seating order?
(A) Anand, Sujatha, Pranav, Srilatha, Bhuvan, Kruti, Krupa
(B) Anand, Kruti, Sujatha, Pranav, Krupa, Srilatha, Bhuvan
(C) Anand, Krupa, Kruti, Pranav, Sujatha, Srilatha, Bhuvan
(D) Anand, Krupa, Bhuvan, Srilatha, Pranav, Sujatha, Kruti

Directions for questions 10 to 12: These questions are based on the following information.

A group of six boys, namely Prasad, Prakash, Prashant, Pranay, Praveen and Prabhat each wearing a T-shirt of a different colour, such as Indigo, Green, Blue, Orange, Violet and Yellow are sitting around a table in six equi-spaced chairs. Prakash is opposite to the boy wearing the Orange T-Shirt. Prabhat is opposite to the boy wearing the Green T-Shirt. Prashant is to the right of the boy wearing the Indigo T-Shirt and opposite to the boy wearing the Violet T-Shirt. Praveen is between the boys wearing Orange and Yellow T-Shirts and is not wearing the Violet T-Shirt. Pranay is opposite to the boy who is wearing the Yellow T-Shirt.

10. Which of the following statements is true?
I. The boys wearing Green and Orange T-Shirts are either next to each other or opposite to each other.
II. The boys wearing Indigo and Orange T-Shirts are either next to each other or opposite to each other.
III. The boys wearing Blue and Violet T-Shirts are always next to each other.
IV. The boys wearing Blue and Indigo T-Shirts are either opposite to each other or are next to each other.
(A) Only I and II (B) Only III
(C) Only III and IV (D) I, II, III and IV

11. If Prabhat is wearing the Orange T-Shirt, then who is wearing the Green T-Shirt?
(A) Prasad (B) Prakash
(C) Praveen (D) Pranay

12. If Prashant is wearing the Orange T-Shirt, then who is between Praveen and Pranay?
(A) Prashant (B) Prasad
(C) Prakash (D) Prabhat

Directions for questions 13 to 15: These questions are based on the following information.

Eight people, namely Ram, Ramesh, Mohan, Sohan, Seema, Saroj, Sakshi and Saloni are sitting around a circular table. Each of them is from different professions, such as Doctor, Engineer, Dancer, Singer, Teacher, Lawyer, Accountant and Pilot, not necessarily in the given order. Further it is known that

I. Pilot is sitting opposite to Ramesh, who is adjacent to the Accountant.
II. Dancer is sitting opposite to the Lawyer and is not adjacent to Sakshi who is not sitting adjacent to the Lawyer.
III. Saloni is sitting opposite to the Engineer, Ramesh is not a Lawyer or Doctor or Engineer.
IV. Sakshi, the Singer, is sitting one place away to the right of Saroj.
V. Seema is sitting opposite to the Lawyer and Ram is sitting opposite to the Dancer.
VI. Ramesh is sitting three places to the right of Singer. Mohan is neither the Accountant nor adjacent to the Dancer.

13. Who is the Doctor?
(A) Ramesh (B) Saloni
(C) Saroj (D) Cannot be determined

14. What is the profession of Mohan?
(A) Accountant (B) Pilot
(C) Engineer (D) Cannot be determined

15. Who is sitting opposite to Ramesh?
(A) Seema (B) Sakshi
(C) Saroj (D) None of these

Directions for questions 16 to 18: These questions are based on the following information.

Each of the eight boys from A through H has a different fruit with them and are seated around a square table such that two boys are seated along each side. The following information is known about the seating arrangement.

(i) G, who has Watermelon is four places away to the right of B. F is opposite to the boy who has Banana.
(ii) The boy who has Grapes and the boy who has Kiwi are on the same side of the table. C is to the immediate left of B but is not along the same side.
(iii) The boy who has Orange and the boy who has Guava are seated at opposite sides.
(iv) E has Litchi and H has Grapes. There are three boys between E and H.

(v) The boy who has Watermelon is to the immediate right of the boy who has Mango and is to the immediate left of F.

16. If A has Orange, then who will be sitting at the side which is opposite to the side where C is sitting?
(A) D (B) A
(C) H (D) F

17. Who is three places away to the left of F?
(A) A (B) E
(C) G (D) B

18. Which of the following is a correct combination of boy and the fruit that he has?
(A) C-Kiwi (B) G-Mango
(C) F-Orange (D) B-Watermelon

Directions for questions 19 to 21: These questions are based on the following information.

Eight people A, B, C, D, E, F, G and H are sitting around a square table, but not necessarily in that order. The people who are sitting at the corners, face the centre and the people who are sitting at the sides face away from the centre. Each of them likes a different colour among red, blue, green, yellow, pink, black, white and violet. The following information is known about their seating.

(i) B sits second to the left of the person who likes blue.
(ii) The person who likes violet sits at the corner, who is adjacent to both G and the person who likes blue.
(iii) A sit second to the right of the person who likes yellow and is not adjacent to G.
(iv) C sits adjacent to the person who likes yellow.
(v) C likes neither violet nor blue. The person who likes pink is adjacent to neither A nor B.
(vi) E sits to the immediate right of the person who likes pink.
(vii) F is not adjacent to the person who likes black.
(viii) The person who likes black sits at one of the sides.
(ix) D likes white.
(x) H does not like black.

19. Who likes red?
(A) C (B) E
(C) F (D) Cannot be determined

20. Who sits third to the right of F?
(A) H (B) C
(C) G (D) Cannot be determined

21. Three of the following four are alike in a certain way, based on the given information and so form a group. Find the one which does not belong to that group.
(A) The person who likes green.
(B) The person who likes violet.
(C) The person who likes yellow.
(D) The person who likes red.

Directions for questions 22 to 24: These questions are based on the following information.

Eight people, namely Anand, Brijesh, Chandak, Dweepesh, Sayan, Jagat Rupak and Palak are sitting around a square table such that two people are sitting along each side. The following information is known about them.

(i) Jagat, who is sitting to the immediate right of Rupak is sitting opposite to Chandak who is sitting to the immediate right of Brijesh.
(ii) Sayan is sitting opposite to Dweepesh, who sits along the same side as Brijesh.
(iii) Palak is not sitting along the same side as Sayan.

22. Who is sitting along the same side as Chandak?
(A) Anand (B) Palak
(C) Sayan (D) Rupak

23. Who is sitting opposite to Rupak?
(A) Palak (B) Anand
(C) Brijesh (D) Data inadequate

24. Who is sitting to the immediate right of Sayan?
(A) Anand (B) Rupak
(C) Chandak (D) Data inadequate

Directions for questions 25 to 27: These questions are based on the following information.

Eight people from P through W are sitting around a rectangular table, each of them facing the centre but not necessarily in that order. Three people sit along each of the longer sides of the table and one person sits along each of the shorter sides.

(i) If Q and S interchange their positions, then V sits to the immediate left of S.
(ii) If P and T interchange their positions, then R sits opposite to T.
(iii) If Q and U interchange their positions, then W sits third to the right of U.
(iv) P sits third to the left of Q, who sits at the longer side of the table.
(v) If W and S interchange their positions, then S sits third to the left of T.
(vi) U and S sit opposite to each other.

25. Who sits opposite to V?
(A) S (B) W
(C) N (D) Cannot be determined

26. Who among the following sit along the longer side of the table?
(A) Q, R, V (B) S, U, P
(C) Q, R, W (D) Cannot be determined

27. Who sits second to the left of S?
(A) Q (B) T
(C) U (D) Cannot be determined

Directions for questions 28 to 32: These questions are based on the following information.

Eight members of a family A through H are sitting around a circular table.

The following information is known about them:

(i) There are three married couples in the family.
(ii) One of A's sons is sitting opposite him while the other is adjacent to him.
(iii) H's sister-in-law is B, who is sitting to the immediate right of H's father-in-law.
(iv) The number of females in the family is less than the number of males in the family.
(v) Two of the married couples have two children each.
(vi) C, who is the eldest male in the family is sitting third to the left of his wife.
(vii) F, the youngest is not G's son and is sitting adjacent to H.
(viii) H is the aunt of E, who is sitting three places away from G.

28. Who is C's son?
(A) A (B) E
(C) D (D) None of the above

29. How is A's brother-in-law's nephew's grandmother related to B?
(A) Mother (B) Sister
(C) Niece (D) Aunt

30. What is the position of E's father with respect to C's daughter-in-law?
(A) Immediate left (B) Opposite to each other
(C) Second to the right (D) Second to the left

31. Based on information given three of the following four are similar in a certain way and, hence, form a group. Find the one that does not belong to the group.
(A) E (B) G
(C) F (D) B

32. How is F related to the person sitting third to the left of him?
(A) Son (B) Father
(C) Brother (D) Grandson

Directions for questions 33 to 36: These questions are based on the following information.

Eight people from A through H sit around a circular table, but not necessarily in that order. Some are facing the centre and the remaining are facing away from the centre. The following information is known about their seating.

(i) B sits third to the right of G.
(ii) There are two people sitting between G and A.
(iii) C sits second to the left of A.
(iv) C and G face the same direction.
(v) D sits third to the left of the person who is adjacent to C.
(vi) E sits third to the right of D, both of them face the same direction.
(vii) F faces E.
(viii) B and H face different directions.

33. How many people face the centre?
(A) 4 (B) 3
(C) 5 (D) Cannot be determined

34. If B faces the centre, then who sits third to the left of H?
(A) D (B) C
(C) G (D) E

35. If H and A face the same direction, then who sits second to the right of B?
(A) D (B) A
(C) G (D) H

36. Who sits to the immediate right of B?
(A) F (B) H
(C) D (D) Cannot be determined

Directions for questions 37 to 40: The following questions are based on the information given below:

Eight people, namely G, H, I, J, K, L, M and N are sitting around a square table. Some of them are facing the centre and others are facing away from the centre.

(i) I is sitting at one of the corners and is facing away from the centre.
(ii) Neither J nor M is a neighbour of I.
(iii) The neighbours of I face the same direction as I.
(iv) L and M face the same direction and sit opposite to each other.
(v) H is to the immediate right of M and G is to the immediate left of I.
(vi) J and K are neighbours of N and face different directions.
(vii) N sits opposite to I and faces the centre.
(viii) M and K are facing different directions and K is to the immediate right of N.

37. How many people are facing away from the centre?
(A) Five (B) Four
(C) Two (D) Three

38. Three of the four are alike in a certain way and so form a group. Which is the one that does not belong to that group?
(A) JH (B) NI
(C) MK (D) MN

39. Who is sitting to the immediate right of H?
(A) M (B) G
(C) I (D) K

40. Who is sitting in the opposite position of G?
(A) H (B) M
(C) K (D) J

EXERCISE-3

Directions for questions 1 to 3: These questions are based on the following information.

A group of eight people, namely A, B, C, D, E, F, G and H from eight cities, such as P, Q, R, S, T, U, V and W not necessarily in the same order are sitting around a circular table. We know the following additional information.

(1) Among A, E, G and F, no two people are adjacent to each other.
(2) Among the people from P, T, V and W, no two people are opposite to each other.
(3) A is to the immediate left of B, who is two places away to the right of the person from Q.
(4) The person from S is opposite to D, who is adjacent to E.
(5) The person from P is to the immediate left of G, who is from T.
(6) C, who is from W, is adjacent to the people from R and V.

1. Who is from R?
(A) A (B) B
(C) E (D) F

2. Who is to the immediate right of H?
(A) G (B) E
(C) A (D) Cannot be determined

3. Who is opposite to the person from V?
(A) A (B) G
(C) F (D) Cannot be determined

Directions for questions 4 to 6: These questions are based on the following data.

Eight chairs are arranged in a room. Four of them are exactly at the four corners while the remaining four are placed against the walls on the four sides in between each pair of chairs. In the corners P, Q, R and S are four boys and A, B, C and D are four girls who occupy the chairs all of which are facing the centre of the room. Q is in a corner chair and R is in a chair which is not along the same wall as either of the walls are adjoining Q. A and C are seated at corners, which is diagonally opposite to each other. B does not sit along any wall which is adjacent to the corner where A sits and is opposite to P. C sits to the immediate right of R, who is between C and D.

4. S must be seated between
(A) C and Q (B) A and D
(C) A and Q (D) C and A

5. If S and P interchange their seats, then who is to the immediate left of D?
(A) A (B) P
(C) R or C (D) S

6. Which of the following is not one of the correct arrangements of the corner seat occupants, either in clockwise direction or in anti-clockwise direction consecutively?
(A) Q, A, D and C (B) A, Q, C and D
(C) D, A, Q and C (D) D, Q, A and C

Directions for questions 7 to 9: These questions are based on the following data.

Four teachers Ranjan, Rajan, Raman and Raj, and four doctors Puneet, Piyush, Pratham and Pratima are sitting around a table. No two teachers sit adjacent to each other. Raj is two places to the right of Ranjan and adjacent to Pratima, who is two places to the left of Puneet, who is adjacent to Rajan.

7. If Raman is not opposite Ranjan, then who is seated two places to the left of Ranjan?
(A) Raman (B) Rajan
(C) Raj (D) Cannot be determined

8. If Pratima is adjacent to Raman, then who is seated opposite to Raj?
(A) Pratima (B) Raman
(C) Rajan (D) Ranjan

9. If Pratham is not opposite to Puneet, then who is seated opposite to Pratima?
(A) Puneet (B) Pratham
(C) Raman (D) Cannot be determined

Directions for questions 10 to 12: These questions are based on the following data.

A group of six people, namely Amit, Amitabh, Arnold, Aakash, Abhinav and Atul, each from a different profession, such as Doctor, Lawyer, Teacher, Manager, Business Analyst and Accountant, are seated around a table in six equi-spaced chairs. Atul is opposite to the Lawyer. Arnold is to the right of the Doctor and is opposite to the person who is the Business Analyst. Aakash is opposite to the Accountant. Abhinav is between the Manager and the Accountant and is not the Business Analyst. Amitabh is opposite to the Manager, who is to the left of Aakash.

10. Who is between the Lawyer and the Business Analyst?
(A) Amit (B) Amitabh
(C) Aakash (D) Cannot be determined

11. If Atul is not the Teacher, then who is the Doctor?
(A) Abhinav (B) Amitabh
(C) Akash (D) Amit

12. If Amitabh is the Business Analyst, then who is opposite to Amitabh?
(A) Amit (B) Atul
(C) Arnold (D) Cannot be determined

Directions for questions 13 to 15: These questions are based on the following data.

A librarian wishes to sit at the centre of his circular library hall with eight shelves arranged around him in a circle. There are books on eight subjects English, Physics, Sociology, Chemistry, Mathematics, French, German and History which are placed in the shelves, the books of one subject is only in one shelf. The books on French, German and English should be in three shelves placed side by side. The books on History should be in a shelf opposite to the shelf containing French books. The books on Physics and those on Chemistry should be in the shelves opposite to each other.

13. If the books on German are opposite to the shelf which has Mathematics books, and between the shelves containing books on Physics and French, then which of the following should be opposite to each other?
(A) English and Sociology shelves
(B) English and Physics books
(C) English and History books
(D) Sociology and Mathematics books

14. If the books on Sociology are between the shelves with Physics and History books, then the books on Mathematics would be between the shelves containing books on
(A) History and French
(B) History and Chemistry
(C) French and Chemistry
(D) French and Physics

15. If the English books are to the immediate left of the shelf with Physics books, then the shelf with German books is to the immediate right of shelf containing books of which subject?
(A) Only Physics (B) Chemistry or French
(C) Only French (D) French or German

Directions for questions 16 to 18: These questions are based on the following information.

A group of eight people, namely K, L, M, N, O, P, Q, and R sit around a circular table not necessarily in the same order. Some of them are facing the centre and the remaining are facing away from the centre.
(i) P sits to the immediate left of K.
(ii) M and R are sitting in the opposite places.
(iii) Either 'Q' or 'O' sits next to L but not both.
(iv) No two people are sitting next to each other facing the same direction.
(v) R is the neighbour of both N and Q.
(vi) L sits opposite to K and faces away from the centre.

16. Three of the following are alike in a certain way and so form a group. Which is the one that does not belong to that group?
(A) KM (B) ML
(C) NO (D) PO

17. Which among the following is 'definitely true'?
(A) P is facing away from the centre.
(B) O and N are opposite to each other.
(C) K sits to the immediate right of P.
(D) L sits to the immediate right of O.

18. If M and N interchange their places, then who among the following sits to the immediate left of M?
(A) O (B) P
(C) L (D) None of these

Directions for questions 19 to 21: These questions are based on the following information.

A group of eight people from the same family sit around a rectangular table in such a way that four people, namely A, B, C and D sit along one of the longer sides of the table, facing north and the other four people, namely P, Q, R and S sit along the other longer side of the table facing south, not necessarily in that order. Each person faces exactly one person who sits on the opposite side. The following information is known about them.

P is the brother of Q, who is not adjacent to either P or S. A is the daughter of P and sits to the immediate right of B's husband. D is opposite to neither P nor S. C is the niece of P but is not opposite to either P or S. B is not opposite to S but to opposite her brother. D has only one child who is a male. Q is the daughter of C's grandfather, who is not R.

19. Who is to the immediate right of P?
(A) R's father (B) P's sister
(C) D's father-in-law (D) R

20. Which of the following person sits at an end?
(A) A (B) R
(C) Q's daughter (D) B's father

21. Which of the following statements is true?
(A) Q is at the left end (B) B is at the right end
(C) R is the brother of A (D) All the above

Directions for questions 22 to 25: These questions are based on the following information.

A group of eight people, namely P, Q, R, S, T, U, V, and W belong to the same family and they sit around a circular table facing the centre (not necessarily in the same order). The following information is known about them.
(1) P sits second to the right of his nephew, whose neighbours are females.
(2) V is the wife of P and sits to the immediate right of her daughter T.
(3) U sits second to the right of his brother-in-law and opposite to his son Q.
(4) S sits third to the right of her sister-in-law and second to the left of her father R.
(5) W is the mother-in-law of U and is adjacent to her grandson.

22. Who among the following is the wife of U?
(A) S
(B) The one who is opposite to T.
(C) The one who sits second to the right of R.
(D) Both (A) and (B)

23. Who among the following is the niece of S?
(A) The one who sits opposite to S.
(B) The one who sits to the immediate right of S's husband.
(C) T
(D) All the above

24. Which among the following is 'definitely true'?
(A) R and V sit adjacent to each other.
(B) T and her mother sit opposite to each other.
(C) W sits third to the right of her son.
(D) None of these

25. Four of the following are alike in a certain way, and hence form a group. Which is the one that does not belong to that group?
(A) TU (B) RS
(C) VW (D) QT

ANSWER KEYS

Exercise-1

1. (C)	8. (D)	15. (C)	22. (A)	29. (D)	36. (B)
2. (C)	9. (B)	16. (C)	23. (D)	30. (A)	37. (A)
3. (D)	10. (C)	17. (B)	24. (B)	31. (D)	38. (C)
4. (B)	11. (B)	18. (B)	25. (A)	32. (C)	39. (B)
5. (A)	12. (D)	19. (A)	26. (D)	33. (B)	40. (B)
6. (C)	13. (B)	20. (B)	27. (B)	34. (C)	
7. (A)	14. (C)	21. (D)	28. (A)	35. (C)	

Exercise-2

1. (D)	8. (B)	15. (C)	22. (B)	29. (A)	36. (D)
2. (A)	9. (C)	16. (A)	23. (A)	30. (C)	37. (B)
3. (B)	10. (D)	17. (B)	24. (B)	31. (D)	38. (D)
4. (D)	11. (B)	18. (A)	25. (B)	32. (C)	39. (A)
5. (C)	12. (A)	19. (D)	26. (B)	33. (C)	40. (C)
6. (D)	13. (B)	20. (B)	27. (D)	34. (A)	
7. (D)	14. (C)	21. (C)	28. (D)	35. (B)	

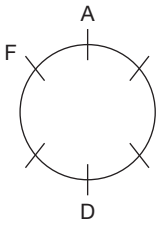
Exercise-3

1. (D)	5. (D)	9. (B)	13. (A)	17. (D)	21. (B)	25. (C)
2. (C)	6. (D)	10. (A)	14. (B)	18. (C)	22. (D)	
3. (A)	7. (A)	11. (A)	15. (B)	19. (C)	23. (D)	
4. (C)	8. (C)	12. (C)	16. (D)	20. (C)	24. (D)	

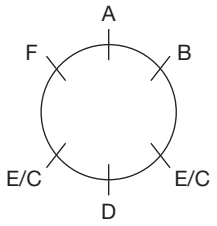
SOLUTIONS

EXERCISE-1

1. A is opposite to D, who is two places away to the right of F.

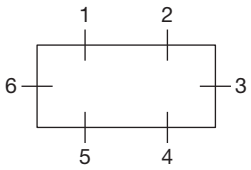


B is adjacent to A. The arrangement will be as follows.

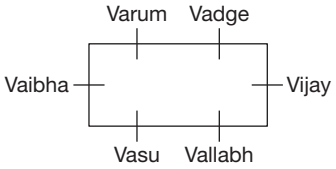


∴ D is in between E and C.

2. The group of six people are seated as follows:

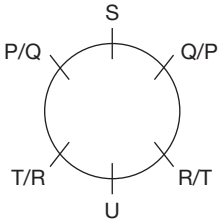


Let Vaibhav be seated at 6. Neither Vasu nor Varun is placed at 3.
Vallabh is opposite Vagdev.
∴ Neither Vagdev nor Vallabh is placed at 3. Vinay is at 3.
Varun is to the immediate right of Vagdev. So, the arrangement will be as follows.

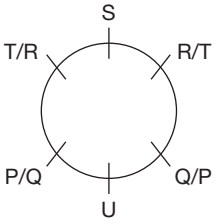


∴ Varun is opposite to Vasu.

3. As, S is 3 places away to the left of U,
S and U are opposite to each other. Given that Q is neither adjacent nor opposite to P.
∴ The following arrangements are possible.
Case – (i):

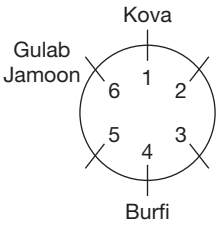


Case – (ii):



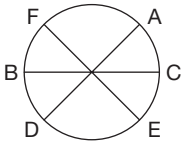
Case-(i):
∴ P, Q and U are of the same gender.
S, R and T are of the same gender.
Case-(ii):
S, P and Q are of the same gender.
U, R and T are of the same gender.

4. Burfi is opposite to Kova, which is to the immediate left of Gulab Jamoon. Hence, the following arrangement is possible.



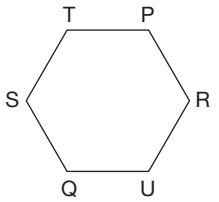
There is one sweet between Laddu and Kaju Katli.
∴ Laddu and KajuKatli are at 3 and 5 in any order and Rasagulla is at 2.
Rasagulla is two places away to the left of Gulab Jamoon.

5. According to the given information, the possible arrangement is as follows.



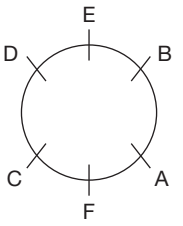
∴ A is sitting opposite to D.

6. The final arrangement is as follows.



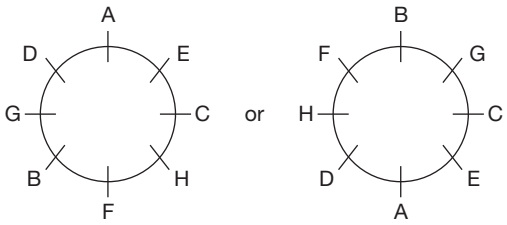
∴ S is sitting opposite to R.

7. It is given that A is two places away to the left of E, who is adjacent to B and D. D is to the right of E and A is setting between B and F. These conditions give us the following arrangement.



∴ A is sitting opposite to D.

8. It is given that A sits in between E and D, and F sits in between B and H.
It is also given that B and D sit neither adjacent to C nor opposite to C.



Hence, none of the choices is definitely true.

9. Given:

(i) Six corners (of a hexagonal table) P, Q, R, S, T and U.

(ii) Six people – A, B, C, D, E and F

(iii) $\xrightarrow[P]{\text{Right}}$ S; R $\xrightarrow[T]{\text{Left of}}$

(iv) E
↕ opp
F → A
(A is to the immediate right of F)

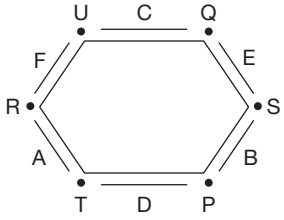
(v) D is sitting between the corners of P and T.
T/P _D_ T/P

(vi) D $\xleftarrow{\text{opp}}$ C

(vii) R/U _F_ U/R

Now, let us try to make an arrangement with the given information.

Clearly, E sits between the corners of Q and S.



Solutions for questions 10 to 12: Let us write the data as shown below:

(i) 6 people – Sameer (Smr), Sameep (Smp), Sandeep (Snd), Sangeet (Sgt), Sanskar (Skr) and Saarang (Srg) are sitting around a hexagonal table.

(ii) Colour of the books in their hands – Red, Green, Blue, Orange, White and Yellow.

(iii) Sameer $\xleftarrow{\text{opp}}$ Sameep

(iv) Sameep $\xleftarrow[\text{Left}]{\text{Immediate}}$ Blue

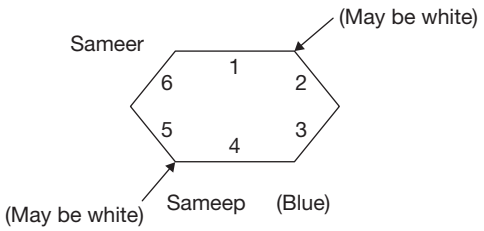
(v) Blue _____ _____ White (2 places away)

(vi) Sangeet _____ _____ Yellow (2 places away)

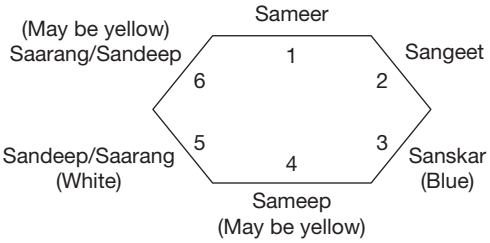
(vii) Sangeet is opposite to White.

(viii) Sandeep is adjacent to Saarang.

Based on (iii), (iv) and (v), we get the following arrangements:

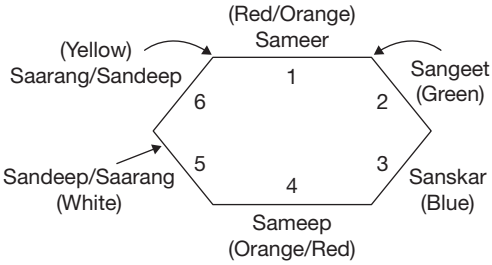


But from (vii), we get that Sangeet is opposite to White; in that case Sameer cannot have White coloured book in his hand, as he is opposite to Sandeep, not Sangeet. Hence, the person holding White coloured book must be to the immediate left of Sameep, i.e., at 5. Then Sangeet is opposite to White and to the left of Sameer, at 2. Now as Sandeep and Saarang are adjacent, hence, they must be accommodated at seat numbers 5 and 6, in any order. Then the only seat left for Sanskar is 3. Now, we get the following arrangement:



10. Hence, Sanskar holds the Blue cover book in his hand.

11. In the above figure, if the person sitting at 4 (i.e., Sameep) holds Yellow cover book, then the Red and Orange coloured books cannot be opposite to each other. Hence, the person sitting at 6 (i.e., either Saarang or Sandeep) must have Yellow cover book and Sameer and Sameep will have Red cover and Orange cover book in any order. Then, we get the following arrangement.

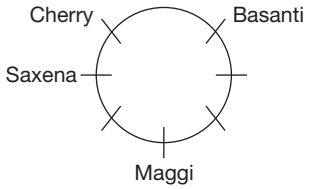


Hence, Sangeet must have Green book.

∴ Choice (B) is the only one that is definitely false.

12. Sandeep is sitting opposite to the person holding the Green cover book which implies that Sandeep is sitting opposite to Sangeet. Thus, either Sameer or Sandeep holds the Red cover book. Hence, it cannot be determined.

Solutions for questions 13 and 14: From (ii) and (iii), the arrangement of the persons can be represented as follows.

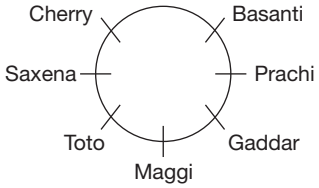


From (i) and (iv), neither Toto nor Gaddar is adjacent to Basanti.

∴ Prachi must be adjacent to Basanti.

As Toto is not adjacent to Prachi, Gaddar must be adjacent to Prachi.

The final arrangement of the person can be represented as follows.

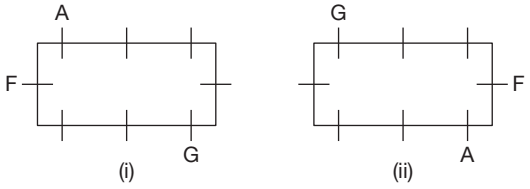


13. Maggi is sitting four places away to the left of Cherry.

14. Choice (C) is the correct representation.

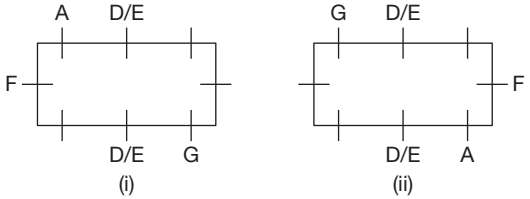
Solutions for questions 15 to 17: It is given that eight people, namely A, B, C, D, E, F, G and H are sitting around a rectangular table. One sits along the shorter side and three sits along the longer side.

A and G are sitting diagonally opposite to each other and A is sitting to the immediate left of F.

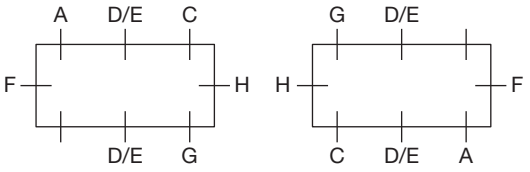


F is sitting along the shorter side.

D and E are sitting opposite each other, which is as follows.

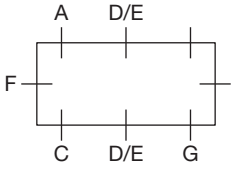


15. If C is sitting to the immediate right of H:



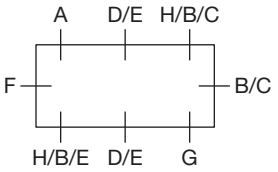
H sits opposite to F.

16. If C is sitting opposite to A, then the arrangement is as follows:



So, G sits on the same side as C.

17. If H is not sitting at one of the shorter sides, then the arrangement is as follows:



H is seated in two ways. B and C are seated in two ways.

D and E are seated in two ways.

Total ways = 2 × 2 × 2 = 8

Solutions for questions 18 to 20: From the given information, John is from china and is adjacent to American who is not Humpty. But Humpty is opposite to the Indian who is not adjacent to Chinese but adjacent to Japanese, thus the following two arrangements are possible.

The English man is left to Australian thus in Case (i) Humpty can be from England and in Case (ii) Humpty can be from England and in Case (iii) Humpty can be from Australia. As Australian is opposite to the Dumpty.

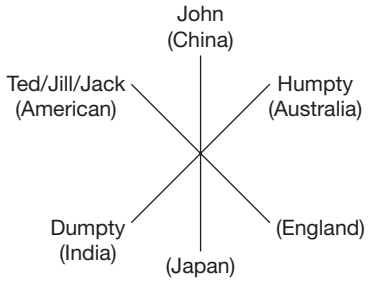
Case (i), Dumpty is the Amercian and

Case (ii), Dumpty is the Indian.

Thus, the arrangements are as follows.

Case (i): Now among the remaining people, i.e., Ted, Jill and Jack, as Ted and Jack are not from India Jill is the Indian. Ted and Jack are Australian and Japanese, respectively and are sitting adjacent to each other thus case (i) is not possible.
Case (ii): Either Jack or Jill is from the Japan. If Jack is from Japan, then Ted is the American and Jill is the English.

If Jill is the Japanese, then Ted is either from England or American and jack is either from England or America.



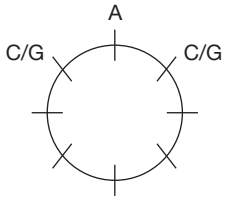
18. Dumpty is from India.

19. Jill is sitting opposite to the American.

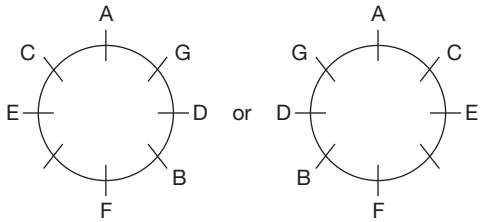
20. Humpty belongs to Australia.

Solutions for questions 21 to 23: It is given that eight friends, A through H are playing a game of cards and they belong to two different teams X and Y. No two persons of the same team sit adjacent to each other.

From (1), A sits between C and G but not opposite D or H.



From (1), (2) and (3), we get



Let the points scored by E = x, F = $x + 4$, D = $x + 7$ and A = $x + 9$.

Similarly, let the points scored by H = y, C = $2y$, G = $4y$ and B = $8y$.

21. B, H, C and G are the members of team X.

22. If E scores 1 point, then F scores 5 points, D scores 8 points and A scores 10 points.
A, D, E and F belong to team Y and their total points is $1 + 5 + 8 + 10 = 24$ points.
Similarly, H scores 1, C scores 2, G scores 4 and B scores 8.
B, C, G and H belong to team X and the total sum of their points is $1 + 2 + 4 + 8 = 15$ points. Hence, team X wins the game.

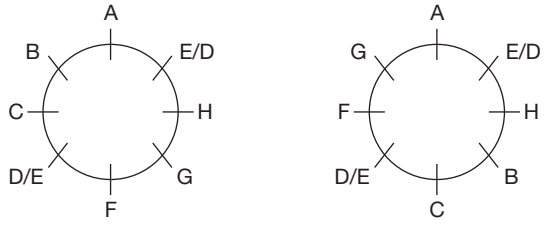
23. If team Y scores 92 points means E + F + D + A = 92.
$\Rightarrow x + (x + 4) + (x + 7) + (x + 9) = 92$
$\Rightarrow 4x + 20 = 92 \Rightarrow x = 18$.
E scores 18, F scores 22, D scores 25 and A scores 27. If team X scores 90 points, then
$y + 2y + 4y + 8y = 90$
$\Rightarrow 15y = 90 \Rightarrow y = 6$
H scores 6, C scores 12, G scores 24 and B scores 48. D scores one point more than G is definitely true.

Solutions for questions 24 to 26: From (i), it can be said that there is exactly one person sitting between C and F.

From (ii), Two people are sitting between C and G, the remaining people E and D are sitting opposite to each other.

From (iii), the representation of people sitting is as follows.

From (iv), B and G are opposite to each other and B is not sitting between C and F.

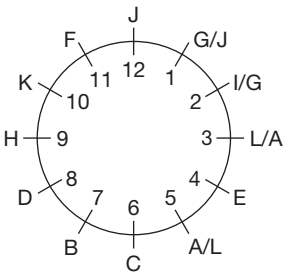


24. B will be sitting two places away to the right of F.

25. C will be sitting opposite to H.

26. D will be sitting two places away to the right of B.

Solutions for questions 27 to 29: It is given that, B is at 7th hour division and F is at 11th hour division. Given F is adjacent to K and J. K is to the immediate left of H. Hence, K is to the immediate right of F and J is to the immediate left of F. H is at 9th hour division. Given E is opposite to K. H is at 90° from C, which is 60° from D. Hence, C is at 6th hour division and D is at 8th hour division. Given L is at 60° from A. G is at 30° from I. Hence, the possible arrangements are as follows.

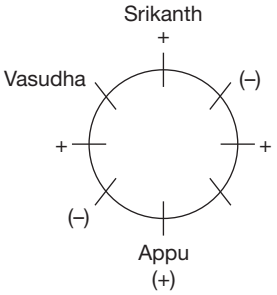


27. 150°

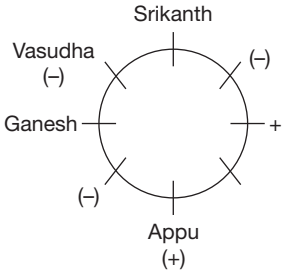
28. L is at 3rd hour division.

29. B or D is opposite to G.

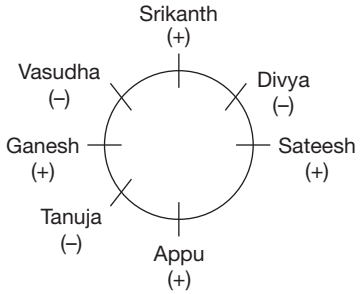
Solutions for questions 30 to 33: It is given that no two females are adjacent to each other. Vasudha (female) is third to the left of Appu (male) and Srikanth is to the immediate left of Vasudha.



Ganesh and Appu are not adjacent to each other. Hence, the arrangement will be as follows.



Appu and Sateesh are adjacent to each other, but Tanuja is not adjacent to Sateesh. Hence, the final arrangement will be as follows.



30. Divya is second to the right of Appu.

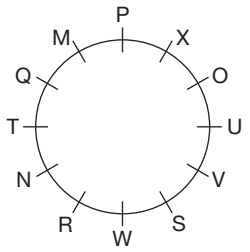
31. Ganesh is sitting adjacent to Vasudha.

32. Vasudha is sitting second to the right of Divya. Similarly, Sateesh is sitting second to the right of Tanuja.

33. Except Vasudha and Ganesh in all other options, the second person is sitting second to the right of first person.

Solutions for questions 34 to 37: From the given information, we can say that P, O, V, W, N and Q are sitting in alternate positions, starting from P in clockwise direction and M, T, R, S, U and X are sitting in alternate positions in anticlockwise direction and M is sitting adjacent to P.

The final circular arrangement is as shown below.



34. S is sitting adjacent to both V and W.

35. X is sitting opposite to R.

36. Six people.

37. V sits third to the left of R.

Solutions for questions 38 to 40: Let us take down the data as below;

(i) Six Russians, namely A, B, C, D, E and F and six French men M, N, O, P, Q and R.

(ii) A ← opp → D

(iii) B ← opp → E

(iv) D ← right → C

(v) B = Russian to French;
C = French to Russian.

(vi) E adj F

(vii) M ← opp → P

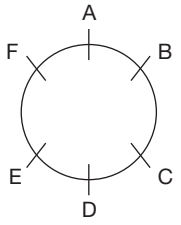
(viii) R ← right → Q

(ix) R ← opp → O

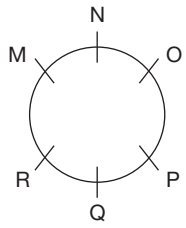
(x) (N and P) adj O

First of all, lets make the seating arrangement for the above data:

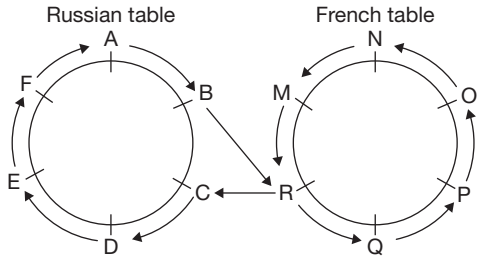
(A) Russian Table:



(B) French Table:



Also, it is given that:



38. C to M is:
(C) → D → E → F → A → B → R → Q → P → O → N → (M)
= Total of 10 people

39. (A) The order of sending message will be as shown below:
A → F → E → D → C → R → M → N → O → P → Q
As the number of people involved is more than 2, hence, this statement is false.

(B) To the right of F is E and to the left of N is O. The route will be as shown:
(E) → D → C → R → M → N → (O)
As there are 5 people between E and O involved in passing the message. Hence, this statement is true.

(C) B sits to the right of C, who now translates French to Russian. Hence, this statement is false.

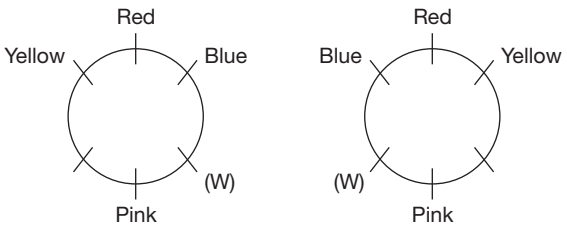
(D) The maximum number of people involved in sending message will remain the same in the new as well as the old arrangement. Hence, (D) is false.

40. A is sitting to the right of B and F is sitting two places to the left of D. The message from A to F can be sent in the following ways:
[A], B, R, Q, P, O, N, M, R, C, D, E, [F]
So, all the 12 people are covered, subtract 2 from 12 (for A and F) and we get 10 people involved in between A and F. Also, in the route shown above, R is repeated twice, still the count is 10.

EXERCISE-2

Solutions for questions 1 to 5: From (A), we incur that red sofa is between blue and yellow sofas.

From (D), we incur that the sofa where W is sitting is adjacent to the blue and pink sofa. The pink sofa should be opposite to the red sofa. The partial arrangement will be as follows:



From (B), X is sitting on the white sofa and Z is opposite to X.

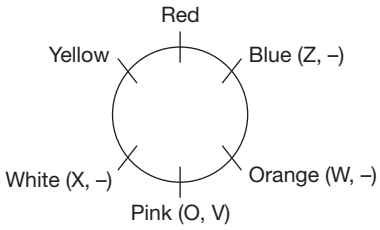
So, Z is either on yellow or blue sofa.

From (B) and (D), we incur that

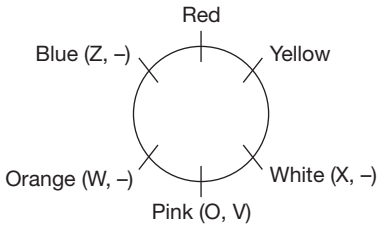
as X and W cannot be seated on the same sofa and X is on white sofa, W is on orange sofa.

From (C), O and V are in pink sofa.

∴ The possible arrangements are as follows:
Case – (i):

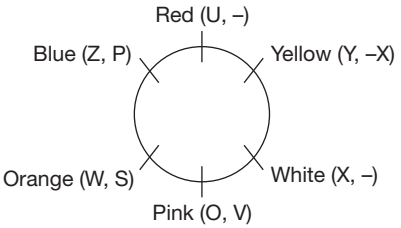


Case – (ii):



From (E), Y is opposite to S.

∴ Y is in yellow sofa and S is in the orange sofa. But in case (A) V is to the left of S, which contradicts (5). Hence, the following arrangement is possible.



1. U is sitting on red sofa.

2. Z and P are sitting on blue sofa.

3. Orange sofa is opposite the sofa where Y is sitting.

4. W and S are sitting on orange sofa.

5. Red, blue, orange, pink, white and yellow is the correct order.

Solutions for questions 6 to 9: The children are Sujatha, Bhuvan, Srilatha, Pranav, Krupa, Kruti and Anand.

From (v), Srilatha is the 4th person to finish her lunch.

From (i) and (iv), Sujatha, Bhuvan and Kruti finished their lunch immediately one after the other in that order. Hence, they can be either 1st, 2nd and 3rd children (or) 5th, 6th and 7th children to finish lunch.

From (iv), Pranav finished his lunch after Kruti. Hence, Sujatha, Bhuvan and Kruti are the first three people to finish their lunch.

From (iii), as Krupa is adjacent to the child who is the fifth to finish his/her lunch. Hence, Krupa cannot be the sixth person to finish her lunch. Hence, Krupa is the 7th child to finish her lunch.

From (ii), Pranav and Anand are the 6th and the 5th to finish their lunch.

The order of children from the child who finished his/her lunch first to that who finished his/her last is Sujatha, Bhuvan, Kruti, Srilatha, Anand, Pranav, Krupa.

The possible seating arrangement is as follows:

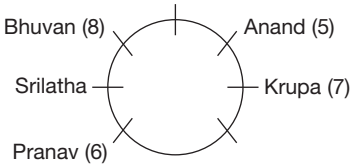
From (ii) and (iii), we incur that

Pranav is three places away to the left of Anand. Krupa is to the immediate left of the child who finished his/her lunch at the 5th place, which is Anand.

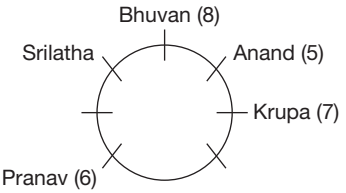
From (i), Bhuvan is to the left of Srilatha and both finished their lunch at the 3rd and the 2nd positions, respectively.

The possible arrangements are as follows:

Case (i):



Case (ii):

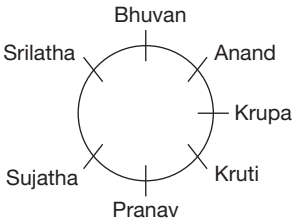


Let us consider case (i).

Here, neither Kruti nor Sujata can be adjacent to Bhuvan, because Kruti and Sujata are the 3rd and the 1st children to finish their lunch.

So, only case (ii) is possible.

Kruti cannot be adjacent to Srilatha, so Sujata is adjacent to Srilatha.



6. Five children finish their lunch before Pranav finishes his lunch.

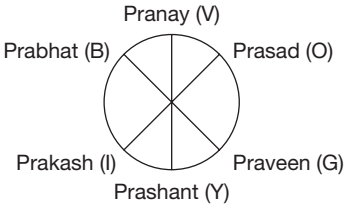
7. Srilatha finished her lunch after Kruti finished his lunch.

8. Kruti is to the immediate right of Pranav.

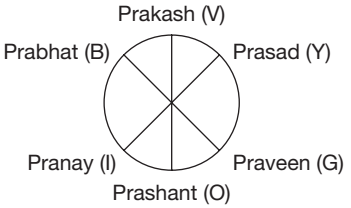
9. Anand, Krupa, Kruti, Pranav, Sujata, Srilatha, Bhuvan.

Solutions for questions 10 to 12: By taking the data given in the problem, we get the following four different arrangements. The first letters of the names of the colours are used to denote the colours.

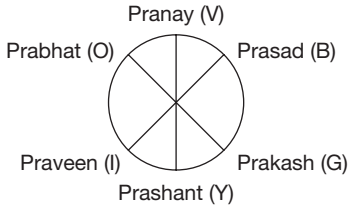
Case 1:



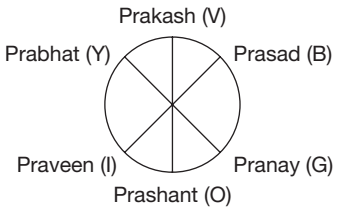
Case 2:



Case 3:



Case 4:



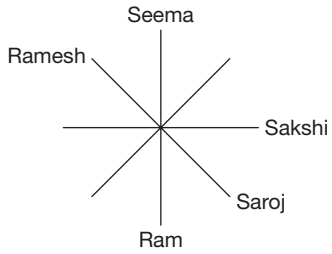
10. All the statements are true.

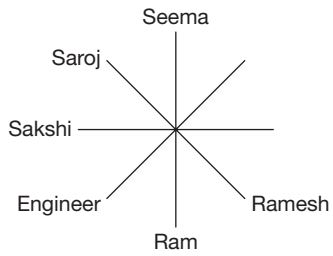
11. This question is referring to Case 3. In this case, it is Prakash who is wearing the Green T-shirt.

12. This question is referring to Cases 2 and 4. In both the cases it is Prashant who is between Praveen and Pranay.

Solutions for questions 13 to 15: From (II) and (V), we know that Seema, the Dancer is opposite to Ram, who is the Lawyer and Sakshi is not adjacent to anyone of these two.

From (IV) Sakshi, who is the Singer is at one place to the right of Saroj. And from (VI), Ramesh is sitting three places to the right of Singer.





From (I), Pilot is sitting opposite to Ramesh, thus Saroj is the Pilot and from (III), Saloni is opposite to the Engineer.

From (III) and above arrangement, Ramesh cannot be any one except Teacher. Saloni is the Doctor, Mohan is the Engineer and Sohan is the Accountant.

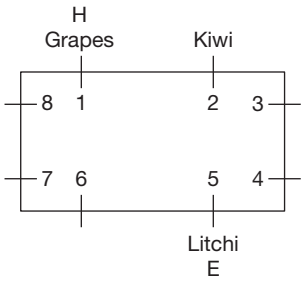
13. Saloni is the Doctor.

14. Mohan is the Engineer.

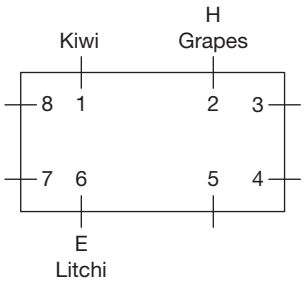
15. Saroj is sitting opposite to Ramesh.

Solutions for questions 16 to 18: From (ii) and (iv), we have two possibilities.

Case (i):



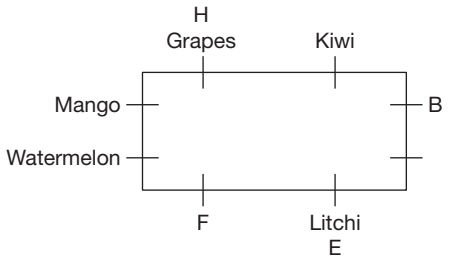
Case (ii):



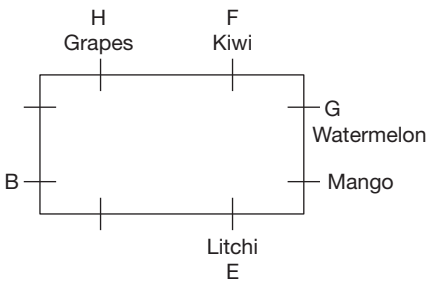
From (i), G has Watermelon and there are three boys between B and G.

From (v), the boys having Mango, Watermelon and F are seated one after the other in anticlockwise direction.

From case (i), the following arrangements are possible.



Or



But in either cases condition (iii) cannot be satisfied.

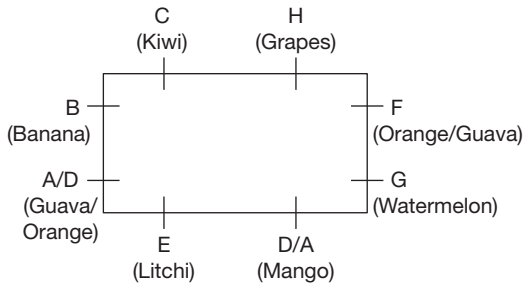
The possible arrangement from Case (ii), we incur the following:

From (iii), F has either Orange or Guava (As G has Watermelon and one boy on that side should have either Orange or Guava).

From (i), B has Banana (As, B is opposite to F).

Boy at position 7 has either Orange or Guava.

∴The final arrangement is as follows.



16. If A has Orange, then C will be opposite to D.

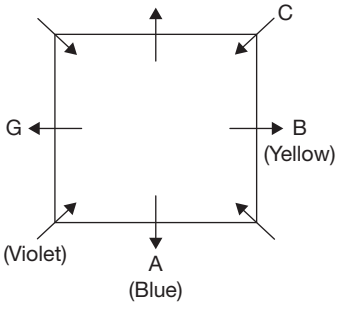
17. E is three places away to the left of F.

18. C – Kiwi is the correct combination.

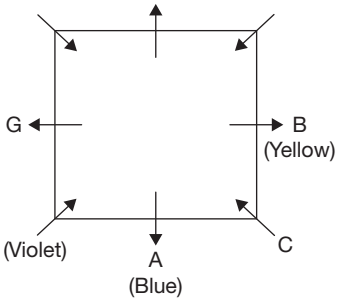
Solutions for questions 19 to 21: From (i) and (ii), G sits to the immediate left of the person who likes violet who sits to the immediate right of the person who likes blue.

From (iii), (iv) and (v), the possible cases are as follows.

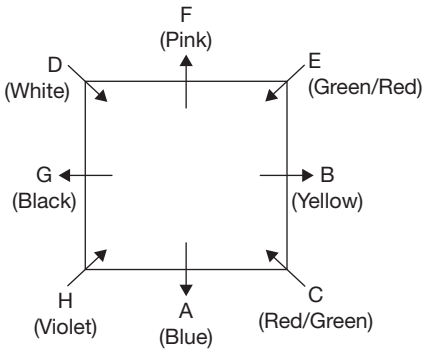
(i)



(ii)



From (vi), (vii), (viii), (ix) and (x), the possible arrangements are as shown below.



19. C or E

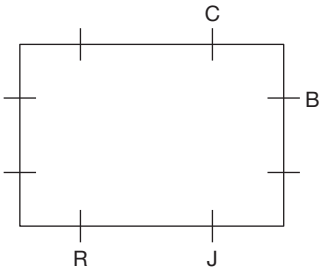
20. C

21. Except (C) remaining all sit at the corners.

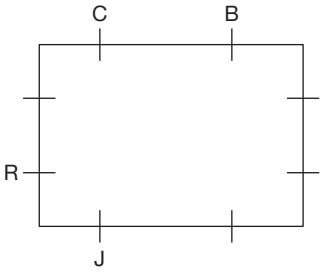
Solutions for questions 22 to 24: Let us represent the people by the first letters of each name.

From (i), we get the following possibilities.

Case (a):

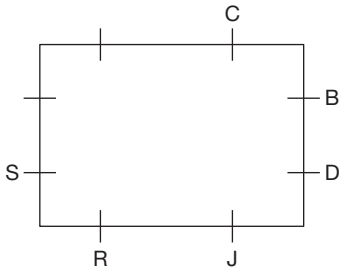


Case (b):

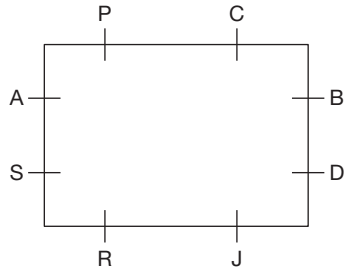


From (ii), as Brijesh and Dweepesh are sitting along the same side, Case (b) is not possible.

From (ii), we get



From (iii), the possibility is as follows.



22. Palak is sitting along the same side as Chandak.

23. Palak is sitting opposite to Rupak.

24. Rupak is sitting to the immediate right of Sayan.

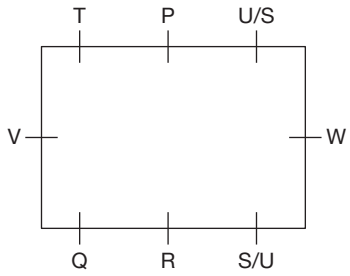
Solutions for questions 25 to 27: From (i), V sits to the immediate left of Q.

From (ii), R sits opposite to P.

From (iii), W sits third to the right of Q.

From (v), W sits third to the left of T.

From (iv), (vi) and above, the possible arrangements is as follows.

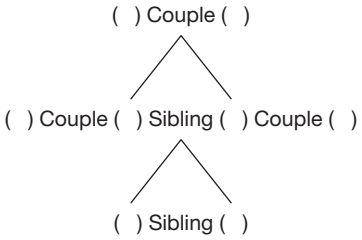


25. W sits opposite to V.

26. S, U and P.

27. Q or U.

Solutions for questions 28 to 32: As there are three married couples and two of them have two children each, the eight-member family is possible only with the following structure.



From (iv), we can say that there are 3 females and 5 males in the family.

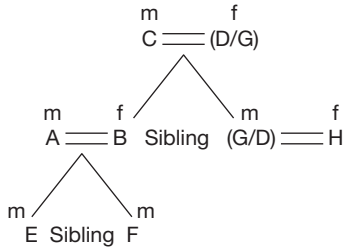
From (iii), we can say that H is from the second generation, as H has a sister-in-law as well as father-in-law. From (viii), we know that H is a female. Thus, one of the siblings in the second generation is male and the other is a female. Now from (ii), A is male and has two sons.

As H is the aunt of E,

A cannot be H's husband as only one of the two couples in the second generation has children.

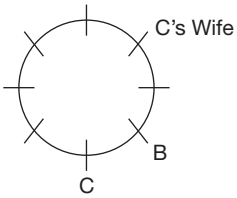
As F is the youngest and he is not G's son, he must be A's son.

Thus, from (ii), (iii), (vi) and (viii), we have the following.



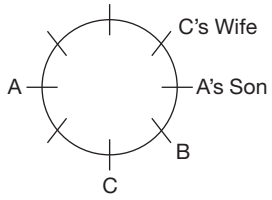
We do not have any information about D and G so let us leave it here.

Now, from (iii) and (vi), we get the following arrangement.

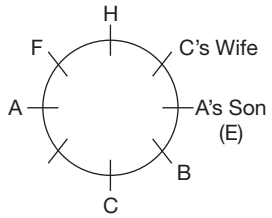


Now, only two seats that are opposite to each other are vacant. Thus, from (ii), A cannot be to the immediate right of B.

Thus, we get the following arrangement.

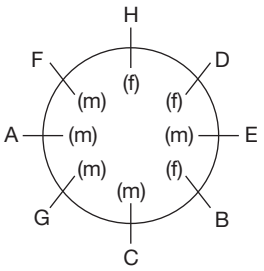


Since F is A's son and F is adjacent to both H. From (vii), (ii) and A, we get the following arrangement.



From (viii), E is three places away from G.

So, we get the following arrangement.



Thus, D is C's wife and G is H's husband.

28. G is C's son.

29. A's brother-in-law is G. G's nephew is E whose grandmother is D.
D is B's mother.

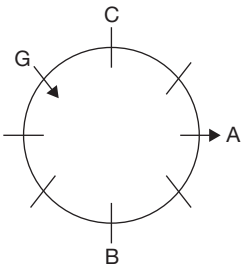
30. E's father is A. C's daughter-in-law is H. A is second to the right of H.

31. E, G and F are males while B is a female.

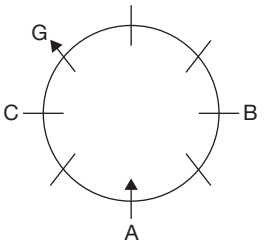
32. F is E's brother.

Solutions for questions 33 to 36: From (i), (ii) and (iii), the possible arrangements are as follows.

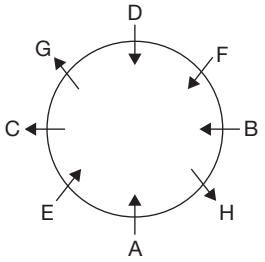
(i)

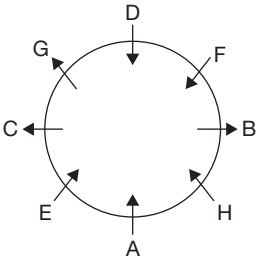


(ii)



From (iv), in case (i), C faces the centre.
In case (ii), C faces away from the centre.
From (v), in both the cases D sits to the immediate right of G.
From (vi) and (vii) and above, the possible arrangement is as follows.





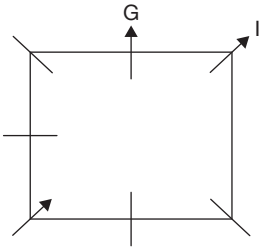
33. 5 people

34. D (From case (i)).

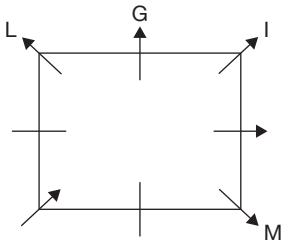
35. A (From case (ii)).

36. H or F

Solutions for questions 37 to 40: From (i), I is sitting at one of the corners and facing away from the centre.
(ii) The neighbour of I faces the same direction as I faces, hence, they face away from the centre.
From (ix), the one who sits opposite to I faces a different direction from which I faces, hence, he/she faces the centre.
From (iv), L and M face the same direction and sits opposite to each other.
From (vii), 'G' is to the immediate left of I.
From (ii), neither J nor M is a neighbour of I.

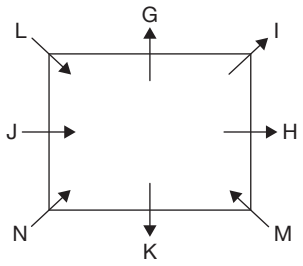


Let us assume that L and M face away from the centre and L is to the immediate left of G.



H is to the immediate right of M. If we place 'H' there we cannot place J and K, since from (viii), J and K are neighbours of N.
Hence, L and M must be facing the centre.
From (x), K must be facing away from the centre.
From (viii), J must be facing the centre.

Hence, the final arrangement is as follows:



37. Four people are facing away from the centre.

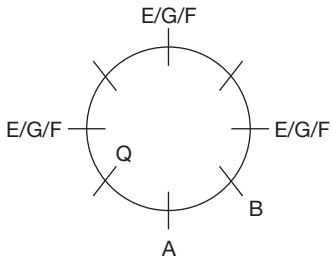
38. Except MN, in all other pairs JH, NI and MK and KN both are facing different directions.

39. M is sitting to the immediate right of H.

40. K is sitting opposite to G.

EXERCISE-3

Solutions for questions 1 to 3: From (1) and (3), we have:



From (2), no two people among P, T, V and W are opposite to each other and no two people from Q, R, S and U are opposite to each other.

From (4), the people from S cannot be opposite to the person from Q.

∴ The person from S must be B.

From (6), C is from W and H is from Q.

Also, C and H are opposite to each other.

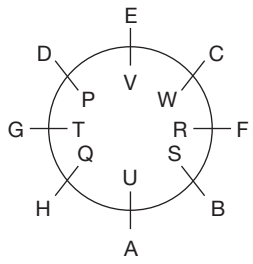
From (5), G must be to the immediate left of H.

∴ E is to the immediate left of D.

From (6) and (2), E must be from V.

F is from R and A is from U.

∴ The final arrangement will be as follows:



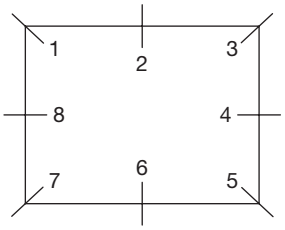
1. F is from R.

2. A is to the immediate right of H.

3. A is opposite to the person from V.

Solutions for questions 4 to 6: It is very clear from the given statements that the room (say table) has eight positions, of which four are at the corners and other four are at the four centres of the four sides of the table, which looks like the arrangement as follows.

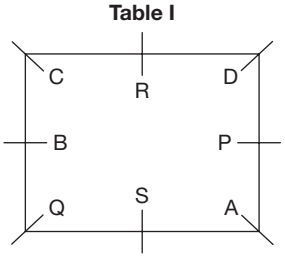
Let us number the chairs 1 to 8.



PQRS, four girls and ABCD, four boys are occupying these eight chairs. Let us analyse all the conditions.

Q is at the corner seat, so it can be anywhere either at 1 or 3 or 5 or 7. Let us say that Q is at seat 7, but as it is given that R is not along the same wall as Q, hence R must be at seat 2 or 3 or 4 whereas A and C are diagonally opposite. So, A and C must be at seat 1 and 5 not necessarily in that order. As B does not sit along any wall adjacent to the corner where A sits, but B is opposite to P. So, if A is at seat 1, then B is at 4 or 5 or 6. If so P must be at 8 or 1 or 2. Finally, as it is given that C is to the immediate right of R who is between C and D, the diagram must be as follows.

Table I



4. S is sitting between Q and A. Refer the table (I).

5. If S and P interchange their positions, then the arrangement will be as follows.

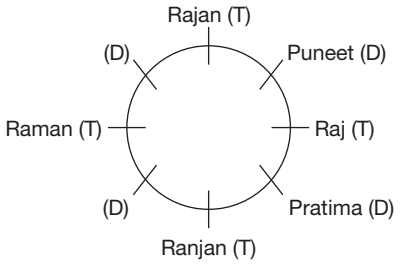
C	R	D
B		S
Q	P	A

S is to the immediate left of D.

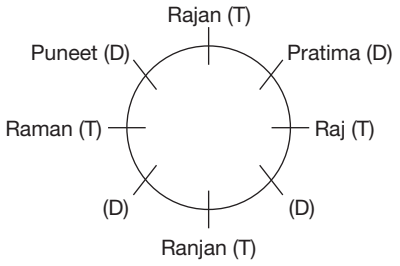
6. The corner seat arrangement clockwise is ⇒ Q, C, D, A (or) C, D, A, Q (OR) D, A, Q, C (OR) A, Q, C, D.
The anti-clockwise arrangement is:
A, D, C Q (OR) D, C, Q, A (OR)
C, Q, A, D (OR) Q, A, D, C.
Choice (A) in Q, A, D, C – Correct.
Choice (B) in A, Q, C, D – Correct.
Choice (C) in D, A, Q, C – Correct.
Choice (D) in D, Q, A, C – Incorrect.

Solutions for questions 7 to 9: The arrangements which can be made based on the data given.

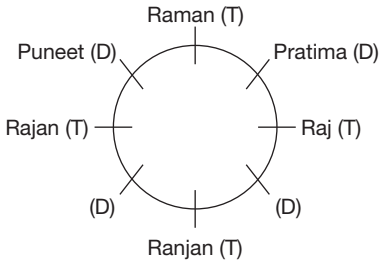
I



II



III



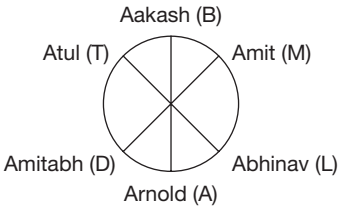
7. Here, cases I and II prevail and it is evident that Raman is two places to the left of Ranjan.

8. If Pratima is adjacent to Raman, then case III prevails and Rajan is opposite to Raj.

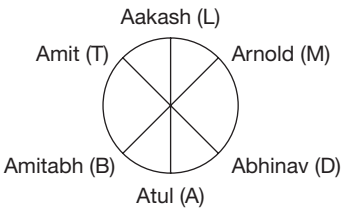
9. If Pratham is not opposite to Puneet, then in any of the two cases Pratham has to be opposite Pratima.

Solutions for questions 10 to 12: We arrive at the following two different arrangements. The first letters of the names of the professions are used to denote the profession.

Case 1:



Case 2:



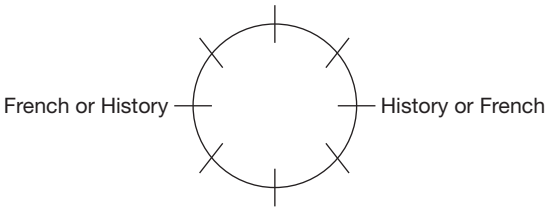
10. In all the cases, it can be observed that Amit is between the Lawyer and the Business Analyst.

11. This question refers to case (2), in which Abhinav is the Doctor.

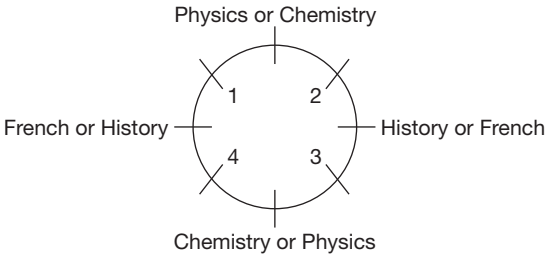
12. This question refers to case (2), where Arnold is sitting opposite Amitabh.

Solutions for questions 13 to 15: Let us analyse all the conditions. A person has eight shelves around him.

French books and History books are on opposite shelves. French, German and English books are in side by side shelves. Physics and Chemistry books are in opposite shelves.

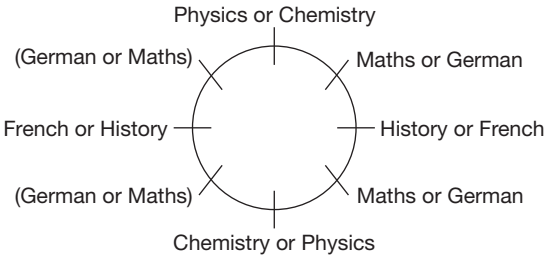


Physics and Chemistry should be on the perpendicular diagonal shelves. The final arrangement is



As French books must have English and German books on either side, these can be 1 and 4 or 2 and 3.

13. If the books on German are opposite to the shelf of Maths books, the arrangement will be as follows.

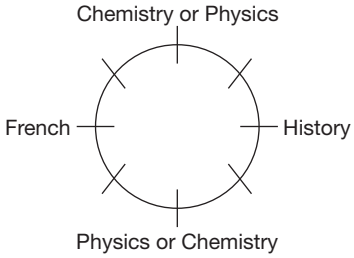


As German is between Physics and French, it can be at any of the two places as shown.

Then, Mathematics books may be between History and Chemistry shelves.

Then, English and Sociology shelves would be opposite to each other.

14. The shelf of Sociology is between the shelves with Physics and History books. Then the arrangement is

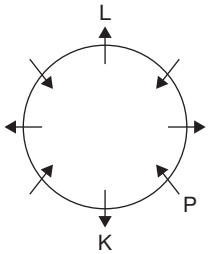


Hence, the books on Mathematics should be between books on History and Chemistry.

15. English books are to the immediate left of Physics books, so that the shelf must be between the shelves with French and Physics books. So, German books would be between the shelves of Chemistry and English. So, they are to the immediate right of Chemistry or French books.

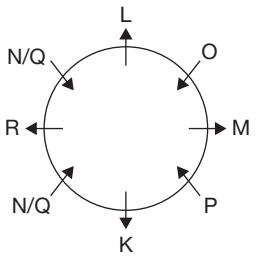
Solutions for questions 16 to 18: From (vi), L sits opposite to K and faces away from the centre. From (iv), no two people sitting next to each other face the same direction and from (i), P sits to the immediate left of K.

From the above points we get the following arrangement.



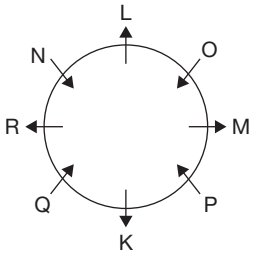
And from (ii), M and R are sitting opposite to each other. From (v), R is the neighbour of both N and Q.

Hence, the arrangement is



From (iii), either Q or O sits next to L.

Hence, the final arrangement is



16. Among KM, ML, and NO, the second person sits second to the left of the first person.
In PO, the second person is second to the right of the first person.

17. L sits to the immediate right of 'O' and is definitely true.

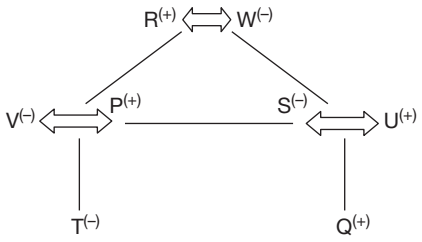
18. If M and N interchange their places, then L sits to the immediate left of M.

Solutions for questions 19 to 21: It is given that:

(i) P (+) — Q, P (+) — A (–)

(ii) (+) — (B) = (–) (+)

(iii) (D) — (+)

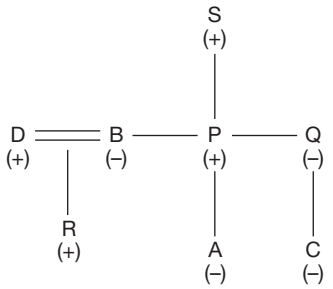


Given, P is the brother of Q, who is not adjacent to either P or S. Hence, Q sits either at the left end or right end and R sits adjacent to Q. Also given, A is the daughter of P and sits to the immediate right of B's husband. C is the niece of P. Hence, D is the husband of B and as D is not opposite to either P or S, we get the following cases.

(i)	P/S	S/P	R	Q
	—	—	D	A
(ii)	Q	R	S/R	P/S
	D	A	—	—
(iii)	Q	R	S/P	P/S
	—	D	A	—

Given, C does not sit opposite either P or S, hence, case (i) and (ii) can be eliminated. In case (iii), C sits at the left end, B sits at the right end. Given, B is not opposite to S, but is opposite to her brother. Hence, B is opposite to P, who is the brother of B. As, D has only one child who is a male, it is either R or S and C is the daughter of Q but, given Q is the daughter of C's grandfather who is not R. Hence, R should be the son of D and S is the grandfather of C. Therefore, the final arrangement and the family tree are as follows.

Q	R	S	P	↓
C	D	A	B	↑



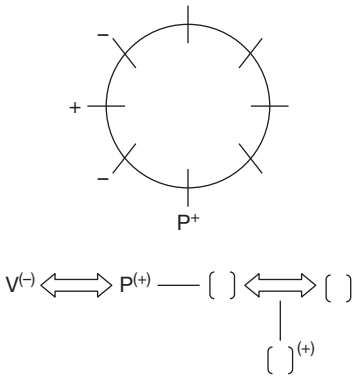
19. D's father-in-law (S) is to the immediate right of P.

20. Q's daughter sits at an end.

21. Choice (B) is true.

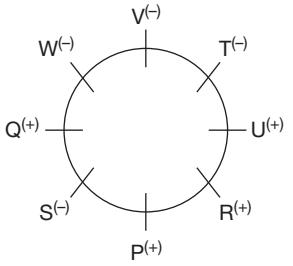
Solutions for questions 22 to 25: It is given that, P sits second to the right of his nephew whose neighbours are females.

V is the wife of P and sits to the immediate right of her daughter T.



U sits second to the right of his brother-in-law and opposite his son Q. Hence, Q must be the nephew of P who is the brother-in-law of U. From (2), we come to know that V sits to the immediate right of her daughter T. We can place T only to the immediate right of U. From (4), we can say that S is the daughter of R and wife of U. From (5), we can say that W is the wife of R, and P and S are their children. Finally, the positions are, W sits to the immediate right of V, R sits to the immediate left of U, and S sits to the immediate right of P.

The final arrangement of the given family members is as follows.



22. Both the options (A) and (B) say about the wife of U.

23. All the options (A), (B) and (C) are saying about the niece of S.

24. None of the given options is true.

25. Except option (C), in all other options the opposite genders are given.

3 Distributions

CHAPTER

Learning Objectives

In this chapter, you will:

- Learn how to interpret the statements given and fill a table.
- Learn how to arrive at the final distribution of parameters among people/objects from the partially filled table.
- Apply knowledge of distributions to linear and circular arrangements.
- Understand and learn to solve puzzles that involve multiple parameters.

In this type of problems, you have to match two or more variables [Variable means a 'subject' as used in the discussion of linear arrangement]. In double line-up, the data given may talk of four people living in four houses each of a different colour. What we need to find out is the colour of the house of each of the four persons. There is no first position or second position of the houses.

Sometimes, double line-up is also known as distribution.

An example of data given for this variety of questions is:

Each of the four people A, B, C and D wears a different coloured shirt, such as red, pink, blue and white. A has a red shirt and D does not have a pink shirt. From the above statement, it becomes clear that no person among A, B, C and D can have shirts of two different colours among red, pink, blue and white.

As discussed in the questions on single line-up, questions can be solved easily by representing the given data pictorially. In case of double line-up, it will help us if we represent the data in the form of a matrix or a table.

Let us see how to draw a matrix for the data given above.

	Colours			
Names	**Red**	**Pink**	**Blue**	**White**
A	✓			
B				
C				
D		×		

As it is given that A has red colour shirt, it is clear that he does not have any other colour shirt. Similarly, B, C, D do not have red colour shirt. So, in all the other cells in the row belonging to A, we put a cross ('×'). Then, the table will look as follows:

	Colours			
Names	**Red**	**Pink**	**Blue**	**White**
A	✓	×	×	×
B	×			
C	×			
D	×	×		

In this manner, we can fill up the cells on the basis of the data given to us. Once, we use up all the data, we will draw any conclusions that can be drawn and then answer the questions given in the set. You will understand this better by going through the solved example section below, please try to solve them first without looking at the solution.

SOLVED EXAMPLES

Directions for questions 3.01 to 3.05: These questions are based on the following information.

P, Q, R, S, T, U, V and W are eight employees of a concern. Each of them is allotted a different locker, out of eight lockers numbered from 1 to 8 in a cupboard. The lockers are arranged in four rows with two lockers in each row.

Lockers 1 and 2 are in the top row from left to right, respectively while lockers 7 and 8 are in the bottom row arranged from left to right, respectively. Lockers 3 and 4 are in the second row from the top, arranged from right to left, respectively. So are lockers 5 and 6 arranged from right to left, respectively in the second row from the bottom. P has been allotted locker 1 while V has been allotted locker 8. T's locker is just above that of Q which is just above that of R, whereas W's locker is in the bottom row.

3.01: Which of the following cannot be the correct locker number–occupant pair?
(A) 3-Q (B) 7-W
(C) 4-U (D) 6-R

3.02: If U's locker is not beside Q's locker, whose locker is just above that of W?
(A) U (B) S
(C) R (D) Q

3.03: Which of these pairs cannot have lockers that are diagonally placed?
(A) P-Q (B) S-R
(C) U-R (D) Either (B) or (C)

3.04: Which of the following groups consists only occupants of odd numbered lockers?
(A) Q, R, W (B) R, V, W
(C) T, R, Q (D) P, T, Q

3.05: If U's locker is in the same row as that of R, and S exchanges his locker with V, then who is the new neighbour of V in the same row? (Assume that nothing else is disturbed from the original arrangement)
(A) P (B) Q
(C) R (D) U

Solutions for questions 3.01 to 3.05: Let us first try to locate the lockers in the cupboard as per the conditions given. Then, we will do the allotment to the people.

Lockers 1 and 2 are in the top row and lockers 7 and 8 are in the bottom-most row. In these two rows, the lockers are numbered from left to right. In the other two rows, the lockers are numbered from right to left.

L	R	
1	2	Top Row
4	3	
6	5	
7	8	Bottom Row

Now let us look at the conditions given for the allotment of the lockers.

P has locker 1. V has locker 8.

1-P	2
4	3
6	5
7	8-V

Locker of W is in the bottom row ➔ W's locker must be 7.

1-P	2
4	3
6	5
7-W	8-V

T's locker is just above that of Q, which is just above that of R ➔ The lockers of T, Q and R must be 2, 3 and 5, respectively (there are no other group of lockers which satisfy this condition).

1-P	2-T
4	3-Q
6	5-R
7-W	8-V

S and U have lockers 4 and 6 left for them.

Thus, on the basis of the data given to us, we can show the final arrangement of lockers as below:

1-P	2-T
4-S/U	3-Q
6-U/S	5-R
7-W	8-V

Now we can answer the questions easily on the basis of the above table.

3.01: By looking at the final arrangement of lockers above, we find that choice (D) does not represent the correct combination of locker number-occupant pair.

3.02: If U's locker is not beside Q's locker, then U's locker must be locker 6. So, it is U's locker that will be immediately above W's.

3.03: R's locker is in the same row as that of exactly one of S or U and diagonally placed to the other one. Hence, 'either S-R or U-R' is the answer.

3.04: The odd-numbered lockers 1, 3, 5 and 7 belong to P, Q, R and W, respectively. Of the choices, we find that Q, R, W appear in choice (A). Hence, this is the correct choice.

3.05: U's locker is in the same row as that of R which means that locker 6 belongs to U. So, locker 4 belongs to S. Now V and S exchange lockers. Then the new neighbour of V is Q.

Directions for questions 3.06 to 3.09: These questions are based on the following information.

There are four variety of trees, such as Lemon, Coconut, Mango and Neem each at a different corner of a rectangular plot. A Well is located at one corner and a Cabin at another corner. Lemon and Coconut trees are on either side of the Gate which is located at the centre of the side opposite to the side at whose extremes, the Well and the Cabin are located. The Mango tree is not at the corner where the Cabin is located.

3.06: Which of the following pairs can be diagonally opposite to each other in the plot?

(A) Neem tree and Lemon tree
(B) Cabin and Neem tree
(C) Mango tree and Well
(D) Coconut tree and Lemon tree

3.07: If the Lemon Tree is diagonally opposite to the Well, then the Coconut tree is diagonally opposite to the

(A) Mango tree (B) Well
(C) Cabin (D) Gate

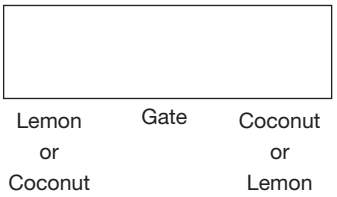
3.08: If the Coconut tree and the Neem tree cannot be at adjacent corners of the plot, then which of the following will necessarily have to be at diagonally opposite corners of the plot?

(A) Coconut tree and Well
(B) Lemon tree and Cabin
(C) Lemon tree and Coconut tree
(D) Lemon tree and Well

3.09: Which of the following is definitely false?

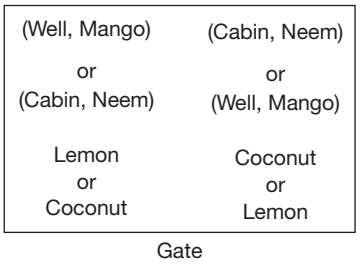
(A) Mango tree is adjacent to the Well at one corner.
(B) Neem tree is adjacent to the Cabin at one corner.
(C) Coconut tree is at the corner adjacent to the Well.
(D) Lemon tree is not on the same side of the plot as the Gate.

Solutions for questions 3.06 to 3.09: Lemon and Coconut are on either side of the gate.



The Well and the Cabin are at either end of the Well opposite to the Gate.

Mango tree and Cabin are not at the same corner. So, Neem tree and Well are not at the same corner. This means that Mango tree and the Well are at the same corner and Neem tree and the Cabin are at the same corner.



3.06: Let us take each choice and check with the above diagram to see if it is possible or not.
Neem and Lemon can be diagonally opposite to each other. Hence, this is the correct answer choice. (In an exam, you do not need to check the other choices since the first choice is correct. But, for the sake of clarity and proper understanding, we will check all the choices).

From the diagram given above, we can see that Cabin and Neem cannot be located diagonally opposite to each other.
Mango and Well cannot be located diagonally opposite to each other.
Coconut and Lemon cannot be located diagonally opposite to each other.

3.07: If Lemon tree is diagonally opposite to the Well, then we can have the following two possible arrangements.

Neem	Well
Cabin	Mango

OR

Well	Cabin
Mango	Neem

The Coconut tree is diagonally opposite to the Cabin and Neem.

3.08: Since Coconut and Neem trees cannot be at adjacent corners, the following arrangements are possible.

(Well, Mango)	(Cabin, Neem)
Coconut	Lemon

OR

(Cabin, Neem)	(Well, Mango)

From the above diagrams, we find that choice (D) is the correct answer.

3.09: We check each statement with the diagram that we drew initially to find out which of the statements has to be false.
We find that choice (D) has to be false.

Directions for question 3.10: Select the correct answer from the given choices.

3.10: A, B, C and D play four different games among Baseball, Cricket, Kabaddi and Volleyball. A does not play Baseball or Cricket. B does not play Kabaddi or Volleyball. C plays Volleyball and D plays either Baseball or Volleyball. Who plays Cricket?

(A) A (B) B
(C) C (D) D

Solution for question 3.10:

3.10: C plays Volleyball. A does not play Cricket and D does not play Cricket as he plays either Baseball or Volleyball.
∴ B should play Cricket.

EXERCISE-1

Directions for questions 1 to 9: Select the correct alternative from the given choices.

1. Each of the five people, namely Bhanu, Lalit, Modi, Ravindra and Kamal is wearing a different coloured shirt among white, black, brown, indigo and yellow. Bhanu is wearing neither a yellow nor a black coloured shirt. Lalit is wearing neither an indigo nor a white coloured shirt. Modi is wearing neither indigo nor a yellow coloured shirt. If Ravindra and Kamal are wearing black and indigo coloured shirts, then which coloured shirt is Lalit wearing?

(A) Brown (B) Yellow
(C) White (D) Cannot be determined

2. Rama, Bhima and Bond have to take two articles each from the available six articles, such as Gun, Bow, Arrow, Mace, Sword and Dagger. Bhima will not take the Gun or the Bow, and Bond will not take any of the Sword, the Bow or the Dagger.
If one of the three people takes the Sword and the Mace, then what is the other item selected by the person who selects the Gun?

(A) Bow (B) Arrow
(C) Dagger (D) Cannot be determined

3. A group of four students, namely Sagar, Swaroop, Sachin and Suman went to four different cities, such as Mumbai, Vijayawada, Hyderabad and Nagpur to take 4 different tests XAT, JMET, CET, CAT. The following data is also known.

1. Suman did not take JMET.
2. Swaroop did not go to Hyderabad and he did not take CET and XAT.
3. CET was conducted in Nagpur.
4. Sagar did not go to Nagpur and he did not take CAT.
5. Sachin had gone to Mumbai.

If Sagar did not take XAT, then which of the following is the correct combination of the city visited and the test written by Swaroop?

(A) Vijayawada and JMET
(B) Nagpur and JMET
(C) Hyderabad and CAT
(D) Vijayawada and CAT

4. Five trains, such as GT Express, AP Express, Rajdhani Express, Goa Express and Bangalore Express travel to five different cities, like Delhi, Goa, Chennai, Bangalore and Hyderabad, not necessarily in the same order. No two trains travel to the same city and no two cities can be visited through the same train. GT Express travels to neither Delhi nor Chennai. Neither AP Express nor Goa Express pass through Hyderabad Bangalore can be visited by either Goa Express or AP Express. Rajdhani Express travels to Chennai. Either Goa Express goes to Hyderabad or the Bangalore Express goes to Delhi.
Which one of the following statements would help in completing the arrangement?

(A) Either Chennai is visited through Rajdhani Express or Goa is visited through AP Express.
(B) Only if Bangalore is visited through Bangalore Express, is Goa then visited through Goa Express.
(C) If Goa Express goes to Bangalore, then AP Express goes to Goa.
(D) If Bangalore is visited through AP Express, then Delhi is visited through the Bangalore Express.

5. Each of five men, such as A, B, C, D and E is married to a different female among P, Q, R, S and T, not necessarily in the given order. S is the wife of B and D is not the husband of P, who is not the wife of A. E is the husband of T. Who is the wife of C?

(A) D (B) P
(C) R (D) Cannot be determined

6. Each of the four people, namely Ramesh, Rajesh, Ramani and Ravan work for four different companies among TCS, CTS, Wipro and Accenture. Each of them belongs to a different city among Delhi, Kolkata, Mumbai and Chennai. The following information is known about them.

(1) Rajesh is from Kolkata but does not work in Wipro and the person who works in Wipro is not from Chennai.
(2) Ravan works neither in Wipro nor in Mumbai.
(3) Ramani works neither in Mumbai nor in Accenture.
(4) Ramesh works neither in TCS nor in Wipro and the person from Kolkata works neither in TCS nor in CTS.

Who is working in CTS?

(A) Ramesh (B) Rajesh
(C) Ramani (D) Ravan

7. Shiva brought 4 boxes, each of a different colour. Each of these boxes contains chocolates of a different brand. He distributed one box to each of his four friends. Manju received a red coloured box but not Eclairs. Either blue or orange coloured box is received by Sanju. Tanooj received Kit Kat. One of them received Bar One while Pooja received neither yellow coloured box nor Dairy Milk. If the orange coloured box contains Diary Milk, then which of the following is true?

(A) Sanju received Bar One.
(B) Bar One is in red coloured box.
(C) Eclairs is in yellow coloured box.
(D) Tanooj received blue coloured box.

8. The teacher in-charge of a class summarized the analysis of number of students who took tests in three different subjects, such asMaths, Physics and Chemistry. No student has appeared for more than one test. Half of the students who took the test in Chemistry passed it. The number of students who passed the Physics test is equal to the number of students who passed the Maths test. The number of students who failed the Maths test and the number of students who failed the Chemistry test are equal. 30% of the students who took the Physics test failed it. 100 students failed the Maths test. If the total number of students who took the tests is 470, then which of the following is true?

(A) Among the students who took tests in different subjects, the number of students who took the test in Physics is the minimum.
(B) The number of students who failed the Maths test is not the least.
(C) The number of students who passed the Maths test is more than those who passed the Chemistry test.
(D) More than one of the above.

9. In a campus recruitment each of the four friends studying in VIT College of Engineering were recruited for a different city and each of them is from any one of the two departments Electronics and Civil. Tinku is recruited for Kolkata. One of the Electronics students is recruited in Bhopal. Pinku belongs to Electronics but is not recruited for Hyderabad. Chinku is not recruited for Chennai and is not from Electronics department. Minku and Tinku belong to the same department. If Pinku is not recruited for Bhopal, then which of the following is true?

(A) Pinku is recruited for Chennai.
(B) Chinku is recruited for Hyderabad.
(C) Minku is recruited for Bhopal.
(D) All the above

Directions for questions 10 and 11: These questions are based on the following information.

A group of three people Karan, Manohar and Jamal own one of the cars from Zen, Alto and Indica. Each of these cars are parked in different parking spaces P1, P2 and P3. It is known that Alto is parked in P2 and it does not belong to Manohar. Jamal owns Indica and Zen is not parked in P1.

10. Which car does Karan owns?

(A) Zen (B) Alto
(C) Indica (D) Either Zen or Indica

11. In which parking space did Jamal park his car?

(A) P1 (B) P2
(C) P3 (D) Either P1 or P3

Directions for questions 12 and 13: These questions are based on the following information.

Each of the four people Ramesh, Rajesh, Ramani and Ravan work for four different companies among TCS, CTS, Wipro and Accenture. Each of them belongs to a different city among Delhi, Kolkata, Mumbai and Chennai. The following information is known about them.

(1) Rajesh is from Kolkata but does not work in Wipro and the person who works in Wipro is not from Chennai.
(2) Ravan works neither in Wipro nor in Mumbai.
(3) Ramani works neither in Mumbai nor in Accenture.
(4) Ramesh works neither in TCS nor in Wipro and the person from Kolkata works neither in TCS nor in CTS.

12. Who is from Chennai?

(A) Ramesh (B) Rajesh
(C) Ramani (D) Ravan

13. Who is working in CTS?

(A) Ramesh (B) Rajesh
(C) Ramani (D) Ravan

Directions for questions 14 to 16: These questions are based on the following information.

Ten monkeys from A through J visit a garden which has tree bearing fruits, such as Mango, Guava, Banana and Berry.

Further it is known that:

(i) Only one monkey visited all the trees.
(ii) Every tree is visited by six monkeys.
(iii) A, D, E, G, I, J visited the Guava tree.
(iv) D, F, G did not visit the Berry tree.
(v) B, C, D, G, I, J visited the Banana tree.
(vi) J, A, H did not visit the Mango tree.
(vii) Every monkey visited at least one tree and exactly two monkeys visited one tree only.

14. Which of the following monkeys visited all the trees?

(A) D (B) G
(C) I (D) J

15. How many monkeys visited exactly three trees?

(A) 3 (B) 4
(C) 5 (D) 2

16. Which of the following monkeys have visited the Berry tree?

(A) B (B) C
(C) A (D) F

Directions for questions 17 to 19: These questions are based on the following information.

Six people P, Q, R, S, T and U carry an umbrella and a bag of six different colours while going to school. The colours of each of the umbrellas and each of the bags are one among red, yellow, green, blue, pink and black. None among them carries an umbrella and a bag of the same colour. Further the following information is known.

(i) S carries a blue coloured umbrella but not a black coloured bag.

(ii) The person who carries a pink coloured umbrella carries a green coloured bag.
(iii) P carries a red coloured bag but not a yellow coloured umbrella.
(iv) R carries a black coloured umbrella and T carries a yellow coloured bag.
(v) Q does not carry a black coloured bag.

17. Who carries a red coloured umbrella?
(A) T (B) U
(C) Q (D) Data inadequate

18. Which colour bag is carried by the person who carries a yellow coloured umbrella?
(A) Blue (B) Black
(C) Pink (D) Either (A) or (C)

19. Which of the following is the correct combination of the person, colour of umbrella and bag he/she carries, respectively?
(A) Q – Red – Blue (B) Q – Red – Black
(C) U – Red – Black (D) T – Red – Yellow

Directions for questions 20 to 22: These questions are based on the following information.

Eight boys from A through H gathered at a picnic. Each of them brought a different dish among P through W to the picnic. The following information is known about them.
(1) Neither A nor D brought S. Either B or E brought R.
(2) Either C or D brought P.
(3) Either G or F brought U.
(4) C brought neither S nor V. E brought W.
(5) Either H or D brought Q.
(6) Either A or F brought T. Neither G nor H brought S.

20. Which dish is brought by A?
(A) T (B) U
(C) W (D) V

21. Which of the following is a correct combination of the boy and the dish he brought?
(A) C – T (B) B – S
(C) C – Q (D) F – S

22. Who brought the dish V?
(A) A (B) B
(C) D (D) Cannot be determined

Directions for questions 23 to 26: These questions are based on the following information.

Each of the five people, namely Suman, Tarun, Uday, Yadav and Gopal is the owner of a field in a different city among A through E. Each of them planted different kinds of plants, such as guava, mango, apple, banana, and water-melon.

The following is known about them.
(1) Mango plants are not planted in the city A. Uday planted apple.
(2) One among banana and guava plants is planted by one among Tarun and Gopal in city E.
(3) Tarun planted watermelon and Suman does not own a field in the city C.
(4) Neither apple nor mango plants are planted either in city C or city D.
(5) Tarun does not have a field in D.

23. If Yadav planted guava, then who owns a field in city B?
(A) Uday (B) Yadav
(C) Suman (D) Tarun

24. Who owns a field in the city A?
(A) Uday (B) Yadav
(C) Tarun (D) Suman

25. Who owns a field in the city C?
(A) Yadav (B) Bhopal
(C) Tarun (D) Uday

26. If Suman planted mango plants, then which among the following is planted in the city D?
(A) Banana (B) Guava
(C) Water melon (D) Cannot be determined

Directions for questions 27 to 29: These questions are based on the following information.

A group of five friends Dweep, Manyata, Jagat, Poulami and Hemant, has at least one of the following items, such as pen, pencil, bag, ruler, calculator and eraser. Hemant has pen, pencil and calculator only. Jagat has calculator and pen only. Dweep has eraser and bag only. Poulami has eraser, bag and pencil only. Manyata has only one item. Each item is with at least one person.

27. Who has the ruler?
(A) Hemant (B) Poulami
(C) Manyata (D) Data inadequate

28. Which of the following gives the complete list of the people who have pencils?
(A) Hemant
(B) Poulami
(C) Hemant and Poulami
(D) Hemant, Dweep and Poulami

29. Which of the items is there with more than two friends?
(A) Pencil (B) Calculator
(C) Bag (D) None of these

Directions for questions 30 to 33: These questions are based on the following information.

A team of six professors, namely–Govind, Manoj, Prasad, Aravind, Bharath and Raman are scheduled to train newly appointed faculty members.

Each of the professors train the faculty members in a different subject, such as from Arithmetic, Logical Reasoning, Pure Maths, English, Currents Affairs and Communication

Skills on a different day among Monday, Tuesday, Wednesday, Thursday, Friday and Saturday of a week.

The following information is available about the schedule.

(1) Training in Pure Maths is scheduled on Tuesday but it is not by Aravind.
(2) Govind's session is scheduled on Wednesday but not in Logical Reasoning.
(3) The session on Current Affairs and Communication Skills are scheduled on two consecutive days.
(4) Aravind's session is scheduled on the day immediately after the day on which Manoj's session is scheduled.
(5) Prasad's session is on English but it is scheduled neither on Monday nor on Saturday.

30. Whose session is scheduled on Friday?
(A) Bharath (B) Raman
(C) Aravind (D) Manoj

31. Which subject is scheduled on Monday?
(A) Logical Reasoning
(B) Pure Maths
(C) Communication Skills
(D) English

32. If Aravind's session is on Current Affairs, then on which day of the week is the session on Communication Skills scheduled?
(A) Monday (B) Wednesday
(C) Thursday (D) Friday

33. On which day of the week is Prasad's session scheduled?
(A) Tuesday (B) Friday
(C) Thursday (D) Wednesday

Directions for questions 34 to 37: These questions are based on the following information.

In a garden there are seven different flower pots A, B, C, D, E, F and G, each of which is having a different flower among Buttercup, Carnation, Columbine, Crocus, Clover, Dahlia and Foxglove.

Each of the seven butterflies, such as P, Q, R, S, T, U and V feed on a different flower among the given but not necessarily in the same order.

(i) P feeds on the flower, which is in E.
(ii) Dahlia is not in pot F. S feeds on Crocus.
(iii) Columbine is in A, but neither U nor S feeds on that.
(iv) V and Q feed on Clover and Dahlia, which are in B and F.
(v) P and T feed on Carnation and Foxglove, but neither feeds on the flowers which is either in pot C or D.
(vi) If T feeds on Columbine, then Columbine is not in A.
(vii) E contains either Foxglove or Carnation.

34. Which butterfly feeds on Buttercup?
(A) P (B) R
(C) U (D) Cannot be determined

35. Foxglove is in which flower pot?
(A) B (B) E
(C) G (D) Cannot be determined

36. If Crocus is in C, then which flower is in D?
(A) Clover (B) Dahlia
(C) Foxglove (D) Buttercup

37. If V feeds on Dahlia, then Q feeds on
(A) Buttercup (B) Foxglove
(C) Clover (D) None of these

Directions for questions 38 to 40: These questions are based on the following information.

Twelve disciples Aman, Arjun, Arhan, Amith Akhil, Ajay, Bhuvan, Bharath, Balu, Bharani, Dharani and Danush were sent to different countries across the world to India, US, Bangladesh, Nepal, Bhutan and UK to spread the teachings of their Guru.

Exactly two disciples were sent to each country.

(i) Bharath and Dharani were sent to the same country, which is neither Bhutan nor the US.
(ii) Aman and Ajay were sent to a different country among UK and Bangladesh. Bhuvan was neither sent to Bhutan nor was he sent along with Ajay.
(iii) Aman and Balu were sent to the same country. Danush and Ajay were sent to different countries. Danush was not sent to the US.
(iv) One among Bharani, Balu and Akhil was sent to the US. The remaining two disciples were sent to different countries.
(v) The disciples having the same first letter in their names and also the same ending letters in their names were sent to Nepal.
(vi) The disciples who were sent to the same country, except Nepal, do not have the same starting letter of their names.

38. Which group of disciples were sent to India?
(A) Akhil, Bhuvan (B) Ajay, Bharani
(C) Bhuvan, Amith (D) Bharath, Dharani

39. If Aman was sent to Bangladesh, then Bharani was sent to
(A) India (B) UK
(C) US (D) None of these

40. Amith was sent to which country?
(A) India (B) Bangladesh
(C) Bhutan (D) UK

EXERCISE-2

Directions for questions 1 to 3: These questions are based on the following information.

A group of six friends A, B, C, D, E and F hailing from six different professions, such as engineer, doctor, professor, architect, lawyer and painter and they belongs to six different cities Kolkata, Bangalore, Hyderabad, Mumbai, Chennai and Delhi, may not be in the same order.

(i) The person from Bangalore is a doctor, who is not B.
(ii) A is an architect and C who is from Chennai, is an engineer.
(iii) The person from Delhi is a professor.
(iv) D is neither a professor nor the person from Bangalore is.
(v) E is from Mumbai and the person from Kolkata is neither an architect nor a lawyer.

1. What is the profession of F?
(A) Painter (B) Lawyer
(C) Professor (D) Doctor

2. What is the profession of the person from Kolkata?
(A) Architect (B) Doctor
(C) Painter (D) Lawyer

3. What is the profession of E?
(A) Professor (B) Lawyer
(C) Doctor (D) Painter

Directions for questions 4 to 7: These questions are based on the following information.

A group of five publishers, namely Prinston, Johnson, Holy Faith, Reprographics and Penguin published a book for competitive examinations. Each book contains three subjects, like Geography, Science, History, Polity and Mental ability. These books are arranged one over the other, three of these are second editions and two of these are first editions. The book published by Reprographic is the first edition and contains Geography. Only one book on science is the first edition. The three books containing science are stacked one over the other and both the first editions are stacked one over the other. All the second editions contain History. Neither of the first editions contains History. The book published by Holy Faith publishers contains Polity and Mental ability. The book published by Prinston publishers is at the top of the stack and the book published by Penguin publishers contains Mental ability and Geography. There is no book which contains both Science and Geography.

4. Which of the following is true?
(A) The 2nd book from the top is the 1st edition.
(B) The 3rd book from the top is the 2nd edition.
(C) The 2nd book from the bottom is the 1st edition.
(D) The bottommost book is the 1st edition.

5. Which of the following is definitely a correct combination of publishers of a book and its related subject?
(A) Penguin – History
(B) Holy Faith – History
(C) Reprographic – Science
(D) Johnson – Polity

6. Books of which publishers are on Polity?
(A) Prinston and Holy Faith
(B) Prinston and Reprographic
(C) Holy Faith and Reprographic
(D) Either (A) or (B)

7. Which among the following subjects can be contained in the least number of books?
(A) History (B) Science
(C) Polity (D) Geography

Directions for questions 8 to 10: These questions are based on the following information.

In a horse racing each of the six Jockeys, such as H, I, J, K, L and M is riding a different horse among Honey, Nunny, Pony, Rony, Tony and Sony but not necessarily in the same order. Each of the six gamblers Kamal, Krish, Kundan, Lohith, Rahul and Rohan bet on exactly one among the given horses. These horses were made to participate exactly in one race among the following races, such as Endurance race, Harness race, Flat race and Hunt race and finished the race in the top three positions only. No two of them got the same position in the same type of racing.

(i) Only Honey participates in Endurance race and its jockey is K. Only Tony finished the race in the 3rd position.
(ii) Kundan bets on the horse which participates in Harness race but did not finish the race in the 3rd position.
(iii) Lohith bets on the horse, whose jockey is M and finished the race either in the 1st or in the 2nd position.
(iv) Pony's jockey is H and participates in flat race. Nunny finished the race in the 1st position but its jockey neither I nor L.
(v) Among the given horses only two horses participate in Harness race. Neither of whose jockey is I.
(vi) Nunny, Honey and the horse whose jockey M finished the race in the same position.
(vii) I finished the race in the 2nd position. Rahul bets on a horse which finished the race in the 2nd position, but its jockey is not I.
(viii) Kamal bets on Sony, which participates with Rony in the same race. Rohan does not bet on Honey.

8. Which of the following statements is/are true?
(i) Sony participates in Hunt race.
(ii) Krish bets on Honey.
(iii) Sony finished the race in the 1st position.
(A) Only (i) (B) All the three
(C) Only (ii) (D) Only (i) and (ii)

9. Which jockey finished the race in the 1st position in Harness race?
(A) H (B) I
(C) J (D) M

10. Who bets on Rony?
(A) Kundan (B) Rahul
(C) Lohith (D) Cannot be determined

Directions for questions 11 to 14: These questions are based on the following information.

There are three students and three teachers, namely A, B, C, D, E and F. Each of these has taken three tests among the tests 1 through 6. Among which, two tests are only for students, two tests are only for teachers and two tests can be taken by both teachers and students. No two of them has taken the same set of tests.

(1) No test is taken by both A and D. Only test 6 is taken by both E and F.
(2) Test 5 is only for teachers while test 4 is only for students.
(3) E took the tests 1, 4 and 6 while A did not take test 5.
(4) Only test 3 is taken by both A and B.

11. What are the tests taken by D?
(A) 2, 5, 3 (B) 2, 5, 6
(C) 4, 1, 6 (D) 5, 1, 6

12. Which of the following tests are only for students?
(A) 1, 2 (B) 4, 1
(C) 5, 6 (D) 2, 5

13. How many people took the test 6?
(A) 3 (B) 2
(C) 4 (D) Cannot be determined

14. Which of the following tests is taken by C?
(A) 4 (B) 5
(C) 2 (D) 3

Directions for questions 15 to 17: These questions are based on the following information.

A group of three friends, namely Anand, Bhuvan and Chander have to select and buy some different music cassettes out of the six cassettes of six different singers, namely UB40, Vanessa, Williams, Xavier, Yellows and Zoloto.

Out of these three friends, one chooses five cassettes, another chooses four cassettes and the remaining person chooses three cassettes. There are exactly two different singers' cassettes, out of the six singers, which are bought by all the three people. No person has more than one cassette of the same singer. It is known that Bhuvan does not have UB40, Anand does not have Zoloto and Chander does not have Williams. The number of cassettes that Anand buys is more than the number of cassettes bought by Chander. Also, any person must have either UB40 or Zoloto, but not both. If a person has Vanessa, then he must have Yellows also. If a person has Yellows, then he must have Xavier also. Vanessa is bought by exactly one person. Also, each cassette is bought by at least one person.

15. Who has the least number of cassettes?
(A) Anand (B) Bhuvan
(C) Chander (D) Cannot be determined

16. Which among the following could be the group of cassettes belonging to only two owners?
(A) Xavier and Yellows (B) Zoloto and Williams
(C) UB40 and Zoloto (D) None of these

17. How many different arrangements are possible for the number of cassettes with the three friends?
(A) 6 (B) 3
(C) 2 (D) None of these

Directions for questions 18 to 20: These questions are based on the following information.

Eight students A, B, C, D, E, F, G, H went to four different places, such as Resort, Beach, Hotel and Cinema, such that each place was visited by two students each.

Each student visited exactly one place. After their return, their teacher asked them about the place visited by each of them. The following were their answers:

(i) A said 'I did not go with C or D and went to the Resort or the Cinema'.
(ii) B said 'I did not go with E or G and went to the Hotel or the Cinema'.
(iii) C said 'I did not go with D or F and went to the Beach or the Resort'.
(iv) D said 'I did not go with B or H and went to the Beach or the Hotel'.
(v) E said 'I went with B or C or D or F or H and went to the Cinema or the Beach'.
(vi) F said 'I did not go with A or G and went to the Resort or the Cinema'.
(vii) G said 'I went with B or D or E or F or H and went to the Beach or the Hotel'.
(viii) H said 'I did not go with C or A and went to the Resort or the Beach'.

18. Who went with A?
(A) E (B) B
(C) G (D) H

19. E went with _____ and visited the _____.
(A) C, Beach (B) F, Cinema
(C) D, Beach (D) G, Beach

20. If only D and H lied about the places visited by them, then with whom did D visit the place of his choice?
(A) H (B) F
(C) G (D) Cannot be determined

Directions for questions 21 to 24: These questions are based on the following information.

A journalist organization which publishes secret information leaks information about the black money of seven people J, K, L, M, N, P and Q who have black money in various branches of Swiss Bank. Each of them has a different amount of black money among ₹19,898, ₹2436, ₹4537, ₹6734, ₹28,116, ₹3624 and ₹8697 (in crores), but not necessarily in the same order.

Each person kept his/her black money in one of the branches among Geneva, London and Switzerland.

Atleast two people kept their black money in each branch.

(i) L's black money is not kept in Geneva branch. M's black money is not ₹3624.
(ii) Either P's or J's black money is ₹19,898 and both of them kept their black money in London branch.
(iii) Neither L's nor P's black money is the highest.
(iv) K's black money is more than N's black money and they kept their black money in the same branch. No other person kept his/her money in this branch.
(v) K's black money is the third highest. Only those persons whose black money is the least and the second least kept their black money in Geneva.

21. Whose black money is 4537 crores (in ₹)?
(A) M (B) L
(C) N (D) Cannot be determined

22. Whose black money is the fourth highest?
(A) L (B) N
(C) Q (D) Cannot be determined

23. Which of the following statements is/are true?
(i) M's black money is the least.
(ii) Q's black money is the highest.
(iii) L's black money is in London.
(A) Only (i) (B) Only (ii)
(C) Only (i) and (iii) (D) All the three

24. Three of the following four pairs are alike in a certain way based on the given information and hence, form a group. Find the one that does not belong to the group.
(A) K, M (B) M, N
(C) P, Q (D) P, K

Directions for questions 25 to 27: These questions are based on the following information.

Six people A, B, C, D, E and F are wearing a different coloured dress among red, green, blue, yellow, violet and white. Following is the information known about them.

(i) Neither C nor F is wearing either a red or a yellow coloured dress.
(ii) Neither of D and E is wearing the dress coloured as white, red or blue.
(iii) B is wearing either a green or a blue coloured dress.
(iv) Neither D nor F is wearing a violet coloured dress.
(v) E is not wearing either a green or a violet coloured dress.

25. Who is wearing the green coloured dress?
(A) B (B) C
(C) D (D) F

26. What colour dress is A wearing?
(A) Green (B) Blue
(C) Red (D) White

27. Who is wearing the white coloured dress?
(A) A (B) F
(C) C (D) Data inadequate

Directions for questions 28 to 31: These questions are based on the following information.

Four channels W through Z telecast six films in three slots 8 to 10, 10 to 12 and 12 to 2. The films are categorized as comedy, horror and action. The number of films in any category is not the same and no channel telecast movies in two consecutive slots. No channel telecast the movies of same category. Kumphu and Tom are telecasted by the same channel while the movies Micky and Karate are telecasted in the same slot. Karate is the only film telecasted by the channel W in the slot 10 to 12, but it is not an action movie.

Micky is the only comedy film. The films Hanuman and Tom are not telecast in the same slot. Vali the horror film is not telecasted in the slot 8 to 10 and not in the channel Z or Y.

28. Which of the following is/are the correct combinations of film and the slot in which it was telecasted?
(A) Hanuman – (8 to 10)
(B) Hanuman – (10 to 12)
(C) Vali – (10 to 12)
(D) Micky – (12 to 2)

29. Which films are telecasted in the slot 12 to 2?
(A) Hanuman – Kumphu
(B) Vali – Tom
(C) Kumphu – Karate
(D) Vali – Micky

30. Which of the following is true?
(A) The film Micky is telecasted by X.
(B) The film Vali is telecasted by Y.
(C) The film Tom is telecasted by Z.
(D) The film Hanuman is telecasted by channel X.

31. Films of which category are maximum in number?
(A) Comedy (B) Horror
(C) Action (D) Either (B) and (C)

Directions for questions 32 to 34: These questions are based on the following information.

Six people Anju, Sanju, Raju, Manju, Billa and Sruthi went to a play station to play a different game among Gothic 2, Max Payne, Mirror's Edge, Mount & Blade, Star Craft and The Last Express. The owner of the play station allotted a different cabin among 1 to 6 to each of these six people. Each of the above-mentioned games were released in a different year among 1997, 1998, 2001, 2002, 2008 and 2009.

(i) The game played by Raju was released in 2001. He played the game in an odd numbered cabin.
(ii) Sanju played the game in Cabin 2. Gothic 2 was released immediately after Max Payne.
(iii) Billa played the game in Cabin 1. The game played by Sruthi was released after the game, The Last Express was released and was allotted Cabin 6.
(iv) The names of the games played by Raju and Manju start with the same alphabet. Mount and Blade was released in 2008.
(v) Mirror's Edge was released recently and was played by Anju in an even numbered cabin.
(vi) Neither 'The Last Express' nor 'Star Craft' was played in Cabin 2.

32. Who played Star Craft?
(A) Sanju (B) Billa
(C) Sruthi (D) None of these

33. In which year was 'The Last Express' released?
(A) 2002 (B) 1998
(C) 1997 (D) 2001

34. In which cabin did Manju play the game?
(A) 6 (B) 5
(C) 3 (D) Cannot be determined

Directions for questions 35 to 37: These questions are based on the following information.

Eight employees from P through W of a company went for a tour to different cities, such as Bangalore, Hyderabad, Mumbai and Delhi in different months during April, September, October and December in a year. Those employees who went to the same place did not go in the same month. Exactly two employees went in the same month and exactly two employees went to the same place.

T went to Delhi in either October or April. V went in September to neither Hyderabad nor Mumbai. One of the employees who went to Bangalore went in December. S went in December. U and R went to the same place, R and W went in the same month. P, R and Q went to different places, but not to Mumbai and they went in different months, but not in April. P did not go in September.

35. Who went to Delhi?
(A) P (B) Q
(C) R (D) V

36. Who went in October?
(A) P (B) Q
(C) R (D) T

37. Which among the following group of employees went to the same place?
(A) P, S (B) Q, T
(C) V, Q (D) S, T

Directions for questions 38 to 40: These questions are based on the following information.

In a horse racing, each of the six Jockeys named as H, I, J, K, L and M is riding a different horse Honey, Nunny, Pony, Rony, Tony and Sony but not necessarily in the same order. Each of the six gamblers Kamal, Krish, Kundan, Lohith, Rahul and Rohan bet on exactly one among the given horses. These horses were made to participate exactly in one race, they were Endurance race, Harness race, Flat race and Hunt race and finished the race in the top three positions only. No two of them got the same position in the same type of racing.

(i) Only Honey participates in Endurance race and its jockey is K. Only Tony finished the race in the 3rd position.
(ii) Kundan bets on the horse which participates in Harness race but did not finish the race in the 3rd position.
(iii) Lohith bets on the horse, whose jockey is M and finished the race either in the 1st or in the 2nd position.
(iv) Pony's jockey is H and participates in Flat race. Nunny finished the race in the 1st position but its jockey neither I nor L.
(v) Among the given horses only two horses participated in Harness race. Neither of whose jockey is I.
(vi) Nunny, Honey and the horse whose jockey M finished the race in the same position.
(vii) I finished the race in the 2nd position. Rahul bets on a horse which finished the race in the 2nd position, but its jockey is not I.
(viii) Kamal bets on Sony, which participates with Rony in the same race. Rohan does not bet on Honey.

38. Which of the following statements is/are true?
(i) Sony participates in Hunt race.
(ii) Krish bets on Honey.
(iii) Sony finished the race in the 1st position.
(A) Only (i) (B) All the three
(C) Only (ii) (D) Only (i) and (ii)

39. Which jockey finished the race in the 1st position in Harness race?
(A) H (B) I
(C) J (D) M

40. Who bets on Rony?
(A) Kundan (B) Rahul
(C) Lohith (D) Cannot be determined

EXERCISE-3

Directions for questions 1 to 4: These questions are based on the following data.

Each of five people A, B, C, D and E owns a different car among Maruti, Mercedes, Sierra, Fiat and Audi and the colours of these cars are black, green, blue, white and red, not necessarily in that order. No two cars are of the same colour. It is also known that:

(i) A's car is not black and it is not a Mercedes.
(ii) B's car is green and it is not a Sierra.
(iii) E's car is not white and it is not an Audi.
(iv) C's car is a Mercedes and it is not blue.
(v) D's car is not red and it is a Fiat.

1. If A owns a blue Sierra, then E's car can be a
(A) Red Maruti (B) White Maruti
(C) Black Audi (D) Red Audi

2. If A owns a white Audi, then E's car can be a
(A) Red Maruti (B) Blue Maruti
(C) Green Audi (D) Black Sierra

3. If A's car is a red Maruti and D's car is white, then E owns a
(A) Black Audi (B) Blue Sierra
(C) Black Sierra (D) Blue Audi

4. If E owns a red Maruti and A's car is white, then D owns a
(A) Green Fiat (B) Black Fiat
(C) Blue Fiat (D) Red Fiat

Directions for questions 5 and 6: These questions are based on the following data.

In a college, there are ten lecturers enrolled in a lecture program. These lecturers have been grouped in any one of the four subjects, such as Physics, Chemistry, Biology and Maths. One professor is assigned to each of these four subject groups. Kunal, Kapil and Kamal will give lectures on the same subject. Kapil and Karishma belong to the same subject group. Karan and Kamini belong to the same subject group. Kusum cannot be with Kamal and Kiran cannot be with Karan. Kapil will deliver a lecture on Maths and Kiran delivers a lecture on the same subject as Kate. Each of Kapil, Karan, Kusum and Kiran delivers lecture on a different subject. Kamal and Kiran are lecturers for Chemistry and Kusum is not a lecturer of Physics. Amar, Beena, Chander and Deepak are professors of subject groups with number of lecturers as 4, 3, 2 and 1, respectively.

5. Which of the following statements must be true?
(A) Amar is the subject group professor of Kamal for Chemistry.
(B) Deepak is the subject group professor of Kusum for Biology.
(C) Beena is the subject group professor of Karan for Maths.
(D) Chander is the subject group professor of Karishma for Physics.

6. Who among the following is a lecturer in Maths?
(A) Karan (B) Kiran
(C) Kamini (D) None of these

Directions for questions 7 to 10: These questions are based on the following information.

A group of eight people, namely P, Q, R, S, T, U, V and W are travelling by the following cars, such as Honda city, BMW and Honda Brio. Each of them belongs to a different city and they are from Hyderabad, Chennai, Kolkatta, Pune, Bengaluru, Cochin, Baroda and Noida but not necessarily in the same order. The number of people travelling by any car is minimum two and maximum three.

Only two people, P and the one from Pune are travelling by BMW. R and T are travelling by different cars but they are neither from Bengaluru nor from Baroda. V is from Kolkata but not travelling by Honda Brio. R and W are travelling by same car. R is not from Cochin, W is not from Bengaluru. T is not from Pune and S is from Hyderabad. U is from Chennai and travelling by Honda City.

7. Who is from Noida?
(A) P (B) W
(C) Q (D) R

8. Which of the following group of people are travelling by Honda Brio?
(A) RUW (B) RVW
(C) QRW (D) SRW

9. In which car is the person from Baroda travelling?
(A) BMW
(B) Honda Brio
(C) Honda City
(D) Either BMW or Honda Brio

10. Which of the following is true regarding the given information?
(A) P is from Noida.
(B) W is from Pune.
(C) T is from Cochin.
(D) R is travelling by Honda city.

Directions for questions 11 to 13: These questions are based on the following information.

Eight people A, C, E, G, H, K, M and P have eight different animals, such as camel, lion, monkey, horse, elephant, cat, dog and tiger. They went to three different Zoos, namely

Zoo – I, Zoo – II and Zoo – III. At least two people and at most three people went to each zoo. The following information is known about them.

Only G and M went to Zoo – III and one of them has a dog. E has a monkey and went to Zoo – I. The person, who went to Zoo – II has a tiger but is not C. C and the person, who has a cat went to Zoo – II. Neither A nor K has a tiger, but one of them went to Zoo – II. A and H went to the same Zoo. H has an elephant. The person, who has a camel did not go to either Zoo – II or Zoo – III. The person who went to Zoo – III does not have a lion. One among G and C has a horse.

11. Who went to Zoo – I?
(A) G, H, E (B) A, H, C
(C) A, K, M (D) A, H, E

12. Who has a lion?
(A) K (B) A
(C) C (D) G

13. Who has a tiger?
(A) G (B) C
(C) P (D) None of these

Directions for questions 14 to 16: These questions are based on the following information.

A group of eight people, namely A, B, C, D, E, F, G and H belong to different colonies named as P, Q and R and three different streets I, II and III, but not necessarily in the same order. No two people who belong to the same colony belong to the same street. At least two and at most three people belong to each colony and each street.

A belongs to street I and C belongs to colony R. A and E belong to neither the same colony nor the same street. D and F belong to the same colony. G and C belong to the same street. F belongs to colony P and G belongs to neither street I nor street II. E and C do not belong to the same street. B and C do not belong to the same colony. H belongs to neither colony P nor colony Q. C, D and E belong to different colonies and different streets. A and B belong to neither the same colony nor colony P. B and G belong to the same street. G does not belong to colony Q.

14. To which colony does G belong?
(A) Q (B) R
(C) P (D) P or R

15. Which of the following is the correct combination of person, colony and street respectively?
(A) F – P – II (B) G – P – II
(C) G – II – P (D) F – II – P

16. Which group of persons belong to the same colony?
(A) D, F, G (B) F, G, H
(C) D, E, F (D) None of these

Directions for questions 17 to 19: These questions are based on the following data.

A group of five men, namely Kambli, Kumble, Kamlesh, Kareem and Kishan are working in the same company but are earning different salaries. They are married to five women, namely Kunti, Kirti, Kamini, Kareena and Karishma not necessarily in that order.

(1) The person who is married to Kirti is neither earning the maximum nor the minimum salary.
(2) The husband of Kamini is earning ₹5 lakh/annum.
(3) Kishan earns ₹6 lakh / annum.
(4) Kumble, the husband of Karishma, is earning ₹1 lakh/annum more than Kamlesh, who earns less than Kishan.
(5) Kambli, who is not married to Kamini is earning ₹4 lakh/annum more than Kareem.
(6) Each of the five men earns at least 1 lakh/annum. Each man's earnings is a natural number.

17. Who earns ₹5 lakh per annum?
(A) Kareem (B) Kamlesh
(C) Kambli (D) Kishan

18. Who is married to Kirti?
(A) Kamlesh (B) Kambli
(C) Kishan (D) Kareem

19. If Kambli is not married to Kunti, then whose husband is earning the minimum salary?
(A) Kunti (B) Kareena
(C) Karishma (D) Kamini

Directions for questions 20 to 22: These questions are based on the following information.

Six people A, B, C, D, E, and F belong to six different professions, each of them being Accountant, Doctor, Engineer, Editor, Painter, Teacher and they are sitting around a circular table not necessarily in the same order. The following information is known about their professions and seating arrangement.

The Doctor and the Teacher are adjacent to each other. B is either the Engineer or the Editor. Neither A nor D is a Doctor but one of them is an Accountant. The Engineer is sitting second to the right of A. The Doctor is sitting opposite to F. Either F or E is the Painter. C is either the Editor or the Accountant. The Editor is not sitting opposite to the Engineer.

20. Who is sitting opposite to the Engineer?
(A) A (B) B
(C) D (D) C

21. If the doctor is to the immediate left of B, then who is sitting to the immediate left of the Accountant?
(A) Painter (B) Editor
(C) Engineer (D) Cannot be determined

22. Which of the following statements is definitely true?

(A) The Teacher is sitting second to the left of the doctor.

(B) D is an Accountant.

(C) A is the Teacher.

(D) A is sitting opposite to the Editor.

Directions for questions 23 to 25: These questions are based on the following information:

Seven people A, B, C, D, E, F and G live on seven floors (ground floor is considered the first floor and the floor just above the first floor is considered the second floor and so on.) of an apartment building. Each person takes an exam on each of the days Sunday, Monday, Tuesday, Wednesday, Thursday, Friday and Saturday, not necessarily in the same order. The following information is known about them:

(i) There are three floors between C's floor and D's floor from top to bottom in that order.

(ii) Either B or E lives on the top floor. The person who lives on the top floor takes an exam on Wednesday.

(iii) Neither F nor G takes an exam on Tuesday and there is one person between F's floor and G's floor who takes an exam on Saturday.

(iv) The person who takes an exam on Tuesday does not live on an even-numbered floor.

(v) There are only two floors below A's floor.

(vi) C takes an exam either on Sunday or on Wednesday. Only two people live between B and G and one of them takes an exam on Monday.

(vii) The person who takes an exam on Thursday is adjacent to the person who takes an exam on either Saturday or Monday.

23. Who lives on the sixth floor?

(A) A (B) B

(C) C (D) E

24. A takes an exam on which day?

(A) Friday (B) Saturday

(C) Monday (D) Wednesday

25. How many people live between E and F?

(A) None (B) One

(C) Two (D) Three

ANSWER KEYS

Exercise-1

1. (B)	8. (D)	15. (B)	22. (D)	29. (D)	36. (D)
2. (B)	9. (D)	16. (C)	23. (C)	30. (D)	37. (C)
3. (D)	10. (B)	17. (A)	24. (A)	31. (A)	38. (D)
4. (B)	11. (A)	18. (B)	25. (C)	32. (D)	39. (B)
5. (B)	12. (D)	19. (D)	26. (D)	33. (C)	40. (C)
6. (A)	13. (A)	20. (A)	27. (C)	34. (C)	
7. (B)	14. (C)	21. (D)	28. (C)	35. (D)	

Exercise-2

1. (D)	8. (D)	15. (C)	22. (D)	29. (B)	36. (C)
2. (C)	9. (C)	16. (D)	23. (C)	30. (D)	37. (B)
3. (B)	10. (C)	17. (C)	24. (B)	31. (B)	38. (D)
4. (C)	11. (B)	18. (B)	25. (C)	32. (C)	39. (C)
5. (A)	12. (B)	19. (A)	26. (C)	33. (C)	40. (C)
6. (C)	13. (D)	20. (B)	27. (B)	34. (D)	
7. (D)	14. (D)	21. (D)	28. (A)	35. (B)	

Exercise-3

1. (A)	5. (B)	9. (B)	13. (C)	17. (A)	21. (A)	24. (B)
2. (D)	6. (D)	10. (C)	14. (C)	18. (C)	22. (D)	25. (D)
3. (B)	7. (D)	11. (D)	15. (A)	19. (A)	23. (D)	
4. (C)	8. (D)	12. (C)	16. (A)	20. (C)		

SOLUTIONS

EXERCISE-1

Solutions for questions 1 to 9:

1. The given information can be represented as follows:

Name	Colours
Bhanu	x yellow x black
Modi	x yellow x indigo
Ravindra	Black/indigo
Kamal	Indigo/black
Lalit	x indigo x white

Since neither Bhanu nor Modi is wearing a yellow coloured shirt, Lalit must be wearing a yellow coloured shirt.

2. Bond will not take a Sword or a Bow or Dagger. Bhima will not take a Gun or a Bow.
∴ Bow must be taken by Rama.
Sword and Mace can be taken by Bhima only and Rama has to take the Dagger, as Bond will not take the Dagger.
∴ Gun and Arrow is taken by Bond.

3. From 1, we know that Suman did not write JMET. From 2 and 3, we know that Swaroop did not go to Hyderabad or Nagpur (as he did not write CET which was conducted in Nagpur). From 5, we know that Sachin went to Mumbai which means Swaroop did not go to Mumbai, which implies that she must have gone to Vijayawada and written either JMET or CAT.
From 4, we know that Sagar did not write CAT or CET (as he did not go to Nagpur) and from the last statement we also know that Sagar did not write XAT, which means that he must have written JMET. This implies that Swaroop wrote CAT.
∴ Swaroop goes to Vijayawada and writes CAT.

4. Forming a grid between the trains and the cities, we get the following arrangement:

	Delhi	Goa	Chennai	Bangalore	Hyd
GT_{XP}	× (i)	× (v)	× (i)	× (iii)	✓ (v)
AP_{XP}	× (v)	•	× (iv)	•	× (ii)
Raj_{XP}	× (iv)	× (iv)	✓ (iv)	× (iii)	× (iv)
Goa_{XP}	× (v)	•	× (iv)	•	× (v)
$B'lore_{XP}$	✓ (v)	× (v)	× (iv)	× (iv)	× (v)

(i) $GT_{XP} \neq$ Delhi, Chennai

(ii) Hyd $\neq AP_{XP}$, Goa_{XP}

(iii) Bangalore = Goa_{XP} or AP_{XP}
$\Rightarrow$ Bangalore $\neq Raj_{XP}$, GT_{XP}, $Bangalore_{XP}$

(iv) Raj_{XP} = Chennai

(v) Either Goa_{XP} = Hyd
or $Bangalore_{XP}$ = Delhi
As $Goa_{XP} \neq$ Hyd, $\Rightarrow Bangalore_{XP}$ = Delhi
$\Rightarrow GT_{XP}$ = Hyd
Now, let us analyse the choices:

(A) **Either p or q:**
Implications: $\sim p \Rightarrow q$ and $\sim q \Rightarrow p$.
But p is true (i.e., Chennai is visited by Raj_{XP}), hence, q may or may not be true (i.e., Goa may or may not be visited by AP_{XP}). Hence, (A) will not help in completing the arrangement.

(B) **Only if p, then q:**
Implications: $q \Rightarrow p$; $\sim p \Rightarrow \sim q$
Here, Bangalore is not visited by the $Bangalore_{XP}$ ($\sim p$), which implies that Goa is not visited by the Goa_{XP} ($\sim p \Rightarrow \sim q$). Hence, this statement helps in completing the arrangement.

(C) **If p, then q:**
Implications: $p \Rightarrow q$; $\sim q \Rightarrow \sim p$
Both p and q are not decided here, as it is not known whether Goa_{XP} visits Bangalore or not, and AP_{XP} visits Goa or not.

(D) **If p, then q:**
Here, Delhi is visited by $Bangalore_{XP}$, means that q is true, but can't say whether p is true or not (since $p \Rightarrow q$).
Hence, it is only (B) which helps in completing the arrangement.

5. Given S is the wife of B, D is not the husband of P, P is not the wife of A, E is the husband of T. Since P's husband is neither D nor A, P's husband should be C. So, P is the wife of C.

6. From clues (A) and (D), Rajesh is from Kolkata and is working in Accenture. From (B) and (C), Ravan and Ramani are not from Mumbai. So, Ramesh is from Mumbai. From (D) we can say Ramesh is from CTS. Hence, Ramani is from Wipro. Since the person from Wipro is not from Chennai, Ravan is from Chennai.
∴ The final arrangement is as follows.

Name	Company	Place
Ramesh	CTS	Mumbai
Rajesh	Accenture	Kolkata
Ramani	Wipro	Delhi
Ravan	TCS	Chennai

Ramesh is working in CTS.

7. The given information can be tabulated as follows.

Name	Chocolate	Colour
Manju		Red
Sanju		Blue/Orange
Tanooj	Kit Kat	
Pooja		

Orange coloured box contains Dairy milk, it is possible only when Sanju received Orange coloured box. The complete distribution is as follows.

Name	Chocolate	Colour
Manju	Bar one	Red
Sanju	Dairy milk	Orange
Tanooj	Kit Kat	Yellow
Pooja	Eclairs	Blue

Choice (B) is true statement.

8. Let the analysis be as follows.

	Number of student		
Subject	**Passed**	**Failed**	**Total**
Physics	a	b	g
Maths	c	d	h
Chemistry	e	f	i
Total			

From the given information, we derive:

$e = \frac{i}{2},\ f = \frac{i}{2},\ a = c,\ d = f,\ b = \frac{3g}{10},\ g + h + i = 40$

$d = 100,\ f = 100,\ i = 200,\ e = 100,$

$b = \frac{3g}{10} \Rightarrow a = \frac{7g}{10} \Rightarrow c = \frac{7g}{10}$

$h = c + d = \frac{7g}{10} + 100$

$\therefore\ g + h + i = g + \frac{7g}{10} + 100 + 200 = 470$

$\frac{17g}{10} = 170$

$g = 100$

$\therefore\ a = 70,\ b = 30,\ c = 70,\ h = 170$

$\therefore$ (A), (B) and (C) are true.

9. The given information can be tabulated as follows.

Name	City	Department
Minku		
Tinku	Kolkata	
Pinku		Electronics
Chinku		

From the given information Chinku does not belong to Electronics, hence, she / he is from Civil, and Chinku is not from Bhopal. Minku is from Bhopal and is an Electronic student. Chinku is from Hyderabad while Pinku is from Chennai.

$\therefore$ All the given statements are true.

Solutions for questions 10 and 11: Given that the Alto is parked in P2 and it does not belong to Manohar and Jamal owns an Indica. Since Jamal owns an Indica, the Alto should be owned by Karan. So, Manohar owns a Zen and it is parked in P3.

The final arrangement is as follows.

Name	Car	Parking Space
Karan	Alto	P2
Manohar	Zen	P3
Jamal	Indica	P1

10. Karan owns an Alto.

11. Jamal parked his car in P1.

Solutions for questions 12 and 13: From clues (A) and (D) Rajesh is from Kolkata and is working in Accenture. From (B) and (C), Ravan and Ramani are not from Mumbai. So, Ramesh is from Mumbai. From (D), we can say that Ramesh is from CTS. Hence, Ramani is from Wipro. Since the person from Wipro is not from Chennai, Ravan is from Chennai.

$\therefore$ The final arrangement is as follows.

Name	Company	Place
Ramesh	CTS	Mumbai
Rajesh	Accenture	Kolkata
Ramani	Wipro	Delhi
Ravan	TCS	Chennai

12. Ravan is from Chennai.

13. Ramesh is working in CTS.

Solutions for questions 14 to 16: Given, every tree is visited by 6 monkeys, total sum of the number of trees visited by all the monkeys is 24, i.e., 4×6.

14. The monkey that visited all the trees cannot be D as it did not visit the Berry tree, it cannot be G as it did not visit the Berry tree, it cannot be J as it did not visit the Mango tree.
$\therefore$ The monkey that visited all the trees is I.

15. It is known that the number of monkeys that visited all the trees is 1 and those that visited only one tree is 2. Let the number of monkeys that visited 3 trees be x and those that visited 2 trees be y.
$1(4) + x(3) + y(2) + 2(1) = 24$
$\Rightarrow 3x + 2y = 18$
and we know that $x + y = 7$
$\therefore x = 4$.

16. From the given data, the monkeys that visited only one tree must be F and H as F did not visit Guava, Berry and Banana trees and H did not visit Guava, Banana and Mango trees.
$\therefore$ A must visit at least two trees as it did not visit the Banana and Mango tree, means it should visit the Berry and Guava trees. We cannot say anything about the remaining monkeys.

Solutions for questions 17 to 19: The given information is represented in the following table.

Name	Umbrella	Bag
P	× Yellow	Red
Q		× black
R	Black	× black
S	Blue	× black
T		Yellow
U		

From the above table it is clear that U carries a black coloured bag.
From (ii) and the above table, S does not carry a blue, black, red, green or yellow coloured bag.
$\therefore$ S carries a pink coloured bag.
From (ii) the pink coloured umbrella and green coloured bag are carried by Q.
$\therefore$ R carries a blue coloured umbrella.
As P is not carrying a yellow coloured umbrella, P is carrying the green coloured umbrella.
$\therefore$ T cannot carry a yellow coloured umbrella.
U is carrying a yellow coloured umbrella.
T is carrying the red coloured umbrella
The final table is as follows.

Name	Umbrella	Bag
P	Green	Red
Q	Pink	Green
R	Black	Blue
S	Blue	Pink
T	Red	Yellow
U	Yellow	Black

17. T is carrying a red coloured umbrella.

18. U is carrying a yellow coloured umbrella and the colour of his bag is black.

19. T – Red – Yellow is the correct combination.

Solutions for questions 20 to 22: From (1) and (4), E brought W, B brought R.
From (3), C did not bring U.
From (4), C brought neither S nor V.
From (5) and (6), C did not bring Q or T.
C did not bring S, Q, V, U, R, W or T.
$\therefore$ C brought dish P.
From (1) and (6), none among A, D, G and H brought S.
$\therefore$ F brought S and A brought T. G brought U and D and H brought Q and V in any order.

Boy	Dish
A	T
B	R
C	P
D	Q/V
E	W
F	S
G	U
H	Q/V

20. A brought the dish T.

21. F – S is the correct combination

22. Either D or H brought the dish V.

Solutions for questions 23 to 26: From (1) and (4), mango is not planted in the city A or C or D.
From (2), either banana or guava is planted in city E. Hence, mango is not planted in city E.
$\therefore$ Mango is planted in city B. From (2), apple is planted by Uday in city A.

From (2) and (3), Tarun planted watermelon and hence, Gopal owns a field in City E.

From (3), Suman owns a field either in the city B or in city D. Tarun owns a field in city C. From (2), Gopal planted banana or guava. We get the following distribution.

Field	Plant	Person
A	Apple	Uday
B	Mango	Yadav/Suman
C	Water melon	Tarun
D	Guava/Banana	Suman/Yadav
E	Banana/Guava	Gopal

23. Yadav planted Guava plants. Hence, he owns a field in city D.
∴ Suman owns a field in city B.

24. Uday owns a field in the city A.

25. Tarun owns a field in city C.

26. Mango is planted in the city B.
Either Guava or Banana is planted in city D.

Solutions for questions 27 to 29:

Name	Item
Hemant	Pen, Pencil, Calculator
Jagat	Calculator, Pen
Dweep	Eraser, Bag
Poluami	Eraser, Bag, Pencil

As none among Hemant, Jagat, Dweep and Poulami has a ruler, Manyata has ruler.

27. Manyata has a ruler.

28. Hemant and Poulami have pencils.

29. None of the items is present with more than two people.

Solutions for questions 30 to 33: Let us use the first letter of the names to represent respective professors and first two letters to represent the subjects.

From (1) and (2), we have

Mon		
Tues	Pu	A^x
Wed	Lo^x	G
Thu		
Fri		
Sat		

∴ From (5) Prasad's session is on English but it is scheduled neither on Monday nor on Saturday. It cannot even be on Friday because if it is Friday, (4) cannot be satisfied. Hence, Prasad's session is scheduled on Thursday. Hence, Manoj's session and Arvind's session are scheduled on Friday and Saturday respectively.

And from (3), the distribution is as follows.

Day	Subject	Faculty
Monday	Lo	B/R
Tuesday	Pu	R/B
Wednesday	Ar	G
Thursday	En	P
Friday	Cu/Co	M
Saturday	Co/Cu	A

30. Manoj's session is scheduled on Friday.

31. Logical Reasoning is scheduled on Monday.

32. In the given case Communication Skills is scheduled on Friday.

33. Prasad gives his orientation on Thursday.

Solutions for questions 34 to 37: The given information can be tabulated as shown below.

Flower pot	Flower	Butterfly
A	Columbine	✘ U ✘ S
B		
C		✘ T
D		✘ T
E		P
F	✘ Dahlia	
G		

From (iv) and the above, Dahlia is in B and Clover is in F. V and Q feed on Clover and Dahlia is in any order.

From (vi) and the above, T feeds on the flower which is in G. Hence, R feeds on Columbine and S and U are in C and D in any order.

From (v), (vii) and the above, E and G contains Foxglove and Carnation in any order. U feeds on Buttercup.

∴ The final distribution is as shown below.

Flower pot	Flower	Butterfly
A	Columbine	R
B	Dahlia	V/Q
C	Buttercup/Crocus	S/U
D	Crocus/Buttercup	U/S
E	Foxglove/Carnation	P
F	Clover	Q/V
G	Carnation/ Foxglove	T

34. U feeds on Buttercup.

35. E or G

36. Buttercup

37. Clover

Solutions for questions 38 to 40: The given information can be tabulated as shown below.

Country	Group of disciples
India	
US	✘ Bharath ✘ Dharani ✘ Danush
Bangladesh	(Aman, Balu)/(Ajay, ✘ Bhuvan, ✘ Danush)
UK	(Ajay/Aman, Balu) ✘ Bhuvan ✘ Danush
Nepal	
Bhutan	✘ Bharath, ✘ Dharani, ✘ Bhuvan
UK	(Ajay/Aman, Balu) ✘ Bhuvan ✘ Danush

From (v) and the above, Arjun and Arhan were sent to Nepal. Bharath and Dharani were sent to India. Bhuvan was sent to US and Danush was sent to Bhutan.

From (vi) and the above, Bharani and Ajay were sent to the same country.

From (iv) and the above, Akhil was sent to US and Amith was sent to Bhutan.

∴ The final distribution is as shown below.

Country	Group of disciples
India	Bharath, Dharani
US	Bhuvan, Akhil
Bangladesh	(Aman, Balu)/(Ajay, Bharani)
Nepal	Arjun, Arhan
Bhutan	Danush, Amith
UK	(Ajay, Bharani)/(Aman, Balu)

38. Bharath and Dharani were sent to India.

39. Bharani was sent to UK.

40. Amith was sent to Bhutan.

EXERCISE-2

Solutions for questions 1 to 3: The given information is as follows.

Name	Profession	Place
A	Architect	
B	Not Doctor	Not Bangalore
C	Engineer	Chennai
D	Not Professorr	Not Bangalore
E		Mumbai
	Not Architect Not Lawyer	Kolkata

The doctor from Bangalore cannot be any one among A, B, C, D and E. Hence, it is F.

Since D is not a professor, he is not from Delhi.

⇒ B is the professor from Delhi.

Since, the person from Kolkata is not an Architect, A is from Hyderabad and D is from Kolkata.

⇒ D is the Painter and E is the Lawyer.

The final distribution is as follows.

Name	Profession	Place
A	Architect	Hyderabad
B	Professor	Delhi
C	Engineer	Chennai
D	Painter	Kolkata
E	Lawyer	Mumbai
F	Doctor	Bangalore

1. F is the doctor.

2. The painter is from Kolkata.

3. E is the lawyer.

Solutions for questions 4 to 7: From the given information, the publishers are as follows:

(1) Reprographic publishers
(2) Holy Faith publishers
(3) Prinston publishers
(4) Penguin publishers and
(5) Johnson publishers

Three books are on History, three books are of 2nd edition, and two books are of 1st edition.

Three books are on Science out of which one is 1st edition and two are 2nd editions.

The books published by Penguin and Reprographic publishers contain Geography. No book contains both Geography and Science.

∴ Books published by Johnson, Prinston and Holy Faith publishers contain Science and are stacked together.

Since no book contains Geography and Science and all the Science books are stacked together, the books containing Geography, i.e., Reprographic and Penguin are stacked together. The Reprographic book is 1st edition. Since the other 1st edition books contain Science, Penguin must be the second edition book, with History, Geography and Mental ability.

∴ Reprographics book is on Geography, Polity and Mental ability.

Holy Faith's book is on Polity, Mental ability and Science; hence, it is 1st edition and is stacked together with Reprographic book. Hence, the order of the books from top to bottom are Prinston, Johnson, Holy Faith, Reprographic and Penguin.

Johnson and Prinston publisher's books are 2nd editions and both of them are on Science, History and either Polity or Mental ability. The final distribution is as follows.

Order from Top	Publishers	Edition	Subjects
1	Prinston	2	History, Science, Polity or Mental ability.
2	Johnson	2	Science, History, Polity or Mental ability.
3	Holy faith	1	Science, Polity and Mental ability.
4	Reprographic	1	Geography, Polity and Mental ability.
5	Penguin	2	Geography, History and Mental ability.

4. The second book from the bottom is 1st edition.

5. The book published by Penguin publishers is on History and it is the only correct combination.

6. Reprographic and Holy Faith books are on Polity.

7. Geography is published by the least number of publishers.

Solutions for questions 8 to 10: The given information can be tabulated as shown below.

Jockey	Horse	Race type	Gambler	Position
H	Pony	Flat		
I	✘ Nunny	✘ Harness	✘ Rahul	2nd
J				
K	Honey	Endurance	✘ Rohan	
L	✘ Nunny			
M			Lohith	1st/2nd

From (iv), (vi) and the above, J rides on Nunny. Honey and M finished the race in the 1st position.

From (i) and the above, Tony's jockey is L.

From (vii), (ii), (v) and the above, Rahul bets on Pony; Nunny participates in Harness race.

From (viii) and the above, I rides on Sony, M rides on Rony and Rohan bets on Tony. I and M participate in Hunt Racing. Krish bets on Honey.

∴ The final distribution is as shown below.

Jockey	Horse	Race type	Gambler	Position
H	Pony	Flat	Rahul	2nd
I	Sony	Hunt	Kamal	2nd
J	Nunny	Harness	Kundan	1st
K	Honey	Endurance	Krish	1st
L	Tony	Harness	Rohan	3rd
M	Rony	Hunt	Lohith	1st

8. Only (i) and (ii) are true.

9. J finished the race in the 1st position.

10. Lohith bets on Rony.

Solutions for questions 11 to 14: It is given that, there are three students and three teachers among six persons A through F.

Each one of them took three tests among six tests 1 through 6.

2 tests are only for teachers.
2 tests are only for students.
2 tests are common for all.

From (1), no test is taken by both A and D. So, among A and D one is a student and the other one is a teacher in any order. From (3), A did not take test 5.

From (2), Test 5 is for only teachers. Hence, A is a student and D is a teacher.

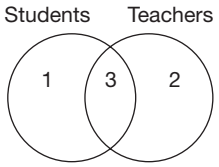
From (1) and (4), we can conclude that tests 3 and 6 are common for both teachers as well as students.

From (2), test 4 is only for students.

From (3), as E took tests 1, 4 and 6.

Test 1 is only for students and test 2 is only for teachers.

The above results can be represented as follows.



The different possible combinations are:

For students	For teachers
143	253
146	256
361	236
364	536

As, E took the tests 1, 4 and 6, E is a student.

A is a student and D is a teacher.

From (1), B is a Teacher.

As only test 6 is given by both E and F. E is a student and F is a teacher, C is a student.

A – Student
B – Teacher
C – Student
D – Teacher
E – Student
F – Teacher

From (4), A and B took only test 3 together.

A took tests 1, 4 and 3.

D took tests 2, 5 and 6 (from (1)).

Hence, C took either 1, 3, 6 or 3, 4, 6, i.e., 3, 6 and (1 or 4).

Similarly, F took 3, 6 and (2 or 5).

B took test 3.

The final combination is as follows.

		Tests		
A	Student	1	3	4
B	Teacher	3		
C	Student	3	6	1/4
D	Teacher	2	5	6
E	Student	1	4	6
F	Teacher	3	6	2/4

11. D took the tests 2, 5 and 6.

12. Test 1 and 4 are only for students.

13. Either four or five persons took test 6.

14. Among the given test C took test 3.

Solutions for questions 15 to 17: Let us take down the data as below:

(i) Three friends – Anand, Bhuvan and Chander (A, B, C).

(ii) Six singers/cassettes: UB40, Vanessa, Williams, Xavier, Yellows and Zoloto (U, V, W, X, Y, Z).

(iii) The three friends choose 5, 4 and 3 cassettes in any order.

(iv) Exactly 2 different singers' cassettes belong to all the three (2 singers common to all the three friends).

(v) $B \neq U$; $A \neq Z$; $C \neq W$.

(vi) $A > C$ (Number of cassettes)

(vii) Each person has either U or Z, but not both.

(viii) If a person has Vanessa, he must have Yellows.
(If $V_{\checkmark} \Rightarrow Y_{\checkmark}$)

(ix) If a person has Yellows, he must have Xavier.
(If $Y_{\checkmark} \Rightarrow X_{\checkmark}$)

(x) Vanessa is bought by exactly one person.
$\Rightarrow$ Vanessa is owned only by the person who has 5 cassettes.

(xi) Each cassette must be bought by at least one person.

Let us analyse the given data. We assume that V is bought by all the three friends (condition (iv), then Y must also be bought. But if Y is bought by all the three, then they must buy X also [From conditions (viii) and (ix)]. Now there will be three different cassettes (V, Y, X), which are bought by all the three, which violates condition (iv) (exactly two cassettes should be common among all the three friends). Hence, these two singers' cassettes, which are common among all the three friends must be Y and X. Also, A does not have Z, then he must have U [condition (vii)]. Similarly, B does not have U, then he must have Z. Now we get the following arrangement:

	U	V	W	X	Y	Z
$A \neq 3$	✓	..	..	✓	✓	✗
B	✗	..	..	✓	✓	✓
$C \neq 5$	..	✗	✗	✓	✓	..

Now, as A has more cassettes than C, hence, A cannot have least (i.e., 3) number of cassettes. Also, C cannot have maximum (i.e., 5) number of cassettes.

According to condition (vii), C must have exactly one cassette out of U and Z (hence, C's total now is 3 cassettes) and he will not have V. Thus

C = 3 cassettes
A = 4 or 5 cassettes
$\Rightarrow$ B = 4 or 5 cassettes.

15. C has the least number of cassettes, i.e., three.

16. X and Y are not only bought by two people, but by three people. UB40 and Zoloto cannot be bought together. A does not have Zoloto and C does not have W. Hence, only two people having same two cassettes is not possible.

17. There are only two arrangements which are possible. They are:

A	:	5	4
B	:	4	5
C	:	3	3

Solutions for questions 18 to 20: It is given that A did not go with C or D means A went with B or E or F or G or H (i)

Similarly,

B went with A or C or D or F or H (ii)
C went with A or B or E or G or H (iii)
D went with A or C or E or F or G (iv)
E went with B or C or D or F or H (v)
F went with B or C or D or E or H (vi)
G went with B or D or E or F or H (vii)
H went with B or D or E or F or G (viii)

From (i) and (v), we get:
A and E do not go with each other.
From (i) and (vi), we get:
A and F do not go with each other.
From (i) and (vii), we get:
A and G do not go with each other.
From (i) and (vii), we get:
A and H do not go with each other.
Hence, A and B go together.

Similarly, we can determine the names of the other people who go together. After this is done we get the following table.

	A	B	C	D	E	F	G	H
A	✗	✓	✗	✗	✗	✗	✗	✗
B	✓	✗	✗	✗	✗	✗	✗	✗
C	✗	✗	✗	✗	✓	✗	✗	✗
D	✗	✗	✗	✗	✗	✗	✓	✗
E	✗	✗	✓	✗	✗	✗	✗	✗
F	✗	✗	✗	✗	✗	✗	✗	✓
G	✗	✗	✗	✓	✗	✗	✗	✗
H	✗	✗	✗	✗	✗	✓	✗	✗

We can find out the places visited by them using the same logic as given above.

The places visited by them are as follows.

	A	B	C	D	E	F	G	H
Resort	✗	✗	✗	✗	✗	✓	✗	✓
Beach	✗	✗	✓	✗	✓	✗	✗	✗
Cinema	✓	✓	✗	✗	✗	✗	✗	✗
Hotel	✗	✗	✗	✓	✗	✗	✓	✗

A and B went to the Cinema.
C and E went to the Beach.
D and G went to the Hotel.
F and H went to the Resort.

18. B goes with A.

19. E went with C and they visited the Beach.

20. If D and H lied about the places they visited, then H goes along with G to the Hotel and D goes along with F to the Resort.

Solutions for questions 21 to 24: The given information can be tabulated as shown below.

Person	Bank Branch	Black Money (in cores)
J	London	
K	✗ Geneva	₹8697
L	✗ Geneva	✗ ₹28,116
M		✗ ₹3624
N		
P	London	✗ ₹28,116
Q		

From (iv) and (v), M and Q kept their black money in Geneva. N's black money is either ₹6734 or ₹4537. K and N kept their black money in Switzerland. L kept his black money in London. J's black money is ₹28,116.

From (ii) and the above, P's black money is 19,898.

From (i) and above, M's black money is ₹2436 and Q's black money is ₹3624. L's black money is either ₹4537 or ₹6734. Therefore, the final distribution is as shown below.

Person	Bank Branch	Black Money (in cores)
J	London	₹28,116
K	Switzerland	₹8697
L	London	₹4537/₹6734
M	Geneva	₹2436
N	Switzerland	₹6734/₹4537
P	London	₹19,898
Q	Geneva	₹3624

21. Either L's or N's black money is ₹4537 crores.

22. Either L's or N's black money.

23. Only (i) and (iii).

24. Except in (B), in the remaining pairs, the first person's black money is more than the second person's black money.

Solutions for questions 25 to 27: From (i), (ii) and (iii) none among C, F, D, E and B is wearing a red coloured dress. Hence, A is wearing the red coloured dress.

∴ From (iv), A, B, D or F is not wearing a violet coloured dress.

From (v) E is not wearing a violet coloured dress.

C is wearing the violet coloured dress.

Again, E is not wearing a white, blue or green coloured dress.

E is wearing the yellow coloured dress.

None among B, C and E is wearing a white coloured dress,

∴ F is wearing white coloured dress.

As D is not wearing a blue coloured dress, D is wearing the green coloured dress.

∴ B is wearing the blue coloured dress. The final distribution table is as follows.

A – Red
B – Blue
C – Violet
D – Green
E – Yellow
F – White

25. D is wearing a green coloured dress.

26. A is wearing a red coloured dress.

27. F is wearing a white coloured dress.

Solutions for questions 28 to 31: It is given that six different films are telecasted in four channels, in three slots. The films are Karate, Micky, Tom, Vali, Hanuman and Kumphu.

The channels – W, X, Y, Z.

Slots – 8 to 10, 10 to 12, 12 to 2.

Categories – Comedy, Horror, Action.

As the number of films in any category is not the same, the number of movies is 1, 2 and 3 in different categories.

As no channel telecast movies in two consecutive slots, a channel which telecasts in (10 to 12) slot does not telecast any other movie. Kumphu and Tom are telecast by the same channel, hence, neither of these movies were telecast in (10 to 12) slot. The movies Micky and Karate are telecast in the same slot. It is also given that Karate is telecast by the channel W in (10 to 12) slot. Hence, Micky is also telecasted in the same slot by another channel. Micky is the only comedy film. Hanuman and Vali are telecasted by the same channel in the slots (8 to 10) and (12 to 2). As Vali is not telecasted in (8 to 10) slot, it is telecasted by the channel X in (8 to 10) slot and Vali in (12 to 2). As Hanuman and Tom are not telecasted in the same slot, Tom is telecasted in (12 to 2) slot and Kumphu in (8 to 10) slot by either Y or Z channel. As Karate is not an action movie, it is a horror film as there is only one comedy film. As Vali is a horror movie, Hanuman is an action movie (as no channel telecast two films of the same category).

Between the films Tom and Kumphu, one is a horror film and the other one is an action movie, in any order. The above results can be represented as follows.

	8 to 10	10 to 12	12 to 2
W		Karate	
X	Hanuman		Vali
Y/Z	Kumphu		Tom
Z/Y		Micky	

Comedy	Horror	Action
Micky	Karate Vali Tom/Kumphu	Hanuman Tom/Kumphu

28. Hanuman – (8 to 10) is the correct combination.

29. Vali and Tom are telecasted in the slot 12 to 2.

30. Hanuman is telecasted by channel X is true.

31. Horror movies are maximum in number.

Solutions for questions 32 to 34: The given information can be tabulated as shown below.

Person	Cabin	Game	Year of release
Anju	4	Mirror's Edge	2009
Sanju	2	✗ The Last Express ✗ Star Craft	✗ 1997
Raju	3/5	Max Payne	2001
Manju		Mount & Blade	2008
Billa	1		
Sruthi			

From (i) and the above, Gothic 2 was released in 2002.

From (iii) and the above, Manju played the game in either Cabin 5 or Cabin 3. Sruthi played Star Craft in Cabin 6 and it was released in 1998. Hence, Billa played 'The Last Express' and it was released in 1997. Sanju played 'Gothic 2'.

∴ The final distribution is as shown below.

Person	Cabin	Game	Year of release
Anju	4	Mirror's Edge	2009
Sanju	2	Gothic 2	2002
Raju	3/5	Max Payne	2001
Manju	5/3	Mount & Blade	2008
Billa	1	The Last Express	1997
Sruthi	6	Star Craft	1998

32. Sruthi.

33. 1997.

34. Either 5 or 3.

Solutions for questions 35 to 30: The given information can be tabulated as shown below.

Employee	Place	Month
P	✗ Mumbai	✗ September ✗ April
Q	✗ Mumbai	✗ April
R	✗ Mumbai	✗ April
S		December
T	Delhi	October/April
U		
V	✗ Hyderabad ✗ Mumbai	September
W		

Given, U and R went to the same place. Hence, U should not go to Mumbai and S and W went to Mumbai, U and R went to Hyderabad, since only one of P, Q and R went to Hyderabad and exactly two employees went to the same place. Given, R and W went in the same month. Hence, it is not April and also neither December nor September, since, exactly two employees went in the same month. Hence, it is October. Therefore, T went in April, P went to Bangalore in December, Q went in September, U went in April and V went to Bangalore.

∴ The final distribution is as shown below.

Employee	Place	Month
P	Bangalore	December
Q	Delhi	September
R	Hyderabad	October
S	Mumbai	December
T	Delhi	April
U	Hyderabad	April
V	Bangalore	September
W	Mumbai	October

35. Q went to Delhi.

36. R went in October.

37. (Q, T) went to the same place.

Solutions for questions 38 to 40: The given information can be tabulated as shown below.

Jockey	Horse	Race type	Gambler	Position
H	Pony	Flat		
I	✗ Nunny	✗ Harness	✗ Rahul	2nd
J				
K	Honey	Endurance	✗ Rohan	
L	✗ Nunny			
M			Lohith	1st/2nd

From (iv), (vi) and above, J rides on Nunny. Honey and M finished the race in the 1st position.

From (i) and above, Tony's jockey is L.

From (vii), (ii), (v) and above, Rahul bets on Pony; Nunny participates in Harness race.

From (viii) and above, I rides on Sony, M rides on Rony and Rohan bets on Tony. I and M participate in Hunt Racing. Krish bets on Honey.

∴ The final distribution is as shown below.

Jockey	Horse	Race type	Gambler	Position
H	Pony	Flat	Rahul	2nd
I	Sony	Hunt	Kamal	2nd
J	Nunny	Harness	Kundan	1st
K	Honey	Endurance	Krish	1st
L	Tony	Harness	Rohan	3rd
M	Rony	Hunt	Lohith	1st

38. Only (i) and (ii) are true.

39. J finished the race in the 1st position.

40. Lohith bets on Rony.

EXERCISE-3

Solutions for questions 1 to 4: We have the following table which can be filled as we go through the statements.

	A	B	C	D	E
Car					
Colour					

From statements (i), (ii), (iii), (iv) and (v), we can fill up the following.

	A	B	C	D	E
Car			Mercedes	Fiat	
Colour		Green			

We have used all the information given and hence, we can now start answering the questions.

1. If A owns a blue Sierra, then B owns Audi (because E cannot own Audi) and hence, E owns a Maruti. Similarly, if A's car is blue, then E's car will be red or black. Hence, E will have red Maruti or black Maruti.

2. If A owns white Audi, then E will own Sierra (because B cannot own a Sierra). Only choice (D) has Sierra. (Also note that if A owns a white car, then the colour of E's car can be blue, red or black).

3. If A's car is Maruti, then E can only own a Sierra. If A's car is red and D's white, then E can only own a blue car (because C's car cannot be blue). Hence, E has a blue Sierra.

4. If E owns a red car and A owns a white car, then D can have only a blue car (because C cannot have a blue car).

Solutions for questions 5 and 6:

5. It is given that each of Kapil, Karan, Kusum and Kiran is a lecturer in different subject. Kapil teaches Maths, Kiran is a lecturer in Chemistry and Kusum is not a lecturer in Physics.
⇒ Kusum is a lecturer in Biology and Karan is a lecturer in Physics.
It is given that Kunal, Kamat and Karishma belong to the same subject group as Kapil, i.e., Maths.
It is given that Kamal is a lecturer of Chemistry and Kiran and Kate teach the same subject.
Hence, Kamal, Kiran and Kate teach Chemistry.
Kamini is in the same subject group as Karan, i.e., Physics.
It is given that Amar, Beena, Chander and Deepak are the professors of the subject groups with a lecturer strength of 4, 3, 2 and 1, respectively.
As per the given instructions, we get the following arrangements:

Maths	Physics	Biology	Chemistry
Kapil Kamat Kunal Karishma	Karan Kamini	Kusum	Kiran Kate Kamal
4	2	1	3
Amar	Chandar	Deepak	Beena

Only (B) is correct.

6. None of the given names belongs to the subject group Maths.

Solutions for questions 7 to 10: The given information can be represented in the tabular form as follows.

Name of the people	City	Car
P		BMW
Q		
R	Cochin (×) Bengaluru (×) Baroda (×)	
S	Hyderabad	
T	Pune (×) Bengaluru (×) Baroda (×)	
U	Chennai	Honda City
V	Kolkata	Honda Brio
W	Bengaluru (×)	

Different cars

Same cars

From the given information, V is not travelling by Honda Brio, we can say that V is travelling by Honda City, since the person who is travelling by BMW is from Pune.

Also, we can say that only two people are travelling by BMW.

From the given information, R and W are travelling by the same car, we can say that they are travelling by Honda Brio.

∴ T, U and V are travelling by Honda City.

As S is from Hyderabad, he cannot travel by BMW.

S, R, W are travelling by Honda Brio.

Q is from Pune and is travelling by BMW.

P is from Bengaluru, since R, T and W cannot be from Bengaluru.

∴ W is from Baroda.

As R is not from Cochin, T is from Cochin.

∴ R is from Noida.

The final arrangement is as follows.

Name of the person	City	Car
P	Bengaluru	BMW
Q	Pune	BMW
R	Noida	Honda Brio
S	Hyderabad	Honda Brio
T	Cochin	Honda City
U	Chennai	Honda City
V	Kolkata	Honda City
W	Baroda	Honda Brio

7. R is from Noida.

8. R, S and W are traveling by Honda Brio.

9. W is travelling by Honda Brio and is from Baroda.

10. Choice (C) is true.

Solutions for questions 11 to 13: Given that only G and M, went to Zoo – III and one of them has a dog. E has a monkey and went to Zoo – I. The person, who went to Zoo – II has a tiger, but is not C. C and the person, who has a cat, went to Zoo – II. Neither A nor K has a tiger, but one of them went to Zoo – II. A and H went to the same Zoo. H has an elephant. So, A cannot go to Zoo – II as already the person who has a tiger and C went to Zoo – II and A cannot go to Zoo – III as only G and M went to Zoo – III. Hence, A and H went to Zoo – I and hence, K went to Zoo – II. As K does not have a tiger, K has a cat. Three people A, E and H went to Zoo – I, so P went to Zoo – II and therefore, P has a tiger. The person, who has a camel did not go to either Zoo – II or Zoo – III. So A, who went to Zoo – I has a camel. The person, who went to Zoo – III, does not have a lion, hence, C has a lion. One among G and C has a horse. As C already has a lion, G has a horse and therefore, M has a dog.

∴ The tabular form of the people, their animals and the Zoo to which they went is as follows.

Person	Zoo	Animal
A	I	Camel
C	II	Lion
E	I	Monkey
G	III	Horse
H	I	Elephant
K	II	Cat
M	III	Dog
P	II	Tiger

11. A, H and E went to Zoo – I.

12. C has a lion.

13. P has a tiger.

Solutions for questions 14 to 16: The given information can be tabulated as shown below.

Name of the person	Colony	Street
A	xP	I
B	xP	
C	R	
D		
E		
F	P	
G	xQ	III
H	R	

From the given information, A and E belong to neither the same colony nor the same street. So, E belongs to either street II or street III. D and F belong to the same colony. Hence, D belongs to colony P. G and C belong to the same street, hence, C belongs to street III. E and C do not belong to the same street. Hence, E belongs to street II as E cannot belong to the same colony as A and C. B and C do not belong to the same colony, hence, B belongs to colony Q. C, D and E belong to different colonies and different streets. Hence, D belongs to street I as C and E belong to street III and street II, respectively and E belongs to colony Q as C and D belong to colony R and P, respectively. A and B neither belongs to the same colony nor colony P. Hence, A belongs to colony

R. B and G belong to the same street. Hence, H belongs to street III. The given condition is that the people who belong to the same colony do not belong to the same street. Hence, H belongs to street II as A and C belong to street I and III, respectively and at least two and at most three people belong to each colony and each street. Hence, G belongs to colony P and F belongs to street II.

∴ The final arrangement is as shown below.

Name of the person	Colony	Street
A	R	I
B	Q	III
C	R	III
D	P	I
E	Q	II
F	P	II
G	P	III
H	R	II

14. G belongs to colony P.

15. The correct combination of person, colony and street respectively is 'F – P – II'.

16. D, F and G belong to the same colony.

Solution for questions 17 to 19:

Males	Females	Salary (₹ lakh/annum)
Kambli		$x + 4$
Kumble	Karishma	$x + 1$
Kamlesh		X
Kareem		
Kishan		6

$x + y$ is a natural number and $x \geq 1$

$\Rightarrow x$ is a natural number.

Also, from (4), $x < 6$

If $x = 5$, then salary (in lakh/annum) of husband of Karishma

$= x + 1 = 6$.

This is not possible as each earns a different salary

$\Rightarrow x \neq 5$.

If $x = 4$

Salary (in lakh/annum) of Kumble $= x + 1 = 5$.

This contradicts rule (2).

If $x = 2$

Salary of Kambli (in lakh/annum) $= x + 4 = 6$ salary of Kishan.

This is not possible as each earns a different salary.

If $x = 1$,

Salary (in lakh/annum) of Kambli $= x + 4 = 5$,

This implies, from rule (2), that Kambli must be married to Kamini, which however violates the condition (5) $\Rightarrow x \neq 1$

The only possible value of $x = 3$.

Males (husband)	Females (wives)	Salary (₹ lakh/annum)
Kumble	Karishma	4/3/2
Kamlesh	(Kareeena/Kunti)	3/2/1
Kareem	Kamini	5
Kishan	Kirti	6
Kambli	Kunti/Kareena	9

17. Kareem earns ₹5 lakh/annum.

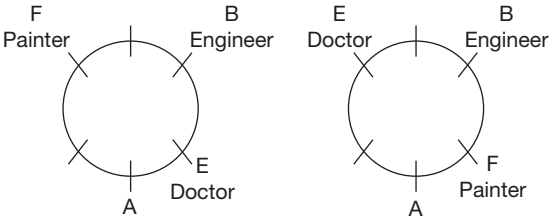
18. Kishan is married to Kirti.

19. Kambli is not married to Kunti, implies Kamlesh is married to Kunti, then the husband of Kunti earns the minimum salary.

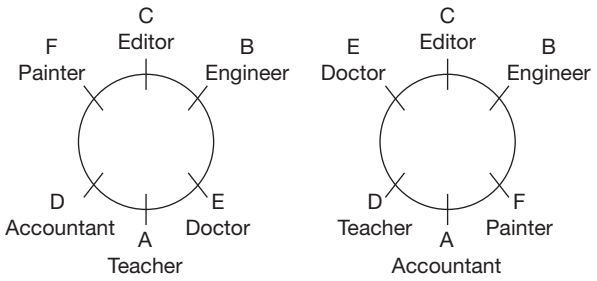
Solutions for questions 20 to 22: B is either Engineer or Editor. Neither A nor D is a Doctor. But exactly one of them is an Accountant. Either E or F is Painter and C is either an Editor or an Accountant. But either A or D is an Accountant. Hence, C is the Editor and B is the Engineer. The information can be represented in the following table. Since E is the Doctor, F is the Painter.

Person	Profession
A	Teacher/Accountant
B	Engineer
C	Editor
D	Accountant/Teacher
E	Doctor
F	Painter

It is given that the Engineer is sitting second to the right of A and the Doctor and F are sitting opposite to each other. We have the following possible arrangements.



Since, the Editor is not sitting opposite to the engineer. Hence, the final arrangements will be as follows.



20. D is sitting opposite to the engineer.

21. The Painter is sitting to the left of the Accountant.

22. 'A is sitting opposite to the Editor' is definitely true.

Solutions for questions 23 to 25: It is given that there are three floors between C's floor and D's floor from top to bottom. Either B or E lives on the top floor and takes exam on Wednesday. Let us represent these points in the following floor arrangement.

Also given that neither F nor G takes the exam on Tuesday and there is one person between them who writes exam on Saturday.

Since there are only two floors below A's floor which means that A lives on the third floor. The possible arrangements are as follows:

Floor	Person	Day
7	B/E	Wednesday
6	F/G	Saturday
5	C	
4	G/F	
3	A	
2		
1	D	
1	D	

Floor	Person	Day
7	B/E	Wednesday
6		
5	C	
4	F/G	
3	A	Saturday
2	G/F	
1	D	

Since either B or E takes an exam on Wednesday, C takes an exam on Sunday and therefore, case (i) is eliminated. Also given that only two people live between B and G, B should live on the top floor and G should live on the fourth floor and as B takes an exam on Wednesday, G takes an exam on Monday.

Floor	Person	Day
7	B	Wednesday
6	E	
5	C	Sunday
4	G	Monday
3	A	Saturday
2	F	
1	D	

Since, the person who takes an exam on Tuesday does not live on an even – numbered floor. Hence, D takes an exam on Tuesday. Also given that the person who takes an exam on Thursday is adjacent to the person who takes an exam on either Saturday or Monday. The only possibility is F takes an exam on Thursday and E takes on Friday. The final arrangement is as follows.

23. E lives on the sixth floor.

24. A takes an exam on Saturday.

25. Three people live between E and F.

4 Selections

CHAPTER

Learning Objectives

In this chapter, we will:

- Understand how to interpret the conditions given in the question and write down the same in an unambiguous form.
- Find the number of teams that can be formed subject to the constraints/conditions.
- Learn to choose a team(s) without violating the given constraints.
- Learn how to choose a team(s) where multiple parameters are specified.

In this category of questions, a small group of items or people have to be selected from a larger group satisfying the given conditions. The conditions will specify as to when a particular item or person can be included or cannot be included in the subgroup. For example, the condition may specify that two particular people should always be together or that two particular people should not be together.

Sometimes, the conditions given for selection or non-selection of items or people may be based on logical connectives like if-then, either-or, unless, etc. You should be careful in interpreting the logical connectives used in the conditions.

Method of answering the questions:

- Step (i): Analyse the given conditions.
- Step (ii): Try to combine conditions.
- Step (iii): Apply the conditions to the questions.

SOLVED EXAMPLES

Directions for questions 4.01 to 4.05: These questions are based on the following information.

Amit, Bittu, Chintu, Dumpy, Falgun, Hitesh, Ronit, Purav and Saurav are nine players from among whom three teams consisting respectively of 4 members, 3 members and 2 members must be formed subjecting to the following conditions.

Chintu must have three more players with him while Dumpy must have only two more with him.

Chintu and Saurav cannot be in the same team.

Purav and Bittu cannot be in the same team.

Ronit and Hitesh must be in the same team.

4.01: If Dumpy, Falgun, Purav form the team of 3 members, then which of the following must be true?

(A) Hitesh must be in a team with Bittu.

(B) Saurav must form a two-member team with Amit or Chintu.

(C) Saurav must form a two-member team with Bittu or Amit.
(D) Chintu should form a team of 4 members with Hitesh, Ronit and Amit.

4.02: If Dumpy takes Amit as a part of his three-member team, which of the following must go into Chintu's team?
(A) Bittu and Hitesh
(B) Hitesh and Ronit
(C) Purav and Ronit
(D) Purav and Falgun

4.03: If Chintu and Falgun are together and Saurav is in the team of two members, then how many sets of different teams are possible?
(A) 4 (B) 3
(C) 2 (D) 1

4.04: If Chintu does not have Purav in his team and the two-member team consists of Saurav and Amit, then Chintu should take
(A) Hitesh, Bittu and Ronit
(B) Bittu but not Ronit
(C) Bittu and Falgun
(D) Hitesh and Ronit

4.05: If Purav is in the same team as Chintu and Falgun, then Saurav must be in the same team as
(A) Bittu (B) Bittu and Amit
(C) Amit (D) Bittu and Dumpy

Solutions for questions 4.01 to 4.05: It is given that:
Chintu must form a team of 4 members only.
Dumpy must form a team of 3 members only.

Since Chintu and Dumpy are in two different teams, let us for a convenience, denote the two teams as the respective teams of these two persons. Let us call the team with four members as the first team and the team with three members as the second team. The third team should have two people.

Number of members		
4	3	2
Chintu	Dumpy	Saurav
	Saurav	

Now let us take the other conditions and fill them up in the table above.

Chintu and Saurav cannot be in the same team.
Saurav will be in the second or the third team.
Purav and Bittu cannot be in the same team.
Hitesh and Ronit must be in the same team.

We cannot represent these two conditions right now in the table above but we will use them as we go along.

4.01: If Dumpy, Falgun, Purav form the team of 3 members, then Saurav should be in the third team.
Since Hitesh and Ronit must be in the same team, they have to be in the first team. That leaves only Amit or Bittu to be with Saurav in the third team.
(Also, note that we can eliminate choice (B) easily.)

4.02: Dumpy takes Amit as a member of his team.
If we take Hitesh and Ronit as the two members of the third team, then Saurav has to be in the second team, in which case we will have both Purav and Bittu coming into the same team, the first team, which is not possible.
Since Saurav cannot be in Chintu's team and Purav and Bittu cannot be in the same team, the three people required for Chintu's team will have to be Hitesh and Ronit, Falgun or Purav or Bittu.

4.03: Let us analyse the conditions. It is given that Chintu and Falgun are together, whereas Saurav is in the team of two members. Let us fill up these details in the box that we made above and then see in how many ways we can fill up the remaining cells in the box.

Chintu	Dumpy	Saurav
Falgun		

First let us look at Hitesh and Ronit who must be in the same team.
They can go into the first team or the second team. Let us consider these two cases.
Case 1: Hitesh and Ronit go into the first team. Then, one out of Bittu and Purav will go into the third team and the other into the second team. This gives rise to two ways of forming the teams, one with Bittu in the second team and the other with Bittu in the third team.
Case 2: Hitesh and Ronit go into the second team.

In this case too, one out of Bittu and Purav will go into the third team and the other into the second team. Hence, this will also give rise to two ways of forming the teams.
Hence, there are total four ways of forming the teams.

4.04: Let us use the table that we built in the initial analysis and fill up the details that we have in this problem.
Since the two-member team is already formed and Chintu does not take Purav, hence, Purav will have to go into the second team.

Chintu	Dumpy	Saurav
	Purav	Amit

Since Ronit and Hitesh have to be in the same team, they should go into the first team. Since Bittu cannot go with Purav, he should also be in the first team. This leaves Falgun for the second team. Thus, we can fill up the table as follows:

Chintu	Dumpy	Saurav
Ronit	Purav	Amit
Hitesh	Falgun	
Bittu		

4.05: If Purav is with Chintu and Falgun, then Bittu cannot be with them. Since Ronit and Hitesh should be together, the only other person left is Amit. These four members form the first team.
If Hitesh and Ronit together form the two-member team, then Bittu and Saurav will be part of the three-member team.
Instead, if Hitesh and Ronit are in the three-member team, then Saurav and Bittu will form the two-member team.
In either case, Saurav and Bittu are together in one team.

Directions for questions 4.06 to 4.09: These questions are based on the following information.

A, B, C, D, E, F and G are seven players. They form two teams of two players each and one team of three players. A and B cannot be in the same team. B and C cannot be in the same team whereas E and F must be in the same team. G and D cannot be in the same team.

4.06: If C, D and A form a team of three players, which of the following can be the members of one of the other teams?
(A) A and E (B) G and B
(C) E and F (D) Both (B) and (C)

4.07: If E, F and G form a team of three members, then in how many ways can the remaining two teams of two players each be formed?
(A) 2 (B) 4
(C) 3 (D) 1

4.08: If D and A are not in the same team, then altogether in how many ways can the teams of two members be formed?
(A) 4 (B) 7
(C) 8 (D) 5

4.09: If B, E and F form a team of three members, which of the following cannot be the two teams of two members each?
(A) AC, GD (B) AD, CG
(C) AG, CD (D) Both (A) and (B)

Solutions for questions 4.06 to 4.09: Let Team I be of 3 players, Team II be of 2 players and Team III be of 2 players.

It is given that A and B cannot be together. We will represent it as A × B.

Similarly, we have B × C and G × D.

E and F must be in the same team. So, E and F can form a team of 2 members on their own or can form a team of 3 members with another person.

Let us now take up the questions and work them out.

4.06: Given that C, D, A form a team of 3 members, one of the other teams has to have E and F together. Hence, B and G should form one team. Choice (D)

4.07: Given that E, F, G form a team of 3 players. Since A and B or B and C cannot be in the same team, we must necessarily have A and C together in one team and B and D in the other team. So, the teams can be formed only in one way.

4.08: Given that A and D are not in the same team.
Hence, A × B, B × C, G × D and A × D.
We already know that E and F must be in the same team. They may form a team of 3 members or they themselves be a team of 2 members. Let us consider the above two possibilities and then fill up the other teams. They can be formed as follows:

	Team I	Team II	Team III
1.	A E F	B D	C G
2.	A E F	C D	B G
3.	B E F	A G	C D
4.	C E F	A G	B D
5.	D E F	A C	B G
6.	G E F	A C	B D
7.	A C G	B D	E F

Thus, the teams can be formed in 7 ways.

4.09: If B, E, F form a team of 3 members, then the two members teams must be formed from A, C, D, G. The teams can be AD and CG or AG and CD. As D and G cannot form a team, AC and GD cannot be formed. (Please note that we can answer this question from the answer choices.) From choice (A), we find that G and D are together in one team which is not possible. Thus, choice (A) is the answer.

Directions for question 4.10: Select the correct alternative from the given choices.

4.10: At least two boys out of A, B, C and D and at least two girls out of P, Q, R and S have to be chosen to form a group of 5 members.
Neither A nor C can go with Q.
Neither P nor S can go with B.
Q and R cannot be together.

Which of the following is an acceptable team?

(A) ARCQP (B) ASQPD
(C) ASQRP (D) PSRAD

Solution for question 4.10:

4.10: The required group of 5 members must be formed with at least two boys from A, B, C, D and at least 2 girls from P, Q, R, S.
Answers (A), (B) and (C) can be ruled out as A and Q cannot be together.
In choice (D), P, S, R, A, D can be together without violating any of the given conditions.

EXERCISE-1

Directions for question 1 to 6: Select the correct alternative from the given choices.

1. Adam, Andy, Anil, Ann, Jack, John, James and Jill want to go to a nearby city. Only two vehicles, a van and a car are available. Only Alen and Jack know how to drive the van, hence at least one of them must be in the van.
Each vehicle has a seating capacity of exactly four people.
Adam and Anil cannot go in the same vehicle and John and James must go in the same vehicle.
Which of the following cannot be the list of people who are in the car?
(A) John, James, Andy, Alen
(B) Adam, James, John, Jack
(C) Anil, James, John, Jill
(D) Anil, Andy, Jill, Alen

2. A group of five is to be formed from a group of nine students A, B, C, D, E, F, G, H and I.
If A is selected, then F is selected. If F is selected, then D is not selected.
G is selected only if I is selected.
If H is selected, then C is not selected. If B is not selected, then C is selected.
If D is selected, then who among the following must be selected?
(A) C (B) G
(C) D (D) I

3. Each of P, Q and R has to select two items from the six items, such as A, B, C, D, E and F.
If P selects A, then Q does not select E.
Only if R selects E, Q does not select B.
If P selects D, then R will not select C.
If P does not select F, then R will select B.
If Q selects E, then P selects
(A) B and D (B) F and D
(C) C and D (D) F and C

4. A team of three students is to be selected for a quiz competition, a group of students, namely Ankita, Chanchal, Surbhi, Neha and Kanchan such that if Chanchal is selected, then Kanchan should not be selected. Unless Surbhi is selected Neha is selected. Which of the following students must be selected?
(A) Ankita (B) Chanchal
(C) Surbhi (D) None of these

5. A team of four is to be selected from three boys, namely Ajay, Sujay, Vijay and three girls Ena, Meena, Deepa such that exactly two boys are selected. Ajay and Ena should not be selected together. If and only if Meena is selected, then Vijay is selected. In how many ways can the team be selected?
(A) 4 (B) 3
(C) 2 (D) 1

6. A team of three is to be selected from six people, namely from Pavan, Sravan, Raghavan, Aman, Dawan and Bhavan such that if one of Pavan and Sravan is selected then the other must not be selected. If one of Raghavan and Dawan is not selected, then the other must not be selected. If Aman is not selected, then who among the following will not be selected?
(A) Pavan
(B) Bhavan
(C) Raghavan
(D) More than one of the above

Directions for questions 7 to 9: These questions are based on the following data.
A team of five players is to be selected from a group of ten players, such as A, B, C, D, E, F, G, H, I and J.
(i) Exactly one of G and H must be selected.
(ii) H and A must be selected together, if selected.
(iii) B and F must be selected together, if selected.
(iv) F and J cannot be selected together.
(v) C and D cannot be selected together.

7. Which of the following statements must be true?
(A) If G is selected, then B is selected.
(B) If G is selected, then at least one of E and I is selected.
(C) If H and B are selected, then E cannot be selected.
(D) If J is not selected, then B is selected.

8. If G is selected, then which of the following can be the group of players who are not selected?
(A) H, A, F, D, I
(B) H, A, D, E, I
(C) H, C, D, J, A
(D) H, D, J, E, I

9. If G is not selected and J is selected, then the total number of possible selections are
(A) Four (B) Five
(C) Two (D) Six

Directions for questions 10 to 13: These questions are based on the following information.
From a group of five batsmen P, R, S, U and X and five bowlers Q, T, V, W and Y, a group of five players is to be selected. The group must consist of exactly two batsmen.

It is also known that:
(i) At most one among S and Q must be selected.
(ii) Exactly two among R, U, X and V must be selected.
(iii) If R or X is selected, then none among Q, V and T are selected.
(iv) If P is selected, then neither T nor W is selected.

10. Among the batsmen, who must be selected?
(A) R (B) U
(C) X (D) None of these

11. Among the bowlers who must be selected?
(A) Q (B) Y
(C) T (D) None of these

12. If X is selected, then who among the following must be selected?
(A) D (B) U
(C) P (D) Such a case is not possible

13. How many different groups of players can be selected?
(A) 2 (B) 3
(C) 4 (D) 6

Directions for questions 14 to 16: These questions are based on the following information.

A team of three people is to be selected from a group of five people, namely from A, B, C, D and E under the following constraints.
(i) If A is selected, then B must be selected.
(ii) If C is not selected, then E must be selected.

14. In how many ways can the team be selected?
(A) Eight (B) Six
(C) Seven (D) None of these

15. If D is not selected, then who must always be selected?
(A) A (B) B
(C) C (D) E

16. Which of the following is not a possible team?
(A) C, E, D (B) E, A, B
(C) C, B, D (D) A, B, D

Directions for questions 17 to 21: These questions are based on the following information.

A team is to be selected from nine people, namely from R, S, T, U, V, W, X, Y and Z under the following constraints.
(i) If either R or S is selected, then Y must not be selected.
(ii) At least one of W and Z must be selected.
(iii) Unless both T and U are selected then V is selected.
(iv) If and only if W is selected, then Y is selected.
(v) Whenever X is selected, then S must also be selected.

17. What can be the maximum possible number of people selected in a team?
(A) 4 (B) 5
(C) 6 (D) 7

18. What is the minimum possible number of people selected in a team?
(A) 2 (B) 3
(C) 4 (D) 0

19. Which among the following groups can form a team?
(A) TWYZ (B) XYWVU
(C) TUSX (D) None of these

20. In how many ways can a team of four people be selected?
(A) 12 (B) 13
(C) 14 (D) 15

21. If X is selected, then in how many ways can a team of four people be selected?
(A) 4 (B) 2
(C) 3 (D) 1

Directions for questions 22 to 25: These questions are based on the following information.

A team of delegates is to be formed from a group of ten people, N through W by subjecting to the following conditions.
(i) If Q is selected, then none among U, V or W can be selected. Also, U, V and W cannot be selected together.
(ii) If R is selected, then either S or T must be selected. But S and T cannot be selected together.
(iii) At least one out of N, O and P must be selected.
(iv) If P is selected, then neither N nor O can be selected.
(v) N and R cannot be selected together.
(vi) N and Q cannot be selected together.
(vii) P and V cannot be selected together.
(viii) P and W cannot be selected together.

22. If a team of four is selected and Q being one of them, then which of the following must be selected?
(A) R (B) O
(C) T (D) S

23. What is the maximum possible size of a selected team?
(A) Four (B) Five
(C) Six (D) Seven

24. What is the maximum possible size of the team if P is selected?
(A) Four (B) Five
(C) Six (D) Seven

25. In how many different ways can the team be selected if Q is selected?
(A) Seven (B) Eight
(C) Nine (D) Ten

Directions for questions 26 to 28: These questions are based on the following information.

Vijay asked Ajay to select 6 pens of different colours from the available ten colours, such as Orange, Red, Blue, White, Pink, Yellow, Black, Grey, Violet and Brown.

Vijay has laid down some conditions for Ajay, as given below:

(i) If Ajay selects the Blue pen, then he must select the Orange pen also and vice versa.
(ii) If Ajay selects the Grey pen, then he must select the Black pen also and vice versa.
(iii) If Ajay selects the Yellow pen, then he cannot select the Grey pen.
(iv) Exactly one of Red and Violet pens must be selected.

26. If Ajay does not select the Grey or the Brown pen, then among the following choices he can reject the
(A) Pink pen (B) White pen
(C) Red pen (D) Orange pen

27. Which of the following can be the list of colours of pens selected by Ajay?
(A) Yellow, Pink, White, Blue, Brown, Orange.
(B) Red, Blue, Orange, White, Grey, Yellow.
(C) Black, Grey, Brown, Violet, Pink, White.
(D) Red, Pink, Blue, Orange, Violet, White.

28. Which of the following can confirm the selection of pens?
(A) Blue and Yellow pens are selected.
(B) Red and Grey pens are selected.
(C) Orange and Red pens are not selected.
(D) Grey pen is not selected, but the Orange pen is selected.

Directions for questions 29 to 33: These questions are based on the following information.

A team of five members is to be selected from four boys, namely Arjun, Sreekar, Bhavan and Dawan and four girls, namely from Sheela, Rama, Karuna and Nayana under the following constraints.

(i) At least two girls and at least two boys must be selected.
(ii) Sreekar and Karuna cannot be selected together.
(iii) Unless Bhavan is selected, Nayana cannot be selected.
(iv) At most two of Arjun, Dawan and Rama can be selected.
(v) If Sheela is selected, then at most one of the other three girls can be selected.

29. If three girls are selected, then in how many ways can the team be selected?
(A) 5 (B) 4
(C) 3 (D) 2

30. If three boys are selected, then in how many ways can the team be selected?
(A) 7 (B) 8
(C) 9 (D) 10

31. Who must be selected?
(A) Arjun (B) Bhavan
(C) Sreekar (D) Dawan

32. If Sheela is selected, then who is the other girl who must be selected?
(A) Rama (B) Karuna
(C) Nayana (D) None of these

33. If Karuna and Sheela are selected, then who must be selected?
(A) Arjun
(B) Dawan
(C) Nayana
(D) More than one of the above

Directions for questions 34 to 37: These questions are based on the following information.

A company gives an opportunity to its employees to go for a vacation among the months April, May, August, November and December in a year. The employees are A, B, C, D, E, F, G, H, I, J, K, L, M and N. The company gives choice to the employees for selecting the month in which they want to go on a vacation.

But it is stipulated that at least two and at most three persons go on vacation in a month.

(i) F, I, and K want to go on vacation in the same month, but after the month in which J wants to go.
(ii) In May, only two employees want to go on a vacation, but they are neither D nor N.
(iii) M, N, A and E wanted to go in different months.
(iv) If M chooses to go in April, then L wants to go in November and G wants to go in May.
(v) J and H do not want to go in the same month, but one of them wants to go in November.
(vi) A and B want to go in consecutive month in that order. C and E want to go in consecutive months in that order. No two among A, B, C and E wants to go in the same month.
(vii) Only if G wants to go in August, then H and C want to go in the same month.
(viii) If L and N want to go in the same month, then J does not want to go in May.

34. If the company wanted to select five employees for a project, then who wanted to go for the vacation in different months, then which of the following can be the team?
(A) AHMKG
(B) ECHLD
(C) MNHKE
(D) None of these

35. The company has identified three of these employees for promotion and it so happened that these three employees wanted to go on vacation in December, then who among the following will be one among the three?
(A) D (B) L
(C) B (D) M

36. The employees want to go on vacation in November are selected as the three best employees of the company, then who among the following will be in that group?
(A) L, H (B) D, G
(C) A, H (D) G, A

37. The company selects a team of four employees, two of whom want to go on vacation in August, one in April and the other one in May.
Then which of the following cannot be a possible team?
(A) CFKE (B) JGIF
(C) IKFJ (D) FILM

Directions for questions 38 to 40: These questions are based on the following information.

A film-maker wants to select five child artists from a group of children, namely Sakshi Meghana, Neerav, Nihit, Kunal, Kundan, Nabhya and Sagar.

(i) Nihit and Neelam are enemies. So, if one of them is selected, the other one should not be selected.
(ii) Sakshi and Neerav are the best friends. So, if any one of them is selected, then the other one should also be selected.
(iii) The film-maker wants to select exactly one of Sakshi and Sagar.
(iv) Nabhya cannot be selected without Meghana. If both Meghana and Sagar are selected, then Nabhya will not be selected.
(v) Kundan and Nabhya are identical twins. So only one of them must be selected.
(vi) Kunal is selected only if both Meghana and Neerav are selected.

38. In how many ways can the five children be selected?
(A) Five (B) Three
(C) Two (D) Six

39. Who among the following will be selected?
(i) Neerav (ii) Nabhya
(iii) Meghana
(A) (i) (B) (ii) and (iii)
(C) (iii) (D) (i) and (iii)

40. Which of the following is true?
(i) Kundan is not selected.
(ii) Sagar is selected.
(iii) Both Neelam and Kunal are selected.
(A) Only (i)
(B) Only (iii)
(C) Both (i) and (ii)
(D) None of the three

EXERCISE-2

Directions for questions 1 to 3: These questions are based on the following information.

A team of three people is to be selected from six people, namely from Praveen, Rahul, Qureshi, Swathi, Tarun and Umesh confirming the following conditions.

(i) If at least one of Qureshi and Tarun is selected, then Umesh cannot be selected.
(ii) If at least one of Umesh and Praveen is selected, then either Swathi or Rahul must be selected.

1. If Praveen is selected, then who must not be selected?
(A) Qureshi (B) Tarun
(C) Umesh (D) None of these

2. If Qureshi is selected, then in how many ways can the team be selected?
(A) 4 (B) 5
(C) 6 (D) 7

3. If Tarun is selected, then who must be selected?
(A) Praveen (B) Swathi
(C) Rahul (D) Either Rahul or Swathi

Directions for questions 4 to 6: These questions are based on the following information.

In a beauty pageant, the judges have to select five contestants for final round from three different groups of contestants I, II and III. Each group contains five contestants. Group I contains A, B, C, D, and E group II contains G, H, I, J and K, group III contains F, L, M, N and P.

(i) At least one contestant and at most two contestants should be selected from each group.
(ii) B and D should not be selected together. H and M should be selected together.
(iii) Either E or P must be selected. If H is selected, then J must not be selected.
(iv) Only if C is selected then A should be selected. Unless G is selected, F can not be selected.
(v) Neither I nor K should be selected with either B or M.
(vi) Exactly one among C, L and J should be selected.

4. If M and P are selected, then which of the following is a valid group?

(A) MPCBJ (B) MPHCA
(C) MPJAB (D) MPDAH

5. If only K is selected from group II, then in how many different ways can the five be selected?
(A) Six (B) Five
(C) Four (D) None of these

6. If H, M and E are selected, then in how many different ways can the five be selected?
(A) Four (B) Six
(C) Five (D) Seven

Directions for questions 7 to 9: These questions are based on the following information.

A film-maker wants to select five child artists from a group of children, namely Sakshi Meghana, Neerav, Nihit, Kunal, Kundan, Nabhya and Sagar.

(i) Nihit and Neelam are enemies. So, if one of them is selected, then the other one should not be selected.
(ii) Sakshi and Neerav are best friends. So, if any one of them is selected, then the other one should also be selected.
(iii) The film-maker wants to select exactly one of Sakshi and Sagar.
(iv) Nabhya cannot be selected without Meghana. If both Meghana and Sagar are selected, then Nabhya will not be selected.
(v) Kundan and Nabhya are identical Twins. So only one of them must be selected.
(vi) Kunal is selected only if both Meghana and Neerav are selected.

7. In how many ways can the five children be selected?
(A) Five (B) Three
(C) Two (D) Six

8. Who among the following will be selected?
(i) Neerav
(ii) Nabhya
(iii) Meghana
(A) (i) (B) (ii) and (iii)
(C) (iii) (D) (i) and (iii)

9. Which of the following is true?
(i) Kundan is not selected.
(ii) Sagar is selected.
(iii) Both Neelam and Kunal are selected.
(A) Only (i) (B) Only (iii)
(C) Both (i) and (ii) (D) None of the three

Directions for questions 10 to 12: These questions are based on the following information.

Eleven players out of a total of sixteen players have to be selected for a cricket match. Among these sixteen players, there are twelve batsmen, nine bowlers and two wicket-keepers. There are six all-rounders (players who can both bat and bowl are known as all-rounders) and one wicket-keeper who is also a batsman. An ideal eleven consists of at least 6 batsmen, at least six bowlers and exactly one wicket-keeper. No wicket-keeper bowls.

10. If the wicket-keeper, who is also a batsman is selected in the ideal eleven, then what is the minimum possible number of players in the team who can only bowl?
(A) Zero (B) One
(C) Two (D) More than two

11. If the number of all-rounders should be kept at a minimum while selecting the team, then what is the least number of players who can only bat?
(A) Six (B) Five
(C) Four (D) None of these

12. Which of the following statements is never true?
(A) All the eleven players can bat in a team.
(B) In a team, 8 players can bat and 8 players can bowl.
(C) In a team, 7 players can bat and 7 players can bowl.
(D) In a team, when the number of all-rounders is kept at a minimum, then the number of players who can only bat is less to those who can only bowl.

Directions for questions 13 to 16: These questions are based on the data given below.

Four teams are to be formed from fourteen people. A team must consist of at least two people and no two teams can have the same number of people. Each person can be a member of exactly one team. Each of Rama, Ramya, Radha and Raksha must be a member of a different team. Each of Rohini, Padma, Priya and Priyanka must be a member of a different team. Pratima, Pratibha and Sudha must be in the same team. Shreya and Shalini must be in the same team. Rama cannot be in the same team with any of Padma, Priya and Priyanka. Ramya can be in the same team with neither Priyanka nor Priya. Radha cannot be in the same team with Priyanka. Swetha is in one of the teams.

13. How many possible ways are there to form the four teams?
(A) 24 (B) 120
(C) 64 (D) 6

14. Which of the following statements is not definitely true?
(A) Swetha is in a three-member team.
(B) There is a two-member team.
(C) Sudha is in a five-member team.
(D) Shreya is in the two-member team.

15. Which of the following additional statements is sufficient to know the composition of teams?
(A) Rohini and Padma are in teams with five and four members, respectively and Radha is not in a three-member team.

(B) Sudha and Shalini are in teams with five and four members, respectively and Swetha is not in a two-member team.
(C) Pratima and Swetha are in teams with five and three members, respectively and Shreya is not in a two-member team.
(D) None of these

16. Who of the following must be a member of a five-member team?
(A) Priya (B) Priyanka
(C) Pratima (D) Shreya

Directions for questions 17 to 19: These questions are based on the following data.

In a class of ten students, namely A, B, C, D, E, F, G, H, I and J, ranks are given to the top five students, such that the student who gets the highest marks will get the 1st rank, the student getting the second highest marks will get the 2nd rank and so on. It is also known that no two students get equal marks. D gets less marks than G and H gets less marks than I.

If F gets a rank, then D will not get a rank. Exactly one of B and G gets a rank.

If I gets a rank, then C will get a rank and vice-versa.

17. If E did not get a rank and I got less marks than F, then which of the following is definitely false?
(A) J or A gets a rank. (B) D gets a rank.
(C) B gets a rank. (D) F gets a rank.

18. If D and H got two consecutive ranks, then C would not get the
(A) 1st rank (B) 2nd rank
(C) 3rd rank (D) 4th rank

19. If F is not ranked and H gets more marks than G, then who among the following must be ranked?
(A) C (B) G
(C) A or E or J (D) B

Directions for questions 20 to 23: These questions are based on the following data.

A cricket team consisting of 11 players has to be selected from amongst 16 players, A through P.

Among these 16 players
(A) A, C, E, G, I, K, M, J and O are batsmen.
(B) B, D, F, G, H, J, M and P are bowlers.
(C) L and N are wicket-keepers.
(D) Any player who is both a bowler and a batsman is called an all-rounder. The Captain and the Vice-Captain are the all-rounders. The team is selected as per the following restrictions:
(1) The team should contain 5 batsmen, 3 bowlers, 2 all-rounders and a wicket-keeper and the Captain and the Vice-Captain must be selected.
(2) Neither G nor M is the Captain and neither J nor G is the Vice-Captain.
(3) The players mentioned in the following pairs must not get selected together:

J and N; B and F; D and H; D and P; E and I; A and E; and B and C.

20. Which two players are the Captain and the Vice-Captain of the team respectively?
(A) J and G (B) G and M
(C) J and M (D) G and K

21. Who are the three bowlers selected in the team?
(A) F, H and P (B) D, F and H
(C) F, H and B (D) B, D and F

22. Which of the following is definitely false?
(A) J, O, P, A, L and I are selected.
(B) L, O, F, H and C are not selected.
(C) B, D, E and N are not selected.
(D) M, I, K, P and O are selected.

23. If after the first match, in every following match, the Captain and the Vice-Captain exchange their job responsibilities (i.e., Captain takes up the Vice-Captaincy and the Vice-Captain takes up the Captaincy), then who would be the Vice-Captain in the 86th match?
(A) J (B) M
(C) Either J or M (D) L

Directions for questions 24 to 26: These questions are based on the following information.

Two groups of four people each are to be selected from a group of eight people A, B, C, D, E, F, G and H.

The following conditions are to be followed while forming the teams.
(i) If B is selected into a team, then D should also be selected in the same team.
(ii) If E is selected into a team, then C must be selected into the other team.
(iii) G and H should not be selected in the same team.
(iv) Each person is selected into exactly one team.

24. If B is selected into one team, then who among the following pairs must be selected into the other team?
(A) AF (B) CH
(C) EH (D) EG

25. If E and D are selected in one team, then who are the other two people who are selected into the same team?
(A) BH (B) GF
(C) GB (D) Either (BG) or (BH)

26. Which of the following is a valid team?
(A) DEGA
(B) CHFD
(C) EHAF
(D) More than one of the above

Directions for questions 27 to 31: These questions are based on the following information.

Two teams are to be selected from twelve people A, B, C, D, E, F, G, H, I, J, K and L under the following constraints.

(i) Each team must contain at least four people.
(ii) If G is selected in a team, then H must be selected in the other team.
(iii) If I or J is selected in any team, then L must not be selected in any of the teams.
(iv) Unless D or E is selected in a team, K is selected in any team.
(v) F can be selected in a team only if A is selected in the other team.
(vi) If B is selected in a team, then A should not be selected in that team.
(vii) No two of A, C and E can be selected in the same team.

27. If H is selected in a team, then which of the following cannot be the other team?
(A) K, D, L, G
(B) G, D, I, A
(C) A, G, L, F
(D) More than one of the above

28. If B and E are selected in a team and each team has five members, then in how many ways can the other team be selected?
(A) 8 (B) 6
(C) 5 (D) 9

29. If A is selected in a team and J is selected in the other team, then who among the following must be selected in the team where A is selected?
(A) G (B) H
(C) I (D) None of these

30. If X and Y are the names of the two teams and K is selected into the Team X and L is selected, then in how many ways can the Team Y be selected?
(A) 1 (B) 2
(C) 3 (D) 4

31. If F is selected in a team, then how many of the remaining people can be selected in the other team?
(A) 11 (B) 10
(C) 9 (D) 8

Directions for questions 32 to 34: These questions are based on the following information

Each of the six delegates A through F has to give a presentation on different topics that ranges from Terrorism, Trafficking, Poverty, Unemployment, Environmental Protection and Illiteracy, not necessarily in that order, at the World Congress. Each of the six delegates is from a different nation and they are from Brazil, China, India, Russia, South Africa and the USA, not necessarily in that order. Each of the delegates is carrying a folder of different colour among red, green, black, blue, orange and white, not necessarily in that order.

It is known that three delegates have to give presentation in one slot and the remaining three in the other slot. It is also known that:

(i) D is from South Africa and has a presentation on Unemployment.
(ii) The delegate carrying the red folder and the delegate giving a presentation on Traffcking cannot be in the same slot.
(iii) F is not from China or Russia and has to be in the same slot along with the delegate carrying the white folder.
(iv) The delegate giving a presentation on Environmental Protection and the delegate carrying the orange folder must be in the same slot.
(v) B is from India, C is giving a presentation on Illiteracy but she is not carrying the white folder.
(vi) A is carrying neither the red folder nor the white folder but should be with the delegate from China in the same slot.
(vii) E is carrying the green folder.

32. If B is carrying the orange folder, then which of the following must be false?
(A) B is selected for the same slot as A.
(B) F and D are selected for the same slot.
(C) The delegate giving presentation on Environmental Protection is carrying the green folder.
(D) The delegate giving presentation on Unemployment and A are selected for the same slot.

33. If A is presenting on Trafficking and F is carrying the red folder, then which of the following must be true?
I. The delegate carrying the white folder and the delegate from China are selected for different slots.
II. The delegate from China is carrying the orange folder.
III. The delegates giving presentation on Unemployment and Environmental Protection are selected for the same slot.
(A) I only (B) I and II only
(C) III only (D) II and III only

34. If E is from the USA and F is giving presentation on Trafficking, then which of the following must be false?
(A) F is from Brazil and he is not in the same slot with the delegate from Russia.
(B) The delegate carrying the white folder is same slot as the delegate from China.
(C) B is carrying the white folder and he is selected with the delegate carrying the orange folder.
(D) The delegate from Russia is selected with the delegate carrying the blue folder.

Directions for questions 35 to 37: These questions are based on the following information.

A group of three girls, namely Anjali, Bharathi and Chandrika and four boys, namely Kiran, Lala, Manoj and Naveen are to be divided into two teams under the following constraints.

(i) Each team must have at least one girl and at least one boy and at least three people in total.
(ii) If Anjali and Bharathi are selected in a team, then the team must have only one boy.
(iii) Kiran and Lala cannot be in the same team.
(iv) Chandrika and Naveen can be in the same team, only if Bharathi is selected in that team.

35. If Kiran and Chandrika are in the same team, then in how many ways can the other team be selected?
(A) Six (B) Three
(C) Four (D) Five

36. If Manoj is not in the same team as Bharathi, then in how many ways can the teams be selected?
(A) Three (B) Four
(C) Five (D) Six

37. If three boys are selected into one team, then in how many ways can the teams be selected?
(A) Four (B) Five
(C) Three (D) Six

Directions for questions 38 to 40: These questions are based on the following information.

A team of four people is to be selected from seven people, namely Anuj, Bindu, Chanti, Dheeraj, Eswar, Farhaan and Ganesh under the following constraints.

(i) At most two of Chanti, Eswar and Ganesh can be selected.
(ii) At least one of Anuj and Bindu must be selected.
(iii) If Farhaan is selected, then neither Anuj nor Chanti can be selected.

38. If Dheeraj is selected, then in how many ways can the team be selected?
(A) Eight (B) Ten
(C) Nine (D) Eleven

39. If at most one of Farhaan and Ganesh can be selected, then in how many ways can the team be selected?
(A) 11 (B) 12
(C) 13 (D) 14

40. If Eswar is not selected, then in how many ways can the team be selected?
(A) Six (B) Seven
(C) Eight (D) Nine

EXERCISE-3

Directions for questions 1 to 4: These questions are based on the following information.

Ten candidates appear for an interview and six of them are selected. There are two M.As, two M.B.As, two M.C.As and four B.Techs among the candidates. If at least one M.B.A. candidate is selected, then exactly two B.Tech candidates must be selected and vice versa. Of the six selected candidates, exactly one must be an M.A. candidate.

1. Which of the following statements is definitely true, if two B.Tech candidates are selected?
(A) Two M.C.As and two M.As are selected.
(B) Only two M.B.As and only one M.C.A are selected.
(C) One M.B.A and two M.As are selected.
(D) Two MBAs are selected.

2. If two M.C.A. candidates are selected, then which of the following statements can be true?
(A) One M.B.A. and one B.Tech candidate is selected.
(B) Three B.Tech candidates are selected.
(C) Only one M.B.A. and two B.Tech candidates are selected.
(D) One M.A. and three B.Tech candidates are selected.

3. Which of the following statements is definitely FALSE?
(A) If four B.Tech candidates are selected, then two M.B.A. candidates must be selected.
(B) One M.A. candidate, one M.B.A. candidate and two M.C.A. candidates can be selected.
(C) One M.A., one M.B.A., two M.C.As and two B.Techs is a possible combination of selection.
(D) More than one of the above

4. Which of the following statements, if true, will make the selection of six candidates impossible?
(A) Two M.B.As are selected.
(B) Two M.C.As are selected.
(C) Two B.Techs are selected.
(D) No M.C.A. is selected.

Directions for questions 5 to 9: Read the information given below and answer the questions that follow.

Ajay, Bony and Chetan are three people who go to buy six items, such as P, Q, R, S, T and U. Each one of them buys two different items in such a way that if Ajay buys R, then Bony buys neither P nor S. If Bony buys Q, then Chetan buys neither U nor T.

5. If Ajay buys R and T, then Bony buys
(A) P and S (B) Q and U
(C) P and Q (D) S and U

6. If Bony buys Q and S, then Ajay must buy
(A) P and R (B) T and U
(C) P and T (D) R and U

7. If Chetan has to buy P and S, then which of the following must be true?
(A) Ajay bought R (B) Bony bought Q
(C) Ajay bought T (D) None of these

8. If Ajay buys P and Bony buys Q, then which of the following is true?
(A) Chetan buys R and S.
(B) Chetan can buy any two of P, R and S.
(C) Chetan can buy any three of P, R, S and T.
(D) Chetan can buy any two of P, R, S, T and U.

9. Which of the following is definitely true?
(A) Ajay buys R and Bony buys Q.
(B) If Chetan buys T or U, then Bony buys Q and S.
(C) If Ajay buys R, then Bony buys T.
(D) If Ajay buys R and Bony buys Q, then Chetan has to buy P and S.

Directions for questions 10 and 11: These questions are based on the following information.

Out of seven people from A, B, C, D, E, F and G, four are to be selected.

1. At least one of E or B must be selected and at most one between A or D can be selected.
2. Either C or D must be selected.
3. A, F and G cannot be selected together.

10. If A is selected, then who must be selected?
(A) D (B) F (C) G (D) C

11. If neither A nor D is selected, then in how many different ways can the four people be selected?
(A) Three (B) Four (C) Five (D) Two

Directions for questions 12 to 15: These questions are based on the following information.

A group of six students, namely Jagan, Karan, Madan, Pavan, Rajan and Savan are to be divided into three teams of two students each for quiz competitions in Physics, Chemistry and History under the following constraints.

(1) Pavan does not want to be in the same team as Rajan.
(2) Savan does not want to be in Physics team.
(3) If Jagan is selected for Chemistry, then Madan must be selected for History.
(4) Karan and Madan must be selected in the same team.

12. If Rajan is selected for History team, then who must be the team mate of Pavan?
(A) Jagan (B) Savan
(C) Madan (D) Either (A) or (B)

13. If Rajan is selected for Chemistry, then who must be his team mate?
(A) Jagan (B) Savan
(C) Pavan (D) Madan

14. If Rajan wants to be in Physics, then in how many ways can the teams be selected?
(A) 5 (B) 4 (C) 3 (D) 2

15. If Savan wants to be in Chemistry, then in how many ways can the teams be selected?
(A) 5 (B) 4 (C) 3 (D) 2

Directions for questions 16 to 18: Answer these questions based on the data given below.

A team is to be selected from seven members A through G. In that team at least one among B, D and F must be selected. If B is selected, then neither C nor G can be selected. A and F cannot be selected together. If D is selected, then E must be selected and if C is selected, then A must be selected.

16. If a team of four members is to be selected, then in how many ways can the team be selected?
(A) 3 (B) 4 (C) 5 (D) 2

17. If a team of five members is to be selected, then who among the following cannot be selected?
(A) C (B) A (C) G (D) B

18. If a team of three members is to be selected, then in how many ways can the team be selected?
(A) 7 (B) 6 (C) 5 (D) 4

Directions for questions 19 to 21: These questions are based on the following information.

Rahul has to select five books from nine books. Among those nine books, five books are printed in the following different years, in 2004, 2005, 2006, 2007 and 2008 and the remaining books are written by different authors A, B, C and D. Rahul has to select at least two books which were printed in the above given years. Further, it is known that:

(i) If the book which was printed in either 2004 or 2008 is selected, then the book which was written by A must not be selected.
(ii) The book which was printed in 2006 cannot be selected with the books which were printed in the previous years of 2006.
(iii) The book which was written by D cannot be selected with the books which were printed in the previous years of 2007.
(iv) The books which were printed in 2005 and 2007 should not be selected together.
(v) If the book which was written by C is selected, then only two books are to be selected which were printed in the consecutive years.

19. Which among the following books cannot be selected?
(A) The book written by D
(B) The book printed in 2005
(C) The book printed in 2008
(D) The book written by A

20. Which among the following books must be selected, if the book written by A is selected?
(A) The book written by D
(B) The book printed in 2005
(C) The book printed in 2006
(D) None of the above

21. Which among the following books must not be selected, if the book written by D is selected?
(A) The book written by A
(B) The book written by B
(C) The book printed in 2007
(D) The book printed in 2008

Directions for questions 22 to 25: These questions are based on the following information.

A group of people, namely A, B, C, D, E, F, G, H, I, J and K are football players. Each of them can play in at least one of the positions, such as defence, mid-field, forward and goal keeping. Among them A, B, C and K are defenders. C, D, E and F are mid-fielders. F, G, H and I are forwards. J and K are goalkeepers.

A team of six players is to be selected for an exhibition match with the following restrictions. The team should consist of one goalkeeper, two defenders, one mid-fielder and two forwards. The following is known about selecting the players.
(i) Only one among J and K is selected.
(ii) If D is selected, then neither C nor K is selected.
(iii) If B is selected, then neither F nor I is selected.
(iv) If F or C is selected, then J is not selected.
(v) Among D, F and C, only one is selected.

22. If J is selected, then who will be selected as forwards?
(A) F along with G or I (B) Only G and H
(C) G along with H or I (D) Only F and H

23. If F is selected as the mid-fielder, in how many ways can the team be selected?
(A) Eight (B) Nine
(C) Seven (D) No such team is possible

24. If D is selected as the mid-fielder, then in how many ways can the team be selected?
(A) One (B) Three
(C) Six (D) Five

25. Who among the following cannot be selected as forward?
(A) F (B) G
(C) H (D) I

ANSWER KEYS

Exercise-1

1. (A)	8. (C)	15. (B)	22. (A)	29. (D)	36. (C)
2. (D)	9. (B)	16. (D)	23. (B)	30. (C)	37. (D)
3. (D)	10. (B)	17. (D)	24. (A)	31. (B)	38. (D)
4. (D)	11. (D)	18. (A)	25. (D)	32. (D)	39. (D)
5. (B)	12. (D)	19. (D)	26. (C)	33. (D)	40. (D)
6. (D)	13. (C)	20. (A)	27. (C)	34. (C)	
7. (B)	14. (B)	21. (B)	28. (C)	35. (C)	

Exercise-2

1. (D)	8. (D)	15. (A)	22. (B)	29. (D)	36. (D)
2. (B)	9. (D)	16. (C)	23. (A)	30. (B)	37. (A)
3. (D)	10. (A)	17. (B)	24. (A)	31. (D)	38. (D)
4. (B)	11. (C)	18. (D)	25. (D)	32. (D)	39. (C)
5. (B)	12. (D)	19. (A)	26. (A)	33. (A)	40. (A)
6. (D)	13. (A)	20. (C)	27. (D)	34. (B)	
7. (D)	14. (D)	21. (A)	28. (A)	35. (D)	

Exercise-3

1. (D)	6. (B)	11. (B)	16. (C)	21. (A)
2. (C)	7. (D)	12. (D)	17. (D)	22. (B)
3. (A)	8. (A)	13. (B)	18. (A)	23. (D)
4. (D)	9. (D)	14. (D)	19. (B)	24. (A)
5. (B)	10. (D)	15. (B)	20. (C)	25. (A)

SOLUTIONS

EXERCISE-1

1. Alen or Jack or both must be in the van.

Adam × Anil

John, James

(A) is the answer as none of Adam and Anil is in the car.
∴ They both are in van which violates the given condition.

2. ('✓' means selected, '✘' means not selected)
If $A_{✓} \Rightarrow F_{✓}$
If $F_{✓} \Rightarrow D_{✘}$
Only if $I_{✓} \Rightarrow G_{✓}$
If $H_{✓} \Rightarrow C_{✘}$
If $B_{✘} \Rightarrow C_{✓}$
If D is selected, then F is not selected. As F is not selected, A is also not selected.
Only one of H and C can be selected. So, we must select I. If I is not selected, then G cannot be selected, there will be only four people left, which means that the group cannot be formed.

3. It is given that: (✓ is select and x is not selected)
(1) If P ✓ A, then Q ✘ E.
(2) Only if R ✓ E, then Q ✘ B.
(3) If P ✓ D, then R ✘ C.
(4) If P ✘ F, then R ✓ B.
(5) Q ✓ E.
As we know that Q selects E, it means P does not select A (from 1). From 2, we know that Q selects B as R does not select E.
As R does not select B, it means P selects F.
Let us now represent the above information on a table.

	P	Q	R
Selects	F	E, B	
Does not select	A		1

As P does not select A, it means R selects A. From 3, we know that if P selects D, then R does not select C which means that no one selects C, which is not possible. Hence, R selects D and P selects C.
The final table is as follows.

P	Q	R
F	E	A
C	B	D

4. From the given information at most one of Chanchal and Kanchan is selected, and at least one of Surbhi and Neha must be selected.
∴ Some of the possible teams are:
Chanchal, Surbhi, Ankita
Neha, Surbhi, Kanchan
Neha, Chanchal, Ankita.
∴ No one must be selected.

5. From the given information at least one of Ajay and Ena must not be selected, exactly one of Meena and Vijay must not be selected. As four have to be selected, both Meena and Vijay are to be selected.
If Ajay is the other boy, then Deepa is the other girl.
If Sujay is the other boy, then Deepa or Ena is the other girl.
Hence, in three ways we can select the team.

6. Aman is not selected.
At least one of Pavan and Sravan must not be selected.
⇒ At least one of Raghavan and Dawan must be selected.
⇒ Raghavan and Dawan must be selected.
One of Bhavan, Pavan and Sravan is the third person.

Solutions for questions 7 to 9: A team of five players is to be selected from a group of ten players A, B, C, D, E, F, G, H, I and J. It is given that:

(i) One of G and H must be selected.
(ii) H and A must be selected together and B and F must be selected together ⇒ HA and BF.
(iii) F and J cannot be selected together, and C and D cannot be selected together ⇒ F ≠ J, C ≠ D.

7. If G is selected, then H and A cannot be selected but B can be selected or cannot be selected.
∴ (A) is not correct.
If H and B are selected, then we cannot say anything about E.
∴ (C) is incorrect.
If J is selected, then we cannot say anything about B.
∴ (D) is not correct.
If G is selected, then H and A cannot be selected which means that the selection can be done as follows:

G | C / D | F / J | B E I

One of C and D can be selected and one of F and J can be selected. If F is selected, then B is also selected. We can select atmost one of C and D which means that one of E or I must be selected. If J is selected, then F and B are not selected. We can select one of C or D in the team which means at least one of E or I must be selected.

8. If G is selected, then H and A are not selected and F is definitely selected because either H and A or B and F must be selected.
So, (A) is not the answer.
(B) cannot be the answer because both F and J are selected.
(D) cannot be the answer because if G is selected then A definitely is not selected.
So, (C) is the correct answer.

9. If G is not selected and J is selected, then the total possible selections are
(1) H A J E I
(2) H A J C I
(3) H A J D I
(4) H A J C E
(5) H A J D E

Solutions for questions 10 to 13: From (i), if R or X's selected then none of Q, V and T are selected, then three bowlers cannot be selected. Hence, neither R nor X can be selected.
Hence, from (ii) U and V must be selected.
∴ One among S and P must be selected.
If P is selected, then the bowlers, Q, V and Y must be selected.
If S is selected, then the other two bowlers that are to be selected must be from Y, T and W.
∴ The possible teams are
(U, P, Y, Q, V), (U, S, V, Y, T), (U, S, V, Y, W) and (U, S, V, T, W).

10. U must be selected.

11. V must be selected always.

12. Such a case is not possible.

13. The different ways in which a team can be selected is four.

Solutions for questions 14 to 16: From (i), A and B can be selected as follows:
→ Both A and B are selected.
→ Only B is selected.
→ Neither A nor B is selected.
From (ii), C and E can be selected as follows:
→ Only E is selected.
→ Only C is selected.
→ Both E and C are selected.

14. From the above explanation, it is clear that at least one among C and E must be selected. If only C is selected, then the possibilities are
(1) C, A, B
(2) C, B, D
If only E is selected, then the possibilities are
(3) E, A, B
(4) E, B, D
If both C and E are selected, then the possibilities are
(5) C, E, D
(6) C, E, B
∴ There are 6 possible ways.

15. From the above solution, if D is not selected, then B must always be selected.

16. A, B, D is not a possible team.

17. From (i), it is clear that if Y is selected then only one of R and S should not be selected
∴ To maximize the strength of the team, 'Y' must not be selected. Hence, from (iv), W must not be selected.
∴ At most seven members can be selected into a team, i.e., R, S, T, U, V, X, Z.

18. From the rule (iii), either T and U or V must be selected. From the rule (ii), either W or Z must be selected but if W is selected, then Y must be selected. Hence, to minimize the team W and Y should not be selected. Hence, the team with minimum strength is Z, V and its strength is 2.

19. Choice (A) is violating the rule (iii). Choice (B) is violating the rule (v). Choice (C) is violating the rule (ii).

20. From (ii), among W and Z, we must select:
(a) only W or
(b) only Z or
(c) both W and Z.
(a) Only W is selected and Z is not selected.
From (iv), Y is selected.
From (i), R and S are not selected and from (v) X is not selected.
As already three are not selected, at least two of T, U and V must be selected.
∴ T and U are to be selected.
Hence, one team can be selected, i.e., W, Y, T, U.
(b) only Z is selected but not W.
From (iv) Y is not selected and
∴ R or S or both can be selected.
From (iii), among T, U and V either T or U cannot be selected alone.
Also, X and S together can also be selected, but not only X.
∴ Hence, along with Z the other three members can be as follows.
R, S, X
R, S, V
T, U, R
T, U, S
T, V, R
T, V, S
U, V, R
U, V, S
X, S, V
T, U, V
∴ Hence, in ten different ways a team with Z but not W can be selected.

(c) If W as well as Z is selected.
⇒ Y must be selected.
∴ Only one of the remaining six has to be selected.
From (iii), V must be selected.
∴ Only one team, i.e., W, Z, Y, V can be selected.
Total number of ways of selecting a team of size 4 is 1 + 10 + 1 = 12 ways.

21. From the above solution if X is selected then a team of strength four can be selected in two different ways, i.e.,
(A) ZRSX and (B) ZSXV

Solutions for questions 22 to 25: From (i), the pairs QV, QU, QW cannot be selected together. Also, UVW cannot be selected together.

From (ii), the possibilities are RS, RT, only S or only T.

From (iii) and (iv), among the possibilities only N, only O, only P or only N and O one must happen.

From (v) to (viii), the pairs NR, NQ, PV and PW should not be selected together.

22. If Q is selected, then none among N, V, U or W can be selected.
Among the remaining, one among O and P will be selected. The remaining two members have to be selected from R, S and T. S and T cannot be selected. Hence, R must be a part of the team.

23. The maximum number of selections in the team can be as shown below.
(A) N, O, two people out of (U, V, W) and one person out of (S, T).
(B) O, two people out of (U, V, W), R and one person out of (S, T).
Hence, the maximum team size is five.

24. If P is selected, then the maximum selections in the team can be as shown below.
(A) P, Q, R, S
(B) P, Q, R, T
Hence, the maximum team size is four.

25. If Q is selected, then the number of ways the team can be selected is shown below.
(A) O, Q, R, S (i) Q, O
(B) O, Q, R, T
(C) O, Q, S (j) Q, P
(D) O, Q, T
(e) P, Q, R, S
(f) P, Q, R, T
(g) P, Q, S
(h) P, Q, T
Hence, the team can be selected in ten ways.

Solutions for questions 26 to 28: It is given that:
(i) If Ajay selects the Blue pen, then he selects the Orange pen also and vice versa.
(ii) If he selects the Grey pen, then he selects the Black pen also and vice-versa.
(iii) If Ajay selects the Yellow pen, then he cannot select the Grey pen.
(iv) Exactly one of Red and Violet pens must be selected.

26. If he did not select Grey and Brown, then he must select White, Pink, Orange, Blue, Yellow, Red/Violet.
∴ He can reject Red.

27. (A) is not the answer, as there is neither the Red nor the Violet coloured pens.
(B) is not the answer, as both the Yellow and the grey coloured pens are selected.
(D) is not the correct answer, as both the Red and the Violet coloured pens are selected.

28. If the Orange coloured pen is not selected, then the Blue coloured pen also cannot be selected.
If the Red coloured pen is not selected, then the Violet coloured pen should be selected.
Hence, there are seven coloured pens out of which Ajay has to select six coloured pens.
He must select the Grey coloured pen and he cannot select the Yellow coloured pen.
The six coloured pens he selects are White, Pink, Black, Grey, Violet and Blue.

29. Since at least two girls are to be selected, from (v), Sheela must not be selected.
∴ Rama, Karuna and Nayana are selected.
From (iii), Bhavan must be selected.
From (ii), Sreekar must not be selected.
∴ Arjun or Dawan is the other boy.
In two ways we can select the team.

30. As three boys are selected, the teams are:
(A) If Arjun, Sreekha, Bhavan are the boys, then any two of Sheela, Rama and Nayana can be the girls, i.e., the team can be selected in three ways [From (ii)].
(B) If Arjun, Sreekhar, Dawan are the boys, then Karuna, Rama and Nayana cannot be selected [From (ii), (iii) and (iv)].
(C) If Arjun, Bhavan, Dawan are the boys, then any two of Sheela, Karuna and Nayana can be the girls [From (iv)], i.e., the team can be selected in three ways.
(D) If Sreekar, Bhavan, Dawan are the boys, then any two of Sheela, Rama and Nayana can be the girls [From (ii)],
i.e., the team can be selected in three ways.
Hence, in total, there are nine ways to select the team with three boys.

31. Let Bhavan not be selected then,
from (ii), Nayana is not selected.
From (v), at most two of the other three girls can be selected.
⇒ Arjun, Sreekar and Dawan must be selected.
⇒ Rama must not be selected [From (iv)]
⇒ Karuna and Sheela must be selected which is a contradicting statement (ii).

Hence, no team can be selected without Bhavan.
From solution (B), without Arjun or Sreekar or Dhawan we can select a team.

32. If Sheela is selected, then three boys must be selected.
From solution (B), any one of the remaining three girls can be the other girl.

33. Given that, Karuna and Sheela is not selected.
From (ii), Sreekar is not selected.
⇒ Arjun, Dawan and Bhavan must be selected.

Solutions for questions 34 to 37: From (i) and (vi), we can say that F, I and K want to go in August. J wants to go in either April or May.

From (v) and above, H wants to go in November.

From (vii) and above, C and E want to go in April and May, respectively. A and B wants to go in November and December, respectively.

From (ii), (iii), (iv), (viii) and above, the possible cases are as follows.

Case	April	May	August	November	December
(i)	C, J, M	E, G	F, I, K	A, H, L	B, D, N
(ii)	C, G, N	E, J	F, I, K	A, H, D,/L	B, M, L/D
(iii)	C, J, N	E, L	F, I, K	A, H, D/G	B, M G/D
(iv)	C, J, N	E, G	F, I, K	A, H, D/L	B, M, L/D

34. A and H are in the same month. Hence, (A) cannot be the answer. In option (B), one among the three pairs EL, HL and HD will be in the same month. MNHKE is a possible team.

35. None among D, L and M is definitely in December. But B is definitely in December.

36. A and H are definitely in November.

37. Each of (A), (B) and (C) is a possible team but not (D).

Solutions for questions 38 to 40: From (i), only Nihit, only Neelam or neither of them is selected.

From (ii), both Sakshi and Neerav or neither of them is selected.

From (iii), only Sakshi or only Sagar is selected.

From (iv), only Meghana, both Meghana and Nabhya or neither of them is selected. Only Sagar, only Meghana and Sagar or none of them is selected.

From (v), only Kundan or only Nabhya is be selected.

From (vi), only Meghana or only Neerav or Meghana, Neerav and Kunal or only Meghana and Neerav or none of them is selected.

∴ The final possible selections are as follows.

(i) Sakshi, Neerav, Meghana, Nabhya, Nihit.
(ii) Sakshi, Neerav, Meghana, Nabhya, Neelam.
(iii) Sakshi, Neerav, Meghana, Nabhya, Kunal.
(iv) Sakshi, Neerav, Kundan, Meghana, Kunal.
(v) Sakshi, Neerav, Kundan, Meghana, Nihit.
(vi) Sakshi, Neerav, Kundan, Meghana, Neelam.

38. The group can be selected in six different ways.

39. Among the given, Neerav and Meghana will be selected.

40. None of the statements is true.

EXERCISE-2

Solutions for questions 1 to 3: Let each person be denoted by the first letter of his name

1. If P is selected, then some of the possibilities are PSR, UPS and PQS, PTS.

2. If Q is selected, then U should not be selected.
Now from (ii), the possible selections are QTS, QTR, QPS, QPR, QSR.
∴ A total of 5 possibilities.

3. As T is selected, then U should not be selected.
If P is selected, then S or R must be selected.
If Q is selected, then P must not be selected and vice versa.
∴ To select a team of three, S or R must be selected.

Solutions for questions 4 to 6: From (ii), only B or only D or neither of them is selected. Both H and M or neither of them is selected.

From (iii), only E, only P or both E and P are selected. Only H, only J or neither of them is selected.

From (iv), C and A, only C or neither of them is selected. Only G, G and F or neither of them is selected.

From (v), only I, only K, both I and K, only B, only M, both B and M or none of them is selected.

From (vi), only C or only L or only J should be selected.

4. MPHCA is a valid group.

5. The group can be selected in five different ways.
(i) KCENP (ii) KDELN (iii) KDELP
(iv) KDENP (v) KPCDN

6. The group can be selected in six different ways.
(i) EHMCG (ii) EHMCN (iii) EHMCP
(iv) EHMLG (v) EHMLB (vi) EHMLD

Solutions for questions 7 to 9: From (i), only Nihit, only Neelam or neither of them is selected.

From (ii), both Sakshi and Neerav or neither of them is selected.

From (iii), only Sakshi or only Sagar is selected.

From (iv), only Meghana, both Meghana and Nabhya or neither of them is selected. Only Sagar, only Meghana and Sagar or none of them is selected.

From (v), only Kundan or only Nabhya is be selected.

From (vi), only Meghana or only Neerav or Meghana, Neerav and Kunal or only Meghana and Neerav or none of them is selected.

∴ The final possible selections are as follows.

(i) Sakshi, Neerav, Meghana, Nabhya, Nihit
(ii) Sakshi, Neerav, Meghana, Nabhya, Neelam
(iii) Sakshi, Neerav, Meghana, Nabhya, Kunal
(iv) Sakshi, Neerav, Kundan, Meghana, Kunal
(v) Sakshi, Neerav, Kundan, Meghana, Nihit
(vi) Sakshi, Neerav, Kundan, Meghana, Neelam

7. The group can be selected in six different ways.

8. Among the given, Neerav and Meghana will be selected.

9. None of the statements is true.

Solutions for questions 10 to 12: Following is the given information:

(i) From a total of 16 players, out of which 11 are to be selected.
(ii) Among these 16 players:

Number of batsmen = 12
Number of bowlers = 9
Number of wicket-keepers = 2
Number of all-rounders = 6 (out of 12 batsmen and 9 bowlers)
Number of wicket-keeper + Batsman = 1
Now, number of only wicket-keeper = 2 – 1 = 1
Number of only batsman = 11 – 6 = 5
(Eleven, because one batsman is wicket keeper)
Number of only bowlers = 9 – 6 = 3

(iii) Ideal Team

At least 6 batsmen, at least 6 bowlers and at least one wicket-keeper.

10. Ideal Eleven: (W.K. = Wicket-keeper)

Batsmen	Bowlers (6)	All-rounders
1 + 5 or more W.K.	6 or more	?

If all the 6 bowlers are also batsmen (i.e., 6 all-rounders), plus one wicket-keeper batsman gives 7 players. Thus, the least number of only bowlers will be zero.

11. As there are 3 players who can only bowl, but at least 6 bowlers are required, hence, minimum number of all-rounders = 3. The wicket-keeper selected is a batsman. Hence, there are three bowlers who can only bowl. Therefore, the team consists of 3 bowlers + 3 all-rounders + 1 wicket-keeper = 7.

But the total number of players who can only bat is (11 – 7) = 4

Total players (as shown below):

Only			Wicket-keeper	
Batsmen	Bowlers	All-rounders	Not Batsman	Batsman
4	3	3	–	1

12.

(A) If all eleven are batsmen, then the wicket-keeper, who can also bat must be selected, along with 6 all-rounders (so we can have six bowlers) and 4 only batsman.

(B) For 8 players to bat and 8 players to bowl, we can have the following arrangement:

Only batsman = 2
All-rounders = 6
Only bowler = 2
Only wicket-keeper = $\frac{1}{11}$

(C) For 7 players to bat and 7 to bowl, we can have the following arrangement:

All-rounders = 4
Only batsman = 3
Only bowler = 3
Only wicket-keeper = $\frac{1}{11}$

(D) The number of all-rounders = 3

(3 is the minimum number of all-rounders, as found earlier). Now, the number of only batsman can NEVER be less than the number of only bowlers, as out of these 8 remaining players, one is a wicket-keeper and the number of only bowlers cannot be more than 3.

Solutions for questions 13 to 16: Let us list out the conditions specified in the question.

(1) Each team must consist of a minimum of two members and each of the four teams must have a distinct number of members. This implies that the number of people in different teams must be 2, 3, 4 and 5.
(2) Each of Rama, Ramya, Radha and Raksha must be in a different team.
(3) Each of Rohini, Padma, Priya and Priyanka must be in a different team.
(4) Pratima, Pratibha and Sudha must be in the same team.
(5) Shreya and Shalini must be in the same team.
(6) Rama cannot be paired with any of Padma, Priya and Priyanka.
(7) Ramya cannot be paired with Priyanka or Priya.
(8) Radha cannot be paired with Priyanka and Swetha is in one of the teams.

From (1) we know that the teams should consist of 2, 3, 4 and 5 members respectively.

From (2) and (3), we know that each team should have two members out of Rama, Ramya, Radha, Raksha, Rohini, Padma, Priya and Priyanka, since as per (2) each of Rama, Ramya, Radha and Raksha should be in a different team and same is the case with (3).

From (2) and (3), we know that one each of Rama, Ramya, Radha, Raksha must be paired with one each of Rohini, Padma, Priya and Priyanka.

From (6), (7) and (8), we know that Priyanka cannot be paired with Rama, Ramya or Radha, which implies that Priyanka is paired with Raksha. Using a similar logic we find that Rama and Rohini, Ramya and Padma, Radha and Priya are paired together.

From (4), we know that Pratima, Pratibha and Sudha must be in a team together but since all teams already have two members each, these people can only be accommodated in the team that has five members in it.

From (5), we know that Shreya and Shalini must be in a team together which means that can only be accommodated in a team that has four members in it.

From (8), we know that Swetha is one of the members and she can only be placed in the team that has three members in it.

Teams	I (2 members)	II (3 members)	III (4 members)	IV (5 members)
Members		Swetha	Shreya Shalini	Pratima Pratibha Sudha

13. There are 4 pairs, i.e., Raksha–Priyanka, Rama–Rohini, Ramya–Padma, Radha–Priya who must be allocated to 4 teams which can be done in 4! ways.4! = 24 ways.

14. We can see that statements made in choices (A), (B) and (C) are true as per the above discussion. Shreya is in a four-member team, hence, choice (D) is definitely not true.

15. As per choice (A), if Rohini is in a team of five members, it means that Rama is also in that team. Padma is in a four-member team implies that Ramya is also in that team and Radha is not in a three-member team implies that she is in a two-member team along with Priya which leaves us with Priyanka and Raksha in a three-member team which completes the arrangement. Hence, choice (A) gives us the complete arrangement.

16. Pratima is a member of the five-member team.

Solutions for questions 17 to 19: The given data can be represented as follows.

(1) D < G and H < I

⇒ If D gets rank, then G also gets a rank and if H gets a rank, then I also gets a rank.

(2) F × D

(3) B / G (Only one of the two)

(4) IC (If I gets a rank, then C will also get a rank. If I gets a rank, both I and C get ranks.)

17. It is given that E did not get a rank and that F got more marks than I, which means that F > I > H. So, if F does not get a rank, then none of I or H gets a rank. If I does not get a rank, then C also does not get a rank, which means that A, B, D, G and J get ranks. However, this is not possible as only one out of B or G gets a rank, but not both, as per the given conditions. This means that F has to get a rank, which means that D will not get a rank.

18. If D and H get ranks, then G, I and C should also get ranks because G got more marks than D and I got more than H. If I gets a rank, then C also should get a rank. As D and H got two successive ranks, G and I must always be ranked higher than D and H. So, D and H gets either 3rd or 4th rank or 4th or 5th rank. Hence, C would not get the 4th rank.

19. If F is not ranked and H got more marks than G, then H and I both are selected. If I is selected C, must be ranked.

Solutions for questions 20 to 23: It is given that A, C, E, G, I, K, M, J and O are batsmen, B, D, F, G, H, J, M and P are bowlers, L and N are wicket-keepers. The players who are both bowlers and batsmen are known as all-rounders. Hence, G, M and J are all-rounders. The Captain and the Vice-Captain are all-rounders.

Neither G nor M is the Captain, that means J is the Captain. Similarly, M is the Vice-Captain. As only two all-rounders are to be selected, J and M are selected and G cannot be selected. Five batsmen are to be selected from A, C, E, I, K and O. It is also given that if E is selected, then A and I cannot be selected which means that 5 batsmen cannot be selected. Therefore, E should not be selected and the batsmen selected are A, C, I, K and O. It is given that three bowlers are to be selected from B, D, F, H and P.

It is also given that if D is selected, P and H cannot be selected and the bowlers selected would be B, D, F which is not a feasible combination (as B and F cannot be together). Therefore, D is not selected. We already know that C is selected, hence, B cannot be selected. The bowlers who are selected are F, H and P.

J and N cannot be selected. As J is already selected as the Captain. Hence, N cannot be selected into the team. Therefore, L is selected as the wicket-keeper.

The 11 players who are selected into the team are J (Captain), M (Vice-Captain), L (Wicket-keeper), O, F, H, P, A, C, I, K.

20. J and M are the Captain and the Vice-Captain of the team, respectively.

21. F, H and P are the three bowlers selected in the team.

22. L, O, F, H and C are not selected is definitely false.

23. In the 2nd match J is the Vice-Captain and M is the Captain. As, 86th match is an even numbered match, J will be the Vice-Captain in that match.

24. If B is selected into a team, then D must also be selected into that team also one person from E and C should be in this team and one person among G and H should be in this team. So, A and F should be in the other team.

25. (Let the teams be Team 1 and Team 2) Given that E and D are in one team.
So, C is in team 2. Now if B is in team 2, then D should also be in team 2 which is not possible. So, B is in team 1.
Also, exactly one person among G and H is in team 1.
∴ B and G (or) B and H are in team 1.

26. B and D should be together (as described in previous question). So option (A) and (B) are not valid teams. Option (C) does not violate any rule.
∴ EHAF is a valid team.

27. Let H be the member of a team, and let us consider choice (A) i.e. KDLG as the other team. From (iii) we get that, since L belongs to one of the teams, neither I nor J can be selected into any of the teams.
Among the remaining A, B, C, E and F only one among A, C and E can be selected.
∴ B and F must be selected and from (iv), A cannot be selected. The possible teams are H, B, F, C / E.
Choice (B) does not violate any rule to form a team. Consider
choice (C), as A, G, L, F is a team, H must be there in the other team. But A and F both are in the same team, which violate (v).

28. We need to eliminate only two people.
From the rule (vii), one of A, C and E must not be selected. Hence, we can select from only 11 people.
From the rule (iii), If L is selected none or I and J should be selected, hence, L cannot be selected.
∴From (v), if A is not selected then F cannot be selected.
Let B and E belong to team α.
∴ A must be selected in team β, C should not be selected and F must be selected in team 'α'.
From (ii), G and H should be in two different teams.
∴ The possible teams are as follows:
α: B, E, F, G/H, I/J/K/D
β: A, H, G and any two among I, J and K.
Therefore, in 8 different ways, the other team can be selected.

29. The two teams can be ADIG and JFBH or A, D, K, H and JFBG or AIKG and JFBH.
Hence, none must be selected with A.

30. As K is selected, neither D or E can be selected.
As L is selected then I and J must not be selected.
∴ A, B, C, F, G, H, K and L are selected.
From (v), (vi) and (vii), B, F and C are into one team, which does not contain A.
From (ii), G and H are in different teams.
∴ Y has B, F and C and X has K, L and A.
Now, G and H can be distributed in two ways.

31. From (v), A must be selected into the other team.
∴ From (vi) and (vii), B, C and E cannot be selected into the other team.
Of the remaining, each person can be selected into the other team.

Solutions for questions 32 to 34: Based on the given information, the following inferences can be made:
(a) From (III), F is not carrying the white folder.
(b) From (VI), A is not from China.
We have the following distribution:
From the above, we can say that either B or D is carrying the white folder and either C or E is from China. There is no condition for (Brazil, USA), (Black, Blue) and (Terrorism, Poverty). All these can be taken in any combination.

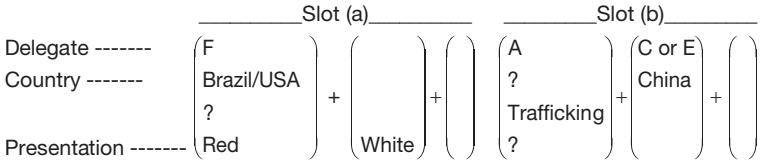
32. If B is carrying the orange folder, then D will be carrying the white folder.
As per (iii), F and D must be in the same slot. Hence, (B) is true.
As per (vi), A and the delegate from China must be selected together.
$\Rightarrow \begin{pmatrix} F \\ \text{Brazil/USA} \end{pmatrix}$ and $\begin{pmatrix} D. \\ \text{S. Africa} \\ \text{Unemployment} \end{pmatrix}$ cannot be selected with A, since only 3 people can be allowed for any one slot. Hence, (D) is false.
We can get the following arrangement, without violating any of the given conditions.

Slot – I	Slot – II
A – Red	F – Trafficking
B – Orange – India	D – White – SA – Unemployment
E – Green – Ching – EP	C – Illiteracy

From the above, we infer that (A) and (C) are true.
∴ (D) is false.

33. Including the additional condition, we have:

Delegate	A	B	C	D	E	F
Country	x China	India		S. Africa		x China x Russia Brazil / USA
Area of presentation	Trafficking		Illiteracy	Unemployment		
Colour	x White x Red		x White		Green	Red



F and A must be selected for different slots as per (ii).
So, statement I is definitely true.

Statement II and III are not true in the following arrangement.

Slot - I	Slot - II
A – Orange – Trafficking	F – Brazil/USA - Red – Terrorism/Poverty
E – China – Green – EP	D – SA – White – Unemployment
C – Blue/Black – Illiteracy	B – India – Black/Blue – Poverty/Terrorism

∴ Only I is true.

34. Since E is from the USA, F is from Brazil and A is from Russia.
Since, F and A have to be in different slots (A) is true.
Since A and the one from China are in one slot and F and the one carrying white folder are in the other slot, (B) is false.
(C) and (D) are true in the following:

Slot – I	Slot – II
A – Russia – Black – Trafficking	F – Brazil – Red – EP
C – China – Blue – Illiteracy	D – SA – White – VE
E – USA – Green –	B – India – Orange

In the above, (C) and (D) are true.
∴ Only (B) is false.

Solutions for questions 35 to 37: Let each person be denoted by the first letter of his / her name.

35. K and C are in the same team.
∴ L must be in the other team. [From (iii)]
If A and B are in the same team as L, then it violates (iv) [From (ii)].
Only one of A and B is in the same team as L.
∴ Using other conditions, the possibilities are:
(a) K, C, A, M and L, B, N
(b) K, C, B, M and L, A, N
(c) K, C, A and L, M, N, B
(d) K, C, B and L, M, N, A
(e) K, C, B, N and L, M, A

36. M and B are not in the same team.
From (iii), either K or L is with B.
Now, if A is with B, then C and N must be with M, which violates (iv).
∴ A is with M.
Now, at least one of C and N is with B.
The teams are:
B, K/L, C, N and M, L/K, A
B, K/L, C and M, L/K, A, N
B, K/L, N and M, L/K, A, C
∴ There are six possibilities.

37. From (iii), M and N are in the same team.
One of K and L is with them.
C cannot be with them as it violates (iv).
From (ii), only one of A and B is with them.
∴ The possibilities are:
M, N, K/L, A/B and L/K, C, B/A.
Therefore, there are four possibilities.

Solutions for questions 38 to 40: Let each person be denoted by the first letter of his/her name.
From (iii), if F is selected, then A and C are not selected.
From (ii), one among A and B must be selected.

∴ The possibilities are:
If F is selected, then

(a) F, B, E, G
(b) F, B, E, D
(c) F, B, D, G

If F is not selected, then A or B or A, B must be selected in the team as we have to select 4, we have to reject 3 and among C, E and G at least one must be rejected.

From (i), at most two of C, E and G can be selected.

∴ The possibilities are as follows.

(d) A, B, C, E
(e) A, B, C, G
(f) A, B, G, E
(g) A, B, D, C
(h) A, B, D, E
(i) A, B, D, G
(j) A, D, C, E
(k) A, D, C, G
(l) A, D, G, E
(m) B, D, C, E
(n) B, D, C, G
(o) B, D, G, E

38. Except possibilities (a), (d), (e) and (f), all other team have Dheeraj.

39. Except (a) and (c), all have at most one of F and G.

40. (c), (e), (g), (i), (k) and (n) are the possibilities.

EXERCISE-3

Solutions for questions 1 to 4: It is given that there are ten candidates, out of which 2 are M.A.s, 2 are M.B.As, 2 are M.C.As and 4 are B.Techs. The conditions are as follows.

1 M.B.A ⇒ 2 B.Techs
2 B.Techs ⇒ M.B.A ≥ 1
Exactly one M.A. candidate must be selected.

1. If two B.Tech candidates are selected, then one M.B.A. and one M.A. are selected. More than one M.As cannot be selected according to the data. One M.B.A. and only M.C.A. with one M.A. does not make a total of six. One M.A. is already there. Now 2 B.Techs, one M.B.A. and one M.A make a total of four candidates. Now 2 more candidates must be there. Those two can be 1 M.B.A. + 1 M.C.A. So, the correct option is choice (D).

2. Two M.C.A. candidates are selected. So, the choices must be 2 M.C.As + 1 M.A. + 1 M.B.A. + 2 B.Techs 1 M.B.A. and 1 B.Tech is not accepted. 3 B.Techs implies 2 M.C.As cannot be selected.

3. The given data says that 1 M.B.A. is followed by 2 B.Tech candidates. If four B.Techs are selected, 2 M.B.As cannot be selected because 1 M.A. must be selected and the total has to be six candidates only.

4. Let us validate each choice.
Choice (A): If 2 M.B.As are selected, then 2 B.Techs must also be selected and 1 M.A. is in every selection, which makes a total of five people and the 6th can be an M.C.A., which is an acceptable selection.
Choice (B): If 2 M.C.As are selected, then any way 1 M.A. is there and the remaining three will be M.B.As and B.Tech, i.e., 1 M.B.A. and 2 B.Tech.
Choice (C): If 2 B.Techs are selected, then it does not violate any rule as explained in choice (B).
Choice (D): If no M.C.A. is selected, then we need to select 6 out of M.B.As, M.As and B.Techs, i.e., 1 M.A and 5 out of M.B.A and B.Tech. The maximum of 2 M.B.A. can be selected and then only 2 B.Tech should be selected. If so, we have to take 1 M.C.A. also. So, this choice is false.

Solutions for questions 5 to 9: A group of three people, namely Ajay, Bony and Chetan buy two each out of 6 items P, Q, R, S, T and U. If Ajay buys R, Bony does not buy P or S or both. If Bony buys Q, Chetan does not buy U or T or both.

5. If Ajay buys R and T, then Bony cannot buy P or S or both. So Bony buys Q and U.

6. If Bony buys Q and S, then Chetan cannot buy T and U. So, Ajay must buy T and U, as each one has to buy two each.

7. If Chetan bought P and S, Ajay and Bony have to choose any two each of Q, R, T, U. Ajay may have any pair of QR, QT, QU, RT, RU or TU. So, we cannot say anything about their purchases as all the choices (A), (B) and (C) be true always.

8. If Ajay buys P and Bony buys Q, then Chetan buys neither T nor U. So, Chetan can buy the pair of R and S only.

9. Let us validate each choice.
Choice (A): If Ajay buys R, Bony cannot buy P and S but he can buy Q or T or U. So, it is not necessary to buy Q.
Choice (B): If Chetan buys T or U, that means Bony cannot buy Q. So, this is also false.
Choice (C): Ajay bought R, then it is not necessary for Bony to buy T as explained in choice (A).
Choice (D): If Ajay buys R and Bony buys Q, then Chetan has to buy only P and S, as he cannot buy T and U. Chetan has to buy P and S.

Solutions for questions 10 and 11: From (1), at least one of E or B must be selected.

E can be selected.
B can be selected.

B and E can be selected.

At most one of A or D can be selected.

One of A or D can be selected or none of A or D is selected.

From (3), A, F and G together cannot be selected.

From (2), either C or D must be selected.

10. If A is selected, then D cannot be selected. D is not selected implies that C must be selected.

11. If neither A nor D is selected, then the four people can be selected in four ways.

1.CEFG
2.CBFG
3.CBEF
4.CBEG

Solutions for questions 12 to 15: Let each student be denoted by the first letter of his name.

From (1) and (4), the teams can be (K, M), (P, J), (R, S) or (K, M), (P, S), (R, J).

From (3), in any case, if J is in Chemistry team, then M is in History team.

S must be in Physics team, which is violating (2).

J cannot be in the Chemistry team.

∴ We have the following possibilities:

	Physics	Chemistry	History
1	R, J	P, S	K, M
2	R, J	K, M	P, S
3	K, M	P, S	R, J
4	P, J	R, S	K, M
5	P, J	K, M	R, S
6	K, M	R, S	P, J

Solutions for questions 16 to 18: We will represent the instructions as below.

(1) B, D and F → at least 1 must be selected.
(2) If B → not C and not G
(3) A and F is not together
(4) If D → E
(5) If C → A

16. The possible combinations of a team with 4 members are as follows:

(1) B, A, D, E
(2) B, D, E, F
(3) D, E, A, C
(4) D, E, A, G
(5) D, F, E, G

∴ There are five ways to select a team of four members.

17. A team of five members is ACDEG.

Hence, B cannot be selected.

18. The possible combinations of the team with three members are as follows:

(1) A, B, E
(2) B, D, E
(3) D, E, F
(4) B, E, F
(5) D, E, A
(6) D, E, G
(7) E, F, G

∴ There are 7 ways possible.

Solutions for questions 19 to 21: From (i), the book printed in either 2004 or 2008 is selected or the book written by A is selected or the book printed in 2004 and 2008 are selected or none among them is selected.

From (ii), only the book printed in 2006 or the books printed in 2006 and 2007 or 2006 and 2008 or 2006, 2007 and 2008 can be selected or none among them is selected.

From (iii), (the book written by D and the book printed in 2007) or (the book written by D and the book printed in 2008) or (the book written by D and the books printed in 2007 and 2008) can be selected or none among them is selected.

From (iv), the book printed in only 2005 or only 2007 or none among them is selected.

From (v), the book written by C and the books printed in 2004 and 2005 or the book written by C and the books printed in 2005 and 2006 or the book written by C and the books printed in 2006 and 2007 or the book written by C and the books printed in 2007 and 2008 can be selected or none among them is selected.

∴ The possible selections are:

(i) A, B, C, 2006, 2007

(ii) B, C, D, 2007, 2008

19. The book printed in 2005 cannot be selected.

20. The book printed in 2006 must be selected, if the book written by A is selected.

21. The book written by A must not be selected, if the book written by D is selected.

Solutions for questions 22 to 25: ***From the given data, the*** possible combinations for each position are as follows.

Goalkeeper: J or K
Defenders: A + B, A + C, A + K, B + C, B + K, C + K
Mid-fielder: C or D or E or F
Forward: F + G, F + H, F + I, G + H, G + I, H + I

22. Given that J is selected. From (i), K will not be selected. According to (iv), neither F nor C will be selected. Hence, only A and B can be selected as defenders. According to (iii), when B is selected neither F nor I will be selected. Thus, only G and H can be selected as forwards.

23. Given that F is selected as the mid-fielder. From (iii), B will not be selected. From (iv), J will not be selected.

Hence, A and C both have to be in the team as defenders, but it violates (v), i.e., only one among C and F can be selected.
∴ No such team is possible.

24. When D is selected, from (ii) neither C nor K will be selected. Then J will be the goalkeeper and there is only possible combination of defenders to select, i.e., A + B. Since B is selected, from (iii), neither F nor I will be selected. Then there is only one possible combination of forwards to be selected, i.e., G + H. Thus, there is only one way in which the team can be selected.

25. When F is selected as forward, from (iv) K will be the goalkeeper and from (v) C will not be selected. In such case only A and B can be selected as defenders. But from (iii), even B cannot be selected. Thus, F cannot be selected as forward.

5 Comparisons

CHAPTER

Learning Objectives

In this chapter, you will:

- Understand how to interpret the data given in the question and get a final sequence or ranking out of it based on the given constraints
- Understand how to rank people/objects based on multiple parameters
- Learn how to deal with questions which are a combination of comparisons and other topics.

Questions based on Order Sequencing appear frequently in MBA entrance exams either as simple comparison questions or along with other topics like Linear/Circular Arrangements, Distributions etc. These puzzles involve comparison of persons or objects in various parameters like height, age, marks scored etc. The term 'Order Sequence' is self-explanatory. In questions for this category, you will be asked to deal with relative positions of subjects. The absolute values of the subjects is not what you should be interested in. It is the comparison between different subjects that you have to deal with. The data also specifies the relationships like 'A is greater than B' or 'C is not less than D' and so on. You have to decide the positions of the subjects in ascending or descending order on the parameters given. The subjects of comparison can be people or things.

In short, data will be given to compare the quality or quantity. The parameters on which the subjects are compared can be heights or weights of people, the money with them, complexion, sizes of things, etc.

In such questions, you will come across typical statements like 'A is taller than B', 'B is not shorter than C' and so on.

You may use the following symbols to symbolically represent the conditions given and then later, represent all the subjects pictorially.

Greater than	>
Less than	<
Greater than or equal	≥
Less than or equal	≤

'Not greater than' is the same as 'less than or equal to'. Similarly, 'not less than' is the same as 'greater than or equal to'.

Words like 'Who, And, Which, But' used in the data play a significant role in analysing the data. 'AND' and 'BUT' play the same role whereas 'Who' and 'Which' play the same role.

Let us illustrate with one statement.

'A is taller than B, who is shorter than C and taller than D but shorter than E, who is taller than F and G but shorter than H'.

By using appropriate symbols, the above statement can be represented as follows.

A > B; B < C; B > D; B < E; E > F; E > G; E < H

Questions on the above data can be as follows.

(i) Who is the tallest?
(ii) Who is the shortest?
(iii) Who is the second tallest in the group?

Let us take some examples.

SOLVED EXAMPLES

Directions for questions 5.01 to 5.05: These questions are based on the following information.

A, B, C, D and E are five cars while P, Q and R are three motorcycles. A is the fastest of the cars and R is the slowest of the motorcycles. C is costlier than D and Q but cheaper than B. Among cars, A is not the costliest. D is cheaper than E and there is no car whose cost lies between the cost of these two. E is faster than three of the cars and all the motorcycles. Q is costlier than R but cheaper than P, who is faster than Q.

5.01: Which of the following cars cannot stand exactly in the middle position among cars as far as their cost is concerned?
(A) A (B) C (C) E (D) D

5.02: Which of the following statements is true about the motorcycles?
(A) P is the costliest as well as the fastest motorcycle.
(B) The fastest motorcycle is not the costliest motorcycle.
(C) The slowest motorcycle is also the cheapest motorcycle.
(D) Both (A) and (C)

5.03: If P is costlier than E, how many cars are cheaper than P?
(A) 1
(B) 2
(C) 3
(D) Cannot be determined

5.04: If P is cheaper than A which is not costlier than E, which of these is the cheapest of all the cars and motorcycles put together?
(A) R
(B) Q
(C) E
(D) Cannot be determined

5.05: Which of these is the slowest of the cars, if B and C are faster than D?
(A) B (B) D (C) E (D) A

Solutions for questions 5.01 to 5.05: Let us first write down all the comparisons given for costs and speeds. Then we will tabulate them.

Speed:
A ➔ Fastest car
E ➔ Faster than three of the cars ➔ E is the second fastest car
R ➔ Slowest motorcycle
P > Q

Cost:
C > D
C > Q
B > C
A ➔ Not the costliest among cars
E > D ➔ No other car lies between these two
Q > R
P > Q
Now let us tabulate this data.

Speed:
Cars

Fastest	A	E				Slowest

Motorcycles

Fastest	P	Q	R	Slowest

Cost:
Cars

Costliest	B C E D	Cheapest

Here, we know that A is not the costliest car but we do not know where it will fit in. It can come anywhere after B except between E and D.

Motorcycles

Costliest	P	Q	R	Cheapest

In addition to the above, we also have to keep in mind that C > Q in cost. (From this we can conclude that B > Q, B > R, C > R in cost).

5.01: In terms of cost of the cars, A can come between B and C or between C and E or to the right of E. In each of the above cases, the middle car will be C, A and E, respectively. Hence, among the cars given, D cannot be in the middle.

5.02: By looking at the tables above, we can make out that choices (A) and (C) are both correct and hence, the correct answer is (D).

5.03: If P is costlier than E, we can also conclude that it is costlier than D but we cannot conclude anything about the relationship between the cost of P and that of B, C and A.

5.04: Since A is not costlier than E, it means that A is at the same level of E or cheaper than E. We

cannot conclude which of these two positions A is in. Hence, we cannot conclude which is the cheapest of all the vehicles. [Please note that if A is the cheapest car, then R will be the cheapest of all the vehicles. However, if A is at the same level as E in cost, then there is a possibility of R or D being the cheapest of all the vehicles.]

5.05: If B and C are faster than D, then the order will be as follows:

1	2	3	4	5
A	E	B/C	C/B	D

Hence, D is the slowest of all the cars.

Directions for questions 5.06 to 5.09: These questions are based on the following information.

J, K, L, M and N are five boys in a class. They are ranked in the order of heights ranked from the tallest to the shortest and in the order of cleverness ranked from the cleverest to the dullest. K is taller than N, but not as clever as J and L, whereas M is the cleverest of all but shorter than J. While L is shorter than M but taller than K, L is not as clever as J. No two people got the same ranks in any of these parameters.

5.06: Who is the third in the order of heights?
(A) J (B) N
(C) K (D) L

5.07: If N is not the last in at least one of the two comparisons, which of the following is the dullest of all the five?
(A) K (B) L
(C) M (D) J

5.08: If L is the third in order of cleverness, then who is the dullest of all?
(A) M
(B) N
(C) L
(D) Cannot be determined

5.09: Who among the following is cleverer as well as taller than K?
(A) L and J only (B) N
(C) L and N (D) J, L and M

Solutions for questions 5.06 to 5.09: Let us first write down all the conditions given and then tabulate the data.

Cleverness:
J > K
L > K
M is the cleverest.
J > L

Height:
K > N
J > M
M > L
L > K
Now let us put together all the information we have.

Cleverness

Cleverest	M J L K	Dullest

We do not know where N will come in the order of cleverness but he will definitely be after M.

Height

Tallest	J M L K N	Shortest

5.06: From the table above, we can clearly see that L is ranked third in order of heights.

5.07: N is the last in terms of height. Since we are given that he is not the last in at least one of the lists, he cannot be the last in cleverness. So, K is the dullest of all. Choice (A)

5.08: If L is the third in the order of cleverness, as can be seen from the table above, either N or K can be the dullest. Choice (D)

5.09: By looking at the tables we made above and from the answer choices, we find that L, J and M are taller as well as cleverer than K.
Choice (D)

Directions for question 5.10: Select the correct alternative from the given choices.

5.10: P, Q, R, S, and T are five girls competing in a running race. R and P have at least two girls ahead of each of them. T and P do not have more than one girl behind each of them. Who arrives at the finishing line after two girls as well as before two other girls, if no two girls finish the race at the same time?
(A) Q (B) S
(C) T (D) R

Solution for question 5.10:

5.10: R and P have at least two girls before them. ➔ R and P have to be in two out of 3rd, 4th and 5th positions.
T and P have not more than one girl behind each of them ➔ T and P have to be in the 4th or 5th positions.
The above two statements together mean that R will have to be in the third position.

EXERCISE-1

Directions for questions 1 to 9: Select the correct alternative from the given choices.

1. Each of the five people, such as K, L, M, P and Q is of a different weight. It is known that the number of people heavier than P is the same as the number of people lighter than Q. L is the heaviest and K is not the lightest. Who is the lightest?
(A) P (B) K
(C) Q (D) M

2. Each of the five people from A, B and C is ranked 1 to 3 in the order of their heights as well as in the order of weights. No person got the same rank in both height and weight. C is heavier than B but shorter than A, who is not the tallest. Who is the heaviest?
(A) A (B) B
(C) C (D) Cannot be determined

3. A group of five boys, namely Lalit, Mohan, Naveen, Omi and Pavan are compared with each other in terms of their heights. Lalit is taller than Mohan but shorter than Pavan, who is shorter then Naveen, who is taller than Omi. Who among these five friends is the second tallest?
(A) Omi (B) Naveen
(C) Naveen or Pavan (D) Cannot be determined

4. A, B, C, D and E are five people working in an office. C comes to the office before B, but after A. E comes after D, but not immediately after him. The number of people who came between D and E is the same as those who come between C and B. Who was the first person to come to the office?
(A) A (B) D
(C) A or D (D) C

5. Each of the four students, namely Gopi, Hari, Murali and Anil did exactly one project out of four different projects, such as P.T., T.D., D.M.E. and H.T. No two students got the same marks. The project H.T. secured more marks than the project T.D. and the project P.T. did not get the first or the fourth rank. The projects are ranked from first to fourth from the maximum to minimum marks in that order.

Anil secured more marks than Murali and Hari got less marks than Gopi, who did the project H.T.

If the project P.T. got more marks than H.T., then who did the project P.T.?
(A) Murali (B) Anil
(C) Hari (D) Hari or Anil

6. The following are the comparisons made between five business tycoons Mukesh, Aditya, Prem, Murthy and Raju.

Mukesh is richer and younger than Murthy. Aditya is poorer than Prem but richer than Mukesh. The poorer of Mukesh and Prem is the younger of the two. Murthy is richer than Raju, who is older than Aditya but younger than Mukesh. How many people are richer but younger than Mukesh?
(A) 1 (B) 2
(C) 3 (D) 0

7. A group of seven people, namely Rama, Ramana, Rana, Ravi, Raju, Ramesh and Raman finished a race, not necessarily in the same order. No two people finished the race at the same time.
Rana finished the race before Raju but after Raman.
Rama finished the race after Ramana but before Rana.
Only Ramesh finished the race between Ramana and Raman. Ravi finished the race before Raman.
If no other person finished the race between Ravi and Raman, then who is the 6th person to finish the race?
(A) Rama (B) Ravi
(C) Ramesh (D) Rana

8. Anand, Mohan, Ravi and Kamal together have ten apples. Each person has at least one apple and no two people have the same number of apples. Kamal has more number of apples than Anand but does not have the highest number of apples. Mohan has more number of apples than Ravi. How many apples does Mohan have?
(A) Two (B) Three
(C) Four (D) Cannot be determined

9. Vinit, Karan, Santosh and Sid participated in a race. No two people ran with the same speed. Speed of Karan is more than that of Santosh and Sid finished the race before Vinit finished. It is known that Karan did not finish the race before Vinit. The speed of which person is the lowest?
(A) Vinit (B) Karan
(C) Santosh (D) Sid

Directions for questions 10 to 12: These questions are based on the following information.

A group of seven people, namely P, Q, R, S, T, U and V, who are of different ages, are comparing their ages. We know the following information.
(i) P is younger than R, who is not older than S.
(ii) S is younger than only two people.
(iii) Q is not the oldest but older than the fourth youngest person.
(iv) T is older than only U.

10. Who is the oldest?
(A) S (B) T
(C) U (D) V

11. Who is the third youngest?
(A) V (B) P
(C) R (D) S

12. Who is the fourth eldest?
(A) R (B) P
(C) S (D) V

Directions for questions 13 to 15: These questions are based on the following information.

A group of five people,namely P, Q, R, S and T are of different heights and different weights. Further, it is known that
(1) Either P or Q is the tallest.
(2) T is taller as well as heavier than both S and R.
(3) The heaviest person is the third tallest whereas the second tallest is the lightest.
(4) Only one person is lighter than Q, R is heavier and shorter than S.

13. Who is the lightest?
(A) P (B) Q
(C) R (D) S

14. Who is / are taller and heavier than S?
(A) P and T (B) Only T
(C) Only T and Q (D) Only R

15. How many people are heavier than P?
(A) One (B) Two
(C) Three (D) Four

Directions for questions 16 to 18: These questions are based on the following information.

A, B, C, D, and E are the top five rankers in each of the subjects Maths and Physics, respectively. No two people got the same rank in any subject and no person got the same rank in both subjects. The following information is known about them.
(1) B's rank in Maths is the same as that of D's rank in Physics.
(2) C got a better rank than at most one person in both subjects, respectively.
(3) E got the least rank in Maths.
(4) D got second rank in Maths and B got third rank in Physics.
(5) In Physics A's rank is better than E's rank.

16. What is the rank of D in Physics?
(A) 1 (B) 2
(C) 3 (D) 4

17. What is the rank of A in Physics?
(A) 1 (B) 2
(C) 3 (D) 4

18. The rank of A in Maths is the same as the rank of _____ in Physics.
(A) B (B) C
(C) D (D) E

Directions for questions 19 and 20: These questions are based on the following information.

Pavan, Sravan, Charan, Tarun and Kiran are the top five rankers in a class, not necessarily in the same order. Each of these five is of a different height. The tallest person is the fourth ranker while Kiran is the second ranker. Tarun is taller than at least two people and is the third ranker. The shortest person is the first ranker but he is not Charan. Sravan is taller than only one person and Tarun is taller than Kiran.

19. Who is the fourth ranker?
(A) Pavan (B) Charan
(C) Sravan (D) Tarun

20. How many people are taller than Pavan?
(A) One (B) Two
(C) Three (D) Four

Directions for questions 21 to 23: These questions are based on the following information.

Each of the six children, namely Amit, Sumit, Kamat, Namit, Ranjit and Charit has a different number of chocolates among 3, 4, 5, 6, 7 and 8, not necessarily in the same order. We know the following information.
(i) The difference between the number of chocolates with Charit and Ranjit is the same as that between the number of chocolates with Kamat and Ranjit.
(ii) The number of chocolates with Charit is less than that with Sumit which in turn is less than that with Ranjit.
(iii) The number of chocolates with Sumit is more than that with Namit.

21. Who has 6 chocolates?
(A) Sumit (B) Ranjit
(C) Amit (D) Charit

22. What is the number of chocolates with Sumit?
(A) 5 (B) 6
(C) 7 (D) 4

23. What is the difference between the number of chocolates with Namit and Kamat?
(A) 2 (B) 3
(C) 4 (D) 5

Directions for questions 24 to 26: These questions are based on the following information.

A group of six students, namely Anand, Brijesh, Charan, Deepti, Gopal and Hriday are the top six rankers of a class. No two people got the same rank. We know the following information regarding their ranks.
(i) Deepti got a better rank than at least two students.
(ii) Gopal got a better rank than Brijesh.
(iii) The number of persons who got better rank than

Anand is the same as the number of persons who got worst rank than Charan.
(iv) Anand got a better rank than Deepti.
(v) Only one person got a rank between the ranks of Hriday and Brijesh.

24. If Hriday got the third rank, then the only person whose rank is between the ranks of Deepti and Charan is
(A) Anand (B) Gopal
(C) Hriday (D) Brijesh

25. Who got the sixth rank?
(A) Charan (B) Brijesh
(C) Hriday (D) Cannot be determined

26. If Deepti got the second rank, then who got the fifth rank?
(A) Brijesh (B) Charan
(C) Hriday (D) Cannot be determined

Directions for questions 27 to 29: These questions are based on the following information.

A group of eight people, namely Anurag, Bhadri, Chakri, Dayanand, Eleena, Firoz, Goutam and Hemant who got different marks are comparing their marks. We know the following information regarding their marks.
(i) Anurag got more marks than Bhadri and the number of people who got less marks than Anurag is the same as the number of people who got more marks than Bhadri.
(ii) Chakri got more marks than Dayanand, but less marks than Eleena.
(iii) Firoz got the fifth highest marks.
(iv) Goutam got more marks than Hemant, who did not get the lowest marks.
(v) Dayanand got more marks than Goutam.

27. Who got the fourth highest score?
(A) Anurag (B) Eleena
(C) Chakri (D) Dayanand

28. Who got the third lowest score?
(A) Firoz (B) Dayanand
(C) Goutam (D) Hemant

29. Who got the highest score?
(A) Eleena (B) Anurag
(C) Girish (D) Cannot be determined

Directions for questions 30 to 34: These questions are based on the following information.

Each of the four athletes, namely Johnson, Bolt, Lewis and Powell competed in the World Athletic Meet in each of the four different events, such as 100 m, 200 m, 400 m and 800 m. In each event, these athletes finished in the top four positions.

No athlete finished any two events in the same position.
(1) The athlete who finished first in 100 m finished fourth in 800 m.
(2) The athlete who finished second in 200 m finished third in 400 m and first in 800 m.
(3) Bolt finished second in 100 m and Lewis is not the last one to finish in 200 m.
(4) Johnson finished after Bolt in 200 m and 800 m.

30. Who is the fourth to finish 200 m?
(A) Johnson (B) Bolt
(C) Lewis (D) Powell

31. Who is the first to finish 400 m?
(A) Johnson (B) Bolt
(C) Lewis (D) Powell

32. Who is the third to finish 800 m?
(A) Johnson (B) Bolt
(C) Lewis (D) Powell

33. Who is the second to finish 200 m?
(A) Johnson (B) Bolt
(C) Lewis (D) Powell

34. Who is the second to finish 800 m?
(A) Johnson (B) Bolt
(C) Lewis (D) Powell

Directions for questions 35 to 37: These questions are based on the following information.

An employee is recruited on the basis of eight parameters, such as Honesty, Communication, Sense of humour, Confidence, Commitment, Positive attitude, Creativity and Intuition.

These parameters are arranged in the order of importance.
(i) Confidence is ranked higher than Sense of Humour, which is ranked higher than Creativity.
(ii) Honesty is an important factor and only one parameter is ranked above it.
(iii) Commitment is ranked higher than Intuition, which is ranked higher than Positive Attitude.
(iv) Creativity is ranked higher than Communication but lower than Positive Attitude.
(v) Commitment is ranked lower than Confidence.

35. Consider the following statements:
(x) Sense of Humour is ranked as the fourth most important factor.
(y) Positive Attitude is ranked as the sixth most important factor.
(z) There are exactly three parameters between Creativity and Commitment.
(A) x is always true.
(B) z is always true.
(C) x and z can be true simultaneously.
(D) y and z can be true simultaneously.

36. Which of the following statements is true?
(A) There are at least 3 parameters which are ranked lower than Positive Attitude.
(B) There are at most 3 parameters which are ranked higher than Intuition.
(C) There are at least 3 parameters which are ranked higher than Intuition.
(D) There are at least 3 parameters which are ranked lower than Sense of Humour.

37. Which of the following is true if Intuition is the fourth most important factor?
(A) There are exactly four parameters which are ranked higher than Sense of Humour.
(B) There are at least three parameters which are ranked lower than Positive Attitude.
(C) There are at least three parameters which are ranked lower than Sense of Humour.
(D) There are at least four parameters which are ranked higher than Sense of Humour.

Directions for questions 38 to 40: These questions are based on the following information.

A group of eleven students A, B, C, D, E, F, G, H, I, J and K are given ranks according to their total marks in a final exam. The student who got the highest marks is given Rank 1. The following information is known:
(i) The only student whose rank is between H and I is D.
(ii) C scored more than G.
(iii) No one scored more than B.
(iv) H is eight ranks above F.
(v) The only student whose rank is between C and G is E.
(vi) The only student whose rank is between A and F is J.
(vii) C scored more than K.

38. Who scored the fifth highest marks?
(A) G (B) H
(C) C (D) J

39. How many students scored less than J?
(A) One (B) Two
(C) Four (D) Six

40. How many students scored less than D but more than A?
(A) Two (B) Four
(C) Six (D) None of these

EXERCISE-2

Directions for questions 1 to 3: These questions are based on the following information.

A group of five people, namely Alfa, Beta, Gamma, Delta and Zeta have different efficiencies in completing a work. Each of them is of different height. All of them are given the same amount of work. It is known that Beta is more efficient but shorter than Alfa. Gamma takes the least time to complete the given work and is the shortest. Delta takes more time than Zeta to complete the work but is shorter than Zeta. Alfa is less efficient than Zeta but takes less time than Delta to complete the work. Zeta is taller than Beta who is taller than Delta.

1. Who is the least efficient?
(A) Beta (B) Zeta
(C) Alpha (D) Delta

2. Who is the second tallest?
(A) Alpha (B) Zeta
(C) Beta (D) Cannot be determined

3. If the people are ranked as per their height and efficiencies, such that the tallest will be given first rank, the second tallest will get second rank and so on and the most efficient will get first rank, the second most efficient will get second rank and so on, it can be observed that no person got same rank in two categories, then who is the third tallest and the third efficient, respectively?
(A) Zeta, Delta (B) Beta, Zeta
(C) Delta, Alpha (D) Zeta, Beta

Directions for questions 4 to 8: These questions are based on the following information.

Six people A, B, C, D, E and F are of different heights and they were made to stand in a queue in the decreasing order of their heights. They made the following statements regarding their position in the queue where all of which are true.
(1) A says, 'I am taller than both B and C. The number of people standing ahead of D is the same as the number of people standing behind me.'
(2) B says, 'I am taller than D but not as tall as E.'
(3) C says, 'I am not standing at any end of the queue.'
(4) D says, 'F is shorter than at least two people.'
(5) E says, 'I am not standing adjacent to A.'

4. Who is the tallest?
(A) A (B) B
(C) C (D) D

5. Who is standing between A and E?
(A) Either B or C (B) Only C
(C) Only F (D) Either C or F

6. Who is the shortest?
(A) A (B) B
(C) C (D) D

7. How many people are standing behind C?
(A) One (B) Two
(C) Three (D) Four

8. How many people are standing ahead of B?
(A) One (B) Two
(C) Three (D) Cannot be determined

Directions for questions 9 to 12: These questions are based on the following information.

Six employees, namely P, Q, R, S, T and U are comparing their income and expenditure. The following information is known about them.

(i) The income of P is more than that of U and his expenditure is more than that of T.
(ii) The income of Q is more than that of S, but his expenditure is less than that of R.
(iii) The income of U is less than that of R, but his expenditure is more than that of R.
(iv) No two people have the equal income and the equal expenditure.
(v) The person whose income is the second highest has the second lowest expenditure, but it is not Q.
(vi) The person whose expenditure is the highest has the second lowest income, but it is not S.
(vii) T's expenditure is the third highest and his income is less than that of U.
(viii) The person whose expenditure is the lowest has the third highest income.

9. Whose income is less than that of S but the expenditure is more than that of T?
(A) P (B) U
(C) Q (D) R

10. Who has the lowest income?
(A) P (B) Q
(C) S (D) T

11. How many people have the expenditure less than that of R?
(A) One (B) Two
(C) Three (D) Cannot be determined

12. How many people have more income than that of S but less expenditure than that of T?
(A) One (B) Two
(C) None (D) Three

Directions for questions 13 to 16: These questions are based on the following information.

A group of seven cousins, namely Abhay, Bhargav, Chandini, Deekshit, Ekta, Falgun and Giri was born in a different year from 1981 to 1989. The following information is known about them.

(i) Deekshit was not born before 1985.
(ii) The oldest among them was born in 1981 and the youngest in 1989.
(iii) Abhay and Chandini were born two years apart and neither of them is the oldest.
(iv) There are as many people older than Falgun as there are people younger than him. Falgun is also as many years younger than the oldest cousin as he is older than the youngest cousin.
(v) Both Ekta and Deekshit were born in leap years.
(vi) Giri was born five years before Chandini.

13. Who is the oldest among the seven?
(A) Giri (B) Bhargav
(C) Deekshit (D) Ekta

14. In which year was Chandini born?
(A) 1983 (B) 1985
(C) 1987 D) 1989

15. Who is four years older than Abhay?
(A) Bhargav (B) Giri
(C) Falgun (D) Ekta

16. Who among them is the fifth youngest?
(A) Deekshit (B) Chandini
(C) Ekta (D) Abhay

Directions for questions 17 to 20: These questions are based on the following information.

A group of four boys A, B, C, D and four girls W, X, Y, Z compare their heights. It is found that there are two boys each of whom is taller than exactly two girls. Similarly, there are two girls each of whom is taller than exactly two boys.

Also, it is known that B is taller than W, who is taller than A, who is taller than X. Y is taller than X, but shorter than D, who is shorter than Z, who is not as tall as C, who is taller than B.

17. Which of the following statements can be false?
(A) The shortest among girls is X.
(B) The shortest among boys is A.
(C) The tallest among boys is C.
(D) The tallest among girls is W or Z.

18. If W is taller than Z, then which of the following statements is not definitely true?
(A) X is the shortest among all.
(B) B is the second tallest and Y is the second shortest.
(C) W is the third tallest and D is the third shortest.
(D) Z is taller than four people.

19. If D is shorter than A, then which of the following statements can be false?
(A) W and Z are the two girls each of whom is taller than exactly two boys.
(B) A and D are the two boys each of whom is taller than exactly two girls.
(C) D and X are the shortest among the boys and the girls respectively.
(D) W is the tallest among the girls.

20. Which choice among the following has the names of the shortest boy and the tallest girl, respectively, given that D is taller than A?

(A) C and X (B) A and X
(C) C, and Z or W (D) A, and Z or W

Directions for questions 21 to 24: These questions are based on the following information.

In a cricket match, eleven players, from A to K, scored different number of runs against the opposite team. The first two top scorers are called openers and the four lowest scorers are tailenders.

(i) G is a tailender but did not score the lowest runs.
(ii) Only three people scored more runs than K, who scored more runs than A and C.
(iii) C did not score more runs than A, who scored less runs than E. C is not a tailender.
(iv) E did not score more runs than F, who did not score the highest runs.
(v) There are at least three people who scored more runs than E.
(vi) The scores of four people are between the scores of D and B. D scored more runs than B.
(vii) H scored more runs than I, who did not score less runs than G.

21. Who scored the lowest runs?

(A) B (B) J
(C) C (D) E

22. How many people scored more runs than G and less runs than K?

(A) Two (B) Three
(C) Four (D) Five

23. If C's score is 68 and F's score is 100, then what can be the score of E?

(A) 56 (B) 67
(C) 96 (D) 105

24. In a certain way, if A is related to B and D is related to E, then in the same way, who is related to K?

(A) B (B) A
(C) F (D) H

Directions for questions 25 to 27: These questions are based on the following information.

A group of six websites, such as gmail, rediff, eBay, LinkedIn, Ask and MSN have different average number of visitors per hour and the uploading speed is different for each website. The first three websites with the most number of visitors have the lowest uploading speeds not necessarily in the same order. No two websites have the equal uploading speed.

(i) 'Ask' has the lowest uploading speed but not the highest number of visitors.
(ii) 'eBay' has less number of visitors than 'Ask' and the uploading speed of 'eBay' is more than only two websites.
(iii) The number of visitors for 'Gmail' is greater than the number of visitors for 'LinkedIn' and the uploading speed is greater for 'LinkedIn' when compared to the uploading speed of 'Gmail'.
(iv) The uploading speed of 'gmail' is not less than that of 'eBay'.

25. Which of the following is false?

(A) The number of visitors for 'LinkedIn' is the lowest.
(B) The uploading speed of 'MSN' is the second lowest.
(C) The number of visitors for 'eBay' is less than that of 'LinkedIn'.
(D) The uploading speed of 'Gmail' is not the highest.

26. Consider the following statements and chose the appropriate answer choice.

(i) The number of visitors for 'eBay' is less than that of 'MSN'.
(ii) The uploading speed of 'MSN' is less than that of 'eBay'.

(A) If (i) is true, (ii) is false.
(B) If (ii) is true, (i) is false.
(C) If (i) is true, (ii) is also true.
(D) None of these

27. Which of the following is true, if the uploading speed of 'rediff' is less than 'eBay' and the number of visitors for 'gmail' is the second lowest?

(A) The number of visitors for 'MSN' is the lowest.
(B) The uploading speed of 'rediff' is the second highest.
(C) The uploading speed of 'MSN' is the highest.
(D) The number of visitors for 'LinkedIn' is the lowest.

Directions for questions 28 to 30: These questions are based on the following information.

A group of four brothers, namely A, B, C, and D bought shares of three different companies P, Q and R. Each of them has different number of shares in each of the companies.

The following information is known about them.

(i) A has the most number of shares in Company P and least number of shares in Company Q.
(ii) B's shares in each of Company P and Q are greater than C's shares, but lesser in Company R.
(iii) D's shares are more than A in two of the given companies but D's shares are not the highest in any of the companies.
(iv) B's shares are not the second lowest in any of the companies.
(v) No person has the same rank in any two of the companies.

28. Who has the highest number of shares in Company Q?

(A) B (B) C
(C) D (D) Either C or B

29. Who has less number of shares than B in Company Q and more number of shares than B, in Company R?
(A) A (B) C
(C) D (D) All of A, C, and D

30. How many people have more number of shares than C in Company Q?
(A) One (B) Two
(C) Three (D) None

Directions for questions 31 to 33: These questions are based on the following information.

A group of five people, namely Abanti, Bhabani, Chandan, Deeptam and Fahrook were comparing their expenditure and savings. It is known that:

(i) Expenditure of no two of them is the same but their income is the same.
(ii) For every person, income is the sum of his/her expenditure and savings.
(iii) Chandan's savings are more than Deeptam's savings.
(iv) Abanti's expenditure is more than Fahrook's expenditure.
(v) The savings of Bhabani are more than that of Fahrook and the expenditure of Bhabani is more than that of Deeptam.

31. Whose expenditure is the highest?
(A) Abanti (B) Bhabani
(C) Deeptam (D) Fahrook

32. Whose savings are the highest?
(A) Fahrook (B) Bhabani
(C) Deeptam (D) Chandan

33. Savings of how many people are more than that of Fahrook?
(A) 1 (B) 2 (C) 3 (D) 4

Directions for questions 34 to 37: These questions are based on the following information.

Each of the five women, namely Amala, Kamala, Nirmala, Parimala and Vimala are of different ages and each of them has exactly one child. The five children are of different ages from 1 year through 5 years. If all the women were given ranks according to the decreasing order of their ages (i.e., the eldest woman gets the first rank) and all the children were given ranks in the similar manner, no woman has the same rank as her child. The names of their children are Chinna, Kanna, Munna, Rinku and Tinku. We know the following information about them.

(i) Chinna is the eldest but his mother is not the youngest and Nirmala is not the eldest.
(ii) Nirmala, who is the mother of the three-year-old child is elder than Vimala and Amala is elder than Kamala.
(iii) The number of years by which Tinku is elder than Munna is same as the number of years by which Chinna is elder than Rinku.
(iv) Parimala's child is Tinku and the number of women elder than Parimala is same as the number of children younger than Tinku.

34. Who is the child of Nirmala?
(A) Chinna (B) Kanna
(C) Rinku (D) Cannot be determined

35. If Munna is the child of Vimala, then Parimala is elder than
(A) Vimala (B) Kamala
(C) Nirmala (D) Cannot be determined

36. If Nirmala is elder than only one woman, then who is the mother of Rinku?
(A) Kamala (B) Vimala
(C) Amala (D) Cannot be determined

37. Which of the following statement is true?
(A) Rinku is three years old.
(B) Amala's child is five years old.
(C) Nirmala got the same rank as Tinku.
(D) Kanna is the child of either Vimala or Kamala.

Directions for questions 38 to 40: These questions are based on the following information.

There is a group of five friends A, B, C, D and E. It is known that A is heavier and shorter than D, who is richer and younger than C, who is older and shorter than E. B is lighter, shorter and richer than E, but is neither the shortest nor the youngest. The person who is the richest is also the youngest and the person who is the heaviest is also the shortest. The person who is the second eldest is also second poorest. The person who is the second heaviest is also third shortest. The person who is the second shortest is also third poorest. The person who is second richest is third eldest. The ranks are from most to least, for instance, the heaviest is ranked first and the lightest is ranked fifth or last and so on for other parameters. In any of these four comparisons, D is never ranked least and E is never ranked first, and also no person gets the same rank in any of the two comparisons. Based on the above information, solve the following questions.

38. Which of the following statements would be required to complete the arrangement?
(I) A is shorter than E.
(II) E is lighter than A.
(III) The youngest person is heavier than the poorest person.

(A) Only I and II
(B) Only I and III
(C) Only II and III
(D) Any one of I, II and III

39. What is the total sum of the ranks obtained by all the five people?
(A) 50 (B) 60
(C) 90 (D) 120

40. Which choice consists of the correct order of the names of the people with the following characteristics, such as second richest, fourth richest, fourth heaviest, second shortest?
(A) D, E, D, (A or E)
(B) (A or E), C, B, D
(C) D, C, D, B
(D) B, D, (A or E), (A or E)

EXERCISE-3

Directions for questions 1 to 4: Read the given data carefully and answer the questions that follow.

A, B, C, D and E are five students in a class. A is cleverer than B but scores less marks than D. C is cleverer than B and also scores more marks than B. E is the least clever of all but scores more marks than C. The order of the five students is 1 to 5 from the cleverest to the least clever and from the highest scorer to the least scorer.

1. If D is the cleverest, then which of the following can be the order of the five students starting from the cleverest to the least clever?
(A) D, C, B, E and A (B) D, B, A, C and E
(C) D, C, A, B and E (D) D, A, B, C and E

2. If B is cleverer than D, then who can be the cleverest of all?
(A) B (B) C
(C) A (D) A or C

3. If C stands second in terms of marks scored, then who gets the third position?
(A) D (B) B
(C) A (D) Cannot be determined

4. Which of the following students is cleverer than and also scores more marks than two other people?
(A) A (B) B
(C) C (D) Cannot be determined

Directions for questions 5 to 8: These questions are based on the following information.

A group of four students, namely Praneeth, Rajesh, Sravan and Tarun got the top four ranks in Quant, Reasoning and Verbal. For each student, the ranks in no two subjects is the same. In each subject, no two students got the same rank. We know the following additional information.

(1) The sum of the ranks of no two students is the same.
(2) Rajesh got the first rank in Quant, Praneeth got the third rank in Reasoning and Tarun got the fourth rank in Verbal.
(3) The sum of the ranks of Sravan is the highest.
(4) The rank of Rajesh in Reasoning is not same as the rank of Sravan in Verbal.

5. Who got the third rank in Quant?
(A) Tarun (B) Praneeth
(C) Sravan (D) Either (A) or (B)

6. What is the sum of the ranks of Praneeth?
(A) 8 (B) 7
(C) 6 (D) Either (A) or (B)

7. Who got the second rank in Verbal?
(A) Praneeth (B) Rajesh
(C) Sravan (D) Either (A) or (B)

8. What is the sum of the ranks of Rajesh?
(A) 6 (B) 7
(C) 8 (D) Either (A) or (B)

Directions for questions 9 to 12: These questions are based on the following information.

A group of six people, namely Anil, Sunil, Bunty, Chanty, Tarun and Varun are of different heights and weights. They are given ranks according to the descending order of their heights and weights such that the heaviest person is the first ranker and lightest person is the sixth ranker in weight category and the tallest person is the first ranker and the shortest person is the sixth ranker in the height category.

(1) The rank of Bunty in each of the categories is the same as the rank of Tarun in the other category.
(2) Varun is heavier as well as taller than both Sunil and Chanty.
(3) No person got the same rank in both the categories.
(4) Anil is the fifth shortest and Chanty is thefourth heaviest.
(5) Sunil is taller than at least two people.
(6) Tarun is shorter than Sunil and Bunty is heavier than Anil.

9. Who got the third rank in weight?
(A) Sunil (B) Tarun
(C) Varun (D) Either (A) or (B)

10. What is the rank of Chanty in weight?
(A) 2 (B) 3
(C) 4 (D) 5

11. What is the rank of Bunty in height?
(A) 4 (B) 3
(C) 2 (D) 1

12. What is the sum of the ranks of Varun?
(A) 7 (B) 6
(C) 3 (D) 5

Directions for questions 13 to 15: These questions are based on the following information.

A green grocer sells five types of vegetables, such as Carrot, Tomato, Brinjal, Cabbage and Cauliflower. Tomato is more fresh and heavier than Cauliflower. Carrot is heavier than Brinjal and more fresh than Cabbage. Cabbage is heavier than Tomato, but less fresh than Cauliflower. Brinjal is heavier than Tomato, but less fresh than it.

13. Which of the following must be the least fresh of all the vegetables?
(A) Cabbage (B) Carrot
(C) Tomato (D) Cabbage or Brinjal

14. If Cabbage is the heaviest of all, then the second heaviest can be
(A) Brinjal (B) Cauliflower
(C) Tomato (D) Carrot

15. If Carrot is not the freshest of all the vegetables, then which of the following is the most fresh of all of them?
(A) Cabbage
(B) Tomato
(C) Cabbage or Brinjal
(D) Brinjal or Tomato

Directions for questions 16 to 18: These questions are based on the following information.

A group of seven boys, namely A, B, C, D, E, F and G are standing in a row in alphabetical order from left to right in the increasing order of their weights (in kgs). The weights of all the seven boys are distinct 2-digit numbers. The following is the additional information known about them.

(i) E's weight is the average of D's, F's and G's weights.
(ii) D's weight is the average of the weights of two boys, one whose weight is a perfect square and the other, whose weight is a perfect cube.
(iii) G's weight is the sum of B's weight and D's weight.
(iv) B's weight is 10 kg less than the weight of the person whose weight is a perfect square.
(v) A's weight is a multiple of 9.

16. F's weight is ____ (in kgs)
(A) 67 (B) 65
(C) 66 (D) Cannot be determined

17. What is the difference between G's weight and A's weight? (in kgs)
(A) 48 (B) 58
(C) 68 (D) 52

18. What is the weight of all the boys together? (in kgs)
(A) 336 (B) 436
(C) 326 (D) Cannot be determined

Directions for questions 19 to 21: These questions are based on the following information.

Six teams A, B, C, D, E and F play a game. In the first round of the game every team plays with every other team exactly once. If a team wins, it scores 40 points, if it loses, it loses 10 points and a draw results in 20 points for each team. After the first round, the top two teams advance to the finals.

The following are the results of the first round:

(i) Team C neither won nor lost a match.
(ii) Teams B and E lost exactly one match.
(iii) Team F lost exactly three matches.
(iv) Team D won as well as lost exactly two matches.
(v) Team A lost exactly two matches.
(vi) The match played between team E and team F was drawn.

19. Which of the following teams advanced to the finals?
(A) A, B (B) A, E
(C) B, E (D) B, C

20. Which of the following teams scored the same number of points at the end of the first round?
(A) B, D (B) A, D
(C) D, E (D) None

21. The total number of winners in the first round is
(A) 10 (B) 9
(C) 8 (D) Cannot be determined

Directions for questions 22 to 25: These questions are based on the following information.

Four people A, B, C and D participated in a bike racing competition on Road W, which is a North-South road. The race distance is 100 km. In every stretch of 20 km, there is one signal post, which controls the roads in four directions for a maximum time of 9 minutes. At exactly 8:30 a.m., all signal turn green towards North on Road W. At all signals, in any direction the signal will be red for a duration of 9 minutes. In each stretch, between any two signals, a person travels with uniform speed. The race begins at signal 0 and ends at signal 5. Signal 0, Signal 1, Signal 2 up to Signal 5 are consecutive signals on Road W from South to North. Race will be towards the north direction from Signal 0 and will begin at exactly 8.30 a.m. To travel any stretch between any two signals by any person, the time taken is 15 min, 16 min, 20 min and 30 min.

22. If D is travelling with 75 kmph initially, by what earliest time will he reach Signal 3?

(A) 9:30 a.m. (B) 9:33 a.m.
(C) 9:42 a.m. (D) 9:36 a.m.

23. If B has reached Signal 5 at 10:45 a.m., then at what speed did he travel in all stretches respectively?
(A) (40, 60, 80, 40, 60)
(B) (40, 40, 80, 80, 80)
(C) (40, 40, 80, 40, 80)
(D) (40, 60, 40, 80, 75)

24. If C has only 4 min halting time at Signal 3 and travelled with the initial speed of 80 kmph, then at what time will he reach Signal 3?
(A) 9:50
(B) 9:38
(C) 10:02
(D) Either (A) or (B)

25. If A travelled with greater speed on Stretch 1 than on Stretch 2 and starts at Signal 2 at 9:30 a.m., then what is minimum and maximum halting timings?
(A) (10, 15)
(B) (10, 14)
(C) (14, 15)
(D) (12, 14)

ANSWER KEYS

Exercise-1

1. (D)	8. (C)	15. (D)	22. (A)	29. (B)	36. (C)
2. (D)	9. (C)	16. (A)	23. (D)	30. (D)	37. (D)
3. (D)	10. (D)	17. (B)	24. (D)	31. (D)	38. (C)
4. (A)	11. (B)	18. (A)	25. (D)	32. (B)	39. (B)
5. (A)	12. (A)	19. (B)	26. (A)	33. (C)	40. (B)
6. (A)	13. (A)	20. (D)	27. (D)	34. (D)	
7. (D)	14. (B)	21. (B)	28. (C)	35. (C)	

Exercise-2

1. (D)	8. (D)	15. (C)	22. (D)	29. (D)	36. (B)
2. (D)	9. (B)	16. (C)	23. (C)	30. (A)	37. (C)
3. (B)	10. (D)	17. (B)	24. (C)	31. (A)	38. (D)
4. (A)	11. (A)	18. (C)	25. (C)	32. (D)	39. (B)
5. (D)	12. (B)	19. (D)	26. (C)	33. (C)	40. (C)
6. (D)	13. (B)	20. (D)	27. (D)	34. (D)	
7. (D)	14. (C)	21. (B)	28. (A)	35. (A)	

Exercise-3

1. (C)	5. (A)	9. (A)	13. (D)	17. (B)	21. (B)	24. (D)
2. (D)	6. (C)	10. (C)	14. (D)	18. (A)	22. (B)	25. (A)
3. (D)	7. (B)	11. (D)	15. (B)	19. (C)	23. (B)	
4. (D)	8. (B)	12. (D)	16. (C)	20. (B)		

SOLUTIONS

EXERCISE-1

1. Given L is the heaviest and K is not the lightest.
Also, the number of people heavier than P is same as the number of people lighter than Q.
∴ The possible arrangements are (in decreasing order).
L P/Q K Q/P M
Therefore, M is the lightest.

2. Given C is heavier than B but shorter than A. A is not tallest. So, A has to be the second tallest and B is the third tallest. The different possibilities are:

	Height	Weight			Height	Weight
A	2	1		A	2	3
B	1	3	OR	B	1	2
C	3	2		C	3	1

∴ Either A or C is the heaviest. Hence, the answer cannot be determined.

3. The greater than sign '>' used here means 'taller than'.
Using the first letter of the names of the boys, we get the following arrangements.
L > M; P > L; N > P; N > O
On collating the above data, we get:
$N >^{(o)} P^{(o)} > L^{(o)} > M^{(o)}$ and N > O
[Here, 'O' can be placed anywhere, as indicated].
As it is not known whether P or O is taller, hence, the person who is the second tallest cannot be determined.

4. C comes before B and after A.

$$A > C > B \qquad (A)$$

D comes before E.

$$D > E \qquad (B)$$

From (A) and (B), we get that either D or A comes first.
We also know that there is at least one person between D and E.
Case I: D comes first.
The possible order could be
(A) DAECB
(B) DACEB
(C) DACBE
But all of the above orders violate the condition that there must be the same number of people between D and E as between C and B.
This means that A comes first and the order is ACDBE or ADCEB.
∴ A comes first.

5. H.T. > T.D. (H.T. got more marks than T.D.)
We also know that P.T. did not get I or IV rank.
∴ It would get either II or III rank.
Anil > Murali
Gopi > Hari (H.T.)
We also know that P.T. got more marks than H.T which in turn got more marks than T.D.
⇒ P.T. > H.T. > T.D
∴ P.T. should get the 2nd rank and DME the 1st rank.
Since Gopi's project got more marks than Hari, it means that Hari did project T.D. Since we also know that Anil's project got more marks than Murali's project, it means that Anil did project DME and Murali did project P.T.

6. **In terms of richness:**
Muk > Mur
Pre > Ad > Muk > Mur > Ra
Age:
Mur > Muk
Pr > Muk > Raj > Adi
∴ The number of people richer and older than Mukesh is only one, i.e., Aditya.

7. Raman > Rana > Raju
Ramana > Rama > Rana
Ramana Ramesh Raman
Ravi > Raman
If no other person finished the race between Ravi and Raman, then we get the following arrangement:
Ravi > Raman > Ramesh > Ramana > Rama > Rana > Raju.
The 6th person to finish the race is Rana.

8. Since each person has at least one apple and no two people have the same number of apples, we can say number of apples as 1, 2, 3 and 4. Given that Kamal has more apples than Anand. Mohan has more apples than Ravi. But Kamal does not have the highest number of apples. So, Mohan has the highest number of apples that is four apples with him.

9. Given Karan has more speed than Santosh and Sid finished the race before Vinit.
So, Karan > Santosh
Sid > Vinit
Since Karan did not finish before Vinit, we can say that Santosh finished the race last or his speed is the lowest.

Solutions for questions 10 to 12: From (i), P < R < S.
From (ii), S is the third eldest.
From (iii), Q is elder than fourth youngest [i.e., fourth eldest]
∴ Q is the second eldest.
From (iv), T is the second youngest and U is the youngest.
∴ V must be the eldest.
Also, R is the fourth eldest and P is the fifth eldest.
∴ We have,
U < T < P < R < S < Q < V.

10. V is the oldest.

11. P is the third youngest.

12. R is the fourth oldest.

Solutions for questions 13 to 15: A group of five people, namely P, Q, R, S and T are of different heights and different weights.

From (1), we have either P or Q is the tallest.

From (2), T is taller as well as heavier than R and S.

∴ T is either the 2nd or the 3rd tallest and is not the lightest.

From (3), the lightest and the 2nd tallest are the same.

∴ T is 3rd tallest and from (3), T is the heaviest.

From (3), the second tallest, i.e., either P or Q is the lightest. But from (4), Q is the fourth heaviest, i.e., he is not the lightest.

∴ P is the lightest and the 2nd tallest, Q is the heaviest.

From (4), R is heavier and shorter than S.

∴ The final order is as follows.

	Height	Weight
1	Q	T
2	P	R
3	T	S
4	S	Q
5	R	P

13. P is the lightest.

14. Only T is taller as well as heavier than S.

15. Four people are heavier than P.

Solutions for questions 16 to 18: Given that E got last rank, i.e., 5th rank in maths. D got second rank in Maths and got third rank in Physics.

From (2), we can say that C got fourth and fifth rank in Maths and Physics, respectively. (∵ E got fifth rank in Maths)

The data can be represented as follows.

	Maths	Physics
A		
B	x	3
C	4	5
D	2	x
E	5	

So, x cannot be 2, 3, 4 or 5. Now, $x = 1$ also from (5), in Physics A's rank is better than E's rank. Hence, the ranks are as follows:

	Maths	Physics
A	3	2
B	1	3
C	4	5
D	2	1
E	5	4

16. D got 1st rank in Physics.

17. A got 2nd rank in Physics.

18. The rank of A in Maths is same as the rank of B in Physics.

Solutions for questions 19 and 20: A group of five students, namely Pavan, Sravan, Charan, Tarun and Kiran are the top five rankers in a class. Each one of these is of a different height. It is given that, the tallest person is the fourth ranker, Kiran is the 2nd ranker, Tarun is taller than at least two people. Hence, Tarun could be either the tallest, the second tallest or the third tallest. Tarun is the third ranker. As Tarun is the third ranker he cannot be the tallest because the fourth ranker is the tallest.

The shortest person is the first ranker but he is not Charan.

Charan is neither the first ranker nor the shortest.

Sravan is taller than only one person. Hence, Sravan is the fourth tallest.

∴ Sravan cannot be the first or the fourth ranker. As Tarun is taller than Kiran, Kiran is not the shortest. Pavan is the first ranker and the shortest.

Tarun is the second tallest and Charan is the tallest.

The final order is as follows.

Name	Rank	Height
Pavan	1	5
Sravan	5	4
Charan	4	1
Tarun	3	2
Kiran	2	3

19. Charan is the fourth ranker.

20. As Pavan is the shortest, the remaining four people are taller than Pavan.

Solutions for questions 21 to 23: Let the number of chocolates with each of them be denoted by the first letter of his name.

From (ii), $C < S < R$.

From (iii), $S > N$

From (iv), $R - C = K - R$

As R – C is at least two, and no number has a difference of three with more than one of the given numbers.

$R - C = 2$

∴ $K - R = 2$

From (ii) and (iii), we get:
N < C < S < R
As K – R = 2,
A must be greater than R.
∴ The final arrangement will be as follows.

N	<	C	<	S	<	R	<	A	<	K
3	4	5	6	7	8					

21. Ranjit has 6 chocolates.

22. Sumit has 5 chocolates.

23. The difference is = 8 – 3 = 5.

Solutions for questions 24 to 26: From (i) and (iv), Anand got a better rank than at least three people, i.e., Anand's rank can be 1 or 2 or 3.

From (iii), Charan's rank can be 6 or 5 or 4.

If Anand's rank is 3, then Charan's rank must be 4, in this case, condition (v) is violated.

∴ Anand's rank is either 1 or 2.

Here we have three possibilities:

(A)	1	2	3	4	5	6
	Gopal	Anand	Deepti	Hriday/Charan	Brijesh/Brijesh	Harish

(B)	1	2	3	4	5	6
	Anand	Gopal	Hriday/Deepti	Brijesh/Charan	Brijesh	Hriday

(C)	1	2	3	4	5	6
	Anand	Deepti	Hriday	Gopal	Brijesh	Charan

24. It is possible in case (b) and (c).
But only in case (b), we have one person between Deepti and Charan, i.e., Brijesh.

25. We have more than one possibility.

26. It is possibly (c), in which Brijesh got the fifth rank.

Solutions for questions 27 to 29: Let the marks scored by each person be denoted by the first letter of his name.

From (ii), E > C > D
From (iv), G > H
From (v) D > G
Combining the above, we get.
∴ E > C > D > G > H
From (iii), we get

1	2	3	4	5	6	7	8
F							

As H did not get the lowest score, either A or B got the lowest score.
From (i) and the above data, A got the first rank and B got the eighth rank.
∴ The final arrangement will be as follows.
A > E > C > D > F > G > H > B

27. Dayanand got the fourth highest score.

28. Goutam got the third lowest score.

29. Anurag got the highest score.

Solutions for questions 30 to 34: It is given that four athletes, namely Bolt, Johnson, Lewis and Powell competed in four different events 100 m, 200 m, 400 m and 800 m. In each event these athletes finished in four different timings. No athlete finished any two events in the same position.

From (1), we have the same athlete (say *x*) finished first in 100 m and fourth in 800 m.

From (2), we have the same athlete (say *y*) finished 2nd in 200 m, 3rd in 400 m, 1st in 800 m and hence, 4th in 100 m events.

We can conclude that the person *x* finished 2nd in 400 m and 3rd in 200 m event.

	100 m	200 m	400 m	800 m
1	*x*			*y*
2		*y*	*x*	
3		*x*	*y*	
4	*y*			*x*

From (3), we have Bolt finished second in 100 m. Hence, Bolt is neither *x* nor *y* and hence, Bolt finished 3rd in 800 m.

Let *z* be the remaining athlete. *z* is the 2nd in 800 m, 3rd in 100 m.

From (4), as Johnson finished after Bolt in 200 m.

Bolt is the first to finish 200 m and is the fourth to finish in 400 m.

z is the first to finish in 400 m.

As Johnson finished after Bolt in 800 m, from this we can determine that *x* is Johnson.

As Lewis is not the last one to finish 200 m, Powell finished fourth in 200 m and *y* is Lewis.

The final order is as follows.

	100 m	200 m	400 m	800 m
1	Johnson	Bolt	Powell	Lewis
2	Bolt	Lewis	Johnson	Powel
3	Powell	Johnson	Lewis	Bolt
4	Lewis	Powell	Bolt	Johnson

30. Powell is the fourth to finish 200 m.

31. Powell is the first to finish 400 m.

32. Bolt is the third to finish 800 m.

33. Lewis is the second to finish 200 m.

34. Powell is the second to finish 800 m.

Solutions for questions 35 to 37: From (i), Confidence > Sense of Humour > Creativity.

From (ii), Honesty is ranked 2 from the top.

From (iii), Commitment > Intuition > Positive Attitude.

From (iv), Positive Attitude > Creativity > Communication.

From (v), Confidence > Commitment.

Combining the above statements, we get the following possibilities:

(i) Confidence > Honesty > Sense of Humour > Commitment > Intuition > Positive Attitude > Creativity > Communication.

(ii) Confidence > Honesty > Commitment > Sense of Humour > Intuition > Positive Attitude > Creativity > Communication.

(iii) Confidence > Honesty > Commitment > Intuition > Sense of Humour > Positive Attitude > Creativity > Communication.

(iv) Confidence > Honesty > Commitment > Intuition > Positive Attitude > Sense of Humour > Creativity > Communication.

Solutions for questions 38 to 40: From (iv), (iii), (i) and (vi), we get the following cases:

(A) B > H > D > I > – > – > – > A > J > F > –

(B) B > – > H > D > I > – > – > – > – > A > J > F

But from the above data, (ii), (v) and (vii) we can eliminate case (b). The final arrangement is B > H > D > I > C > E > G > A > J > F > K.

38. C scored the fifth highest marks.

39. Two students scored less than J.

40. Four students scored less than D but more than A.

EXERCISE-2

Solutions for questions 1 to 3: Let us represent Alfa, Beta, Gamma, Delta and Zeta with familiar symbols as α, β, γ, δ and ɀ, respectively.

For efficiency of doing the work:

Given that β is more efficient than α. γ takes least time, so he has the highest efficiency. Also δ is more efficient than ɀ. α is less efficient than ɀ and more efficient than δ.

So, in terms of efficiencies γ > β > ɀ > α > δ or γ > ɀ > β > α > δ

For heights:

Given that β is shorter than α ⇒ β < α

γ is shortest.

δ is shorter than ɀ ⇒ δ < ɀ

Also, ɀ is taller than β who is taller than δ.

⇒ α > ɀ > β > δ > γ or ɀ > α > β > δ > α

1. Delta is the least efficient.

2. Either Alpha or Zeta is the second tallest.

3. Under the given condition, the order of efficiencies is as follows.

γ > β > ɀ > α > δ

The order of heights is as follows:

ɀ / α > α / ɀ > β > δ > γ

∴ Beta and Zeta are the third tallest and the third efficient, respectively.

Solutions for questions 4 to 8: It is given that six people, namely A, B, C, D, E and F are standing in a queue and each of them is of a different height. These six stands in the decreasing order of their heights.

From (1), the different possible arrangements are as follows:

(i) ___ ___ D A B/C C/B

(ii) ___ ___ A D B/C C/B

(iii) ___ A ___ ___ D ___

(iv) A ___ ___ ___ ___ D

From (2), B is taller than D. Hence, the arrangements (i) and (ii) are not possible.

Possibility (iii): From (1) and (2), B is taller than D and shorter than A. Hence, B is between A and D.

From (1) and (3), C is shorter than A but does not stand at any end. Hence, B and C are in between A and D. From (2), E is taller than B. Hence, E should be the tallest and next to A which contradicts the condition (5). Hence, (iii) is not possible.

The only possible way is (iv).

A ___ ___ ___ ___ D

The different possible ways are:

A C E B F D
A C E F B D
A C F E B D

4. A is the tallest.

5. Either C or F stands between A and E.

6. D is the shortest.

7. Four people are standing behind C.

8. Either three or four people stand ahead of B.

Solutions for questions 9 to 12: From (i), Income: P > U

Expenditure: P > T

From (ii), Income: Q > S

Expenditure: R > Q

From (iii), Income: R > U

Expenditure: U > R

From (vii), Income: U > T and from the other given conditions, we derive the following data.

	Income	Expenditure
Highest	P	U × S
	R × Q	P
	Q	T
	S	S
	U × S	R × Q
Lowest	T	Q

9. U's income is less than that of S and more than that of T.

10. T has the lowest income.

11. One person has expenditure less than that of R.

12. Two people have income more than that of S but less expenditure than that of T.

Solutions for questions 13 to 16 : From (ii), the oldest was born in 1981 and the youngest was born in 1989.

From (iv), Falgun is the fourth oldest, who was born in 1985.

From (i) and (v), Ekta and Deekshit are born in 1984 and 1988, respectively. Ekta is the third oldest and Deekshit is the second youngest.

From (iii), Abhay and Chandini are the fifth and seventh oldest, respectively but not necessarily in the same order. They are born in 1987 and 1989, respectively.

From (vi), Chandini was born in 1987 (and is the fifth oldest) so that Giri was born in 1982 (and is the second oldest). Abhay is the youngest, who was born in 1989. Hence, Bhargav is the oldest being born in 1981.

The final order, from the oldest to the youngest is as follows. A D

Bhargav (1981) > Giri (1982) > Ekta (1984) > Falgun (1985) > Chandini (1987) > Deekshit (1988) > Abhay (1989)

13. The oldest is Bhargav.

14. Chandini was born in 1987.

15. Falgun is four years older than Abhay.

16. The fifth youngest or third oldest is Ekta.

Solutions for questions 17 to 20: Given that:

(i) Four boys – A, B, C, D
Four girls – W, X, Y, Z

(ii) There are two boys, each of whom is taller than exactly two girls.

(iii) There are two girls, each of whom is taller than exactly two boys.

(iv) ('>' symbol represents taller than)
B > W > A > X

(v) C > Z > D > Y > X and C > B

From (ii) and (iii), we can judge that there are two possibilities.

(I) 2 boys > 2 girls > 2 boys > 2 girls

(II) 2 girls > 2 boys > 2 girls > 2 boys

But from (iv) and (v), we can judge that C is the tallest. Hence, (I) is the acceptable arrangement.

Analysing (iv):

B (boy) > W (girl) > A (boy) > X (girl)

Analysing (v):

C (boy) > Z (girl) > D (boy) > Y (girl) > X (girl)

Hence, we conclude that:

2 boys > 2 girls > 2 boys > 2 girls

C > B > W, Z > A, D > Y > X

Also, among boys, we have:
C > B > A and C > D

Hence, the tallest boy is C (C anyhow is the tallest among all the eight people).

Among girls, we have:
Z > Y > X and W > X

Hence, the shortest girl is X, who also happens to be the shortest among all eight. Hence, the shortest boy and the tallest girl is unknown. Also, the person who is taller among (W, Z) and (A, D) is not known.

17. As discussed above, the shortest among boys could be D. Hence, (B) can be false.

18. Given that W > Z, but the person who is taller out of A and D is not known. Hence, statement (C) is not definitely true.

19. Given that D < A or A > D, but the person who is taller between W and Z is not known.

20. Given that D > A, hence, the shortest boy is A. The tallest girl is either W or Z.

Solutions for questions 21 to 24: From (ii), (iii) and (v), K scored the fourth highest, E scored the fifth highest. A scored the sixth highest and C scored the seventh highest runs.

From (i), (vi) and (vii), D scored the third highest runs, B scored the fourth lowest runs. H scored the highest runs or the second highest runs and I scored the third lowest runs or the second highest runs.

From (iv) and the above data, J scored the lowest, F scored the second highest runs, I scored the third lowest runs and H scored the highest runs.

Therefore, the final arrangement is as follows:

$$\underline{H} > \underline{F} > \underline{D} > \underline{K} > \underline{E} > \underline{A} > \underline{C} > \underline{B} > \underline{I} > \underline{G} > \underline{J}$$

21. J scored the lowest runs.

22. Five players scored more than G and less than K.

23. E's score can be 96.

24. The number of people who scored between A and B is one and A scored more runs than B.
Similarly, F is related to K.

Solutions for questions 25 to 27: From the given information we can say that the top three websites which have the most number of visitors will have the lowest speed, i.e., the first lowest, the second lowest and the third lowest.

From (i) and (ii), 'Ask' has the second highest number of visitors and 'eBay' has the third highest number of visitors.

From (iii) and (iv), the uploading speed of 'gmail' is the highest or the second highest or the third highest and the number of visitors is the lowest or the second lowest or the third lowest. 'LinkedIn' has the lowest or the second lowest number of visitors and uploading speed is the highest or the second highest.

	Number of visitors	Uploading speed
1		
2	Ask	
3	eBay	
4		eBay
5		
6		Ask

25. Statement (C) is false.

26. If (i) is true, (ii) is also true.

27. Statement (D) is true.

Solutions for questions 28 to 30: From (i), (ii) and (iii), D could have bought the second highest or the third highest number of shares in company Q.

B could have bought the second highest or third highest number of shares in P and the highest or the second highest number of shares in Q.

From (iv) and (v), the number of shares bought by B is the second highest in P, the highest in Q and the lowest in R.

∴ The final distribution is as shown below.

P	Q	R
A	B	C
B	C	D
C	D	A
D	A	B

28. B has the highest number of shares in Q.

29. All of A, C and D.

30. One person has one more share than C in company Q.

Solutions for questions 31 to 33: Let each person be represented by the first letter of his respective name. As the expenditure of no two of them is the same and their income is the same, the person who has the maximum expenditure would have the least savings, the person who has the second highest expenditure would have the second least savings and so on.

From (iii) C's savings are more than D's savings.
∴ C's expenditure is less than D's expenditure.
From (iv) A's expenditure is more than F's expenditure.
∴ A's savings are less than F's savings.
From (v) B's savings are more than F's savings.
and B's expenditure is more than D's
∴ B's savings are less than D's.
In terms of savings the order is as follows:
C > D > B > F > A
In expenditure, the order is as follows.
A > F > B > D > C

31. Abanti's expenditure is the highest.

32. Chandan's savings is the highest.

33. Savings of three people are more than that of Fahrook.

Solutions for questions 34 to 37: Let us consider case (I).
From (i) and (ii), Nirmala does not have Rank 1, 3 or 5.
From (iv), Parimala's Rank is 2.
Hence, Nirmala's Rank is 4.
⇒ Nirmala's Rank is 5 (From (ii)).
From (ii), Amala's rank is 1 and Kamala's rank is 3.

Case (I)

Rank	Child	Woman
1	Chinna	Amala
2	Rinku	Parimala
3	Kanna	Kamala
4	Tinku	Nirmala
5	Munna	Vimala

From the above table, Kanna's mother is Nirmala and Chinna's mother is neither Amala nor Vimala.
Since Tinku's mother is Parimala, Chinna's mother is Kamala.
⇒ Munna's mother is Amala and Rinku's mother is Vimala.
Hence, the mother child pairs are as follows.

Amala – Munna, Parimala – Tinku, Kamala — Chinna, Nirmala – Kanna, Vimala – Rinku

Let us consider case (II):
Nirmala's rank is none of 1, 3 or 5.
From (iv), Parimala's rank is 4.
Hence, Nirmala's rank is 2.
From (ii), Rank 3 and 5 are for Vimala and Kamala in any order. Hence, Amala's rank is 1.

Case (II)

Rank	Child	Woman
1	Chinna	Amala
2	Tinku	Nirmala
3	Rinku	Vimala/Kamala
4	Munna	Parimala
5	Kanna	Kamala/Vimala

From the above table, Rinku's mother is Nirmala, Tinku's mother is Parimala, Chinna's mother is not Amala. Hence, Chinna's mother is either Vimala or Kamala, the woman whose rank is 3.
Hence, Kanna's mother is neither 3rd nor 5th ranked women.
Hence, Kanna's mother is Amala.
The following are the mother – child pairs.

Amala – Munna, Parimala – Tinku, Kamala — Chinna, Nirmala – Kanna, Vimala – Rinku

Let us consider case (III).
Parimala's rank is 4.
Nirmala's rank is none of 1, 3 and 5.
Hence, Nirmala's rank is 2.
From (ii), the rank's of Vimala and Kamala is 3 and 5 in any order.
Hence, Amala's rank is 1.

Case (III)

Rank	Child	Woman
1	Chinna	Amala
2	Tinku	Nirmala
3	Kanna	Vimala/Kamala
4	Rinku	Parimala
5	Munna	Vimala/Kamala

From the above table, Nirmala's child is Kanna and Parimala's child is Tinku. Chinna's mother is 3rd ranked woman.
Hence, Munna's child is Amala.
The following are the mother – child pairs.

Amala – Kanna, Nirmala – Rinku, Vimala — Munna/Chinna, Parimala – Tinku, Kamala – Munna/Chinna.

34. Nirmala's child is either Rinku or Kanna.

35. If Munna is the child of Vimala, cases (II) and (III) prevail. But in case (III) Vimala is the mother of Munna, then Vimala should have Rank 3. But Chinna's mother got Rank 3. Hence, case (III) is does not hold good. In case (II) Vimala has Rank 5 and Kamala has Rank 3.
⇒ Parimala is elder than Vimala.

36. If Nirmala is elder than only one person, then case (I) prevails. Then Vimala is Rinku's mother.

37. Statement (C) is true.

Solutions for questions 38 to 40: There is a total of four comparison parameters, such as Weight, Height, Richness and Age. Let us put down the data given for the comparison (greater than symbol '>', which represents a person being heavier, taller richer or older than the other).

	Weight	Height	Richness	Age
(i)	A > D	D > A	D > C	C > D
(ii)	E > B	E > C	B > E	C > E
(iii)	E > B	B ≠ Youngest		
(iv)	B ≠ Shortest			
(v)	Richest = Youngest			
(vi)	Heaviest = Shortest			
(vii)	Second Oldest = Second poorest (or Fourth richest)			
(viii)	Second Heaviest = Third shortest (or Third tallest)			
(ix)	Second Shortest = Third poorest (or Third richest)			
(x)	Second Richest = Third eldest			
(xi)	E ≠ Heaviest, Tallest, Richest, Eldest			
(xii)	No person gets the same rank in any two comparisons			

Now, neither B nor C can be the tallest, as E is taller than

these two. Also, A cannot be the tallest, as D is taller than A. E anyhow cannot be ranked first.

Hence, D must be the tallest.

It is given that E is never ranked first. Hence, the first rank in these 4 different comparisons must belong to A, B, C and D. Also, the last ranks must belong to A, B, C and E as D is never ranked last. Now B is neither the youngest nor the shortest and as B > E in richness. Here, B is not the poorest. Therefore, B must be the lightest.

Now the richest person cannot be D (already D is the tallest and no one can have the same rank in any two comparisons), nor E (B > E). Also, the youngest person is neither C (C > D, E) nor B (given B is not the youngest) nor D (D is never ranked last). Also, the richest and the youngest person is the same. As E is not the richest (E is never ranked first). Hence, the remaining person 'A must be the richest as well as the youngest'.

Now, the shortest person can neither be E (E > C, B) nor B nor A.

(They are already ranked fifth in some other comparison) nor D (D can never be ranked last). Hence, C must be the shortest as well as the heaviest person. This means that E must be the poorest person. Also, B must be the eldest person.

Now let us represent the ranks as given below

Person	Weight	Height	Richness	Age
A			1	5
B	5			1
C	1	5		
D		1		
E			5	

Also, Second poorest = Fourth richest, Third shortest = Third tallest, and Second shortest = Fourth tallest; Third poorest = Third richest.

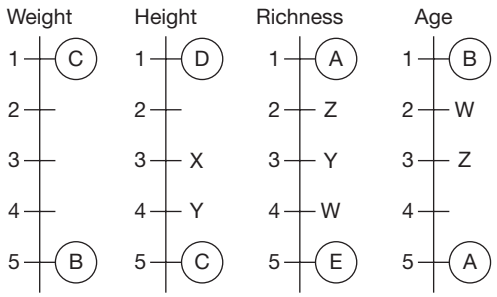
→ Second oldest, Fourth richest = W

→ Second heaviest, Third tallest = X

→ Fourth tallest, Third richest = Y

→ Second richest, Third eldest = Z

We now represent the ranks on a scale as shown below:



Now D is neither X nor Y. Hence, D ≠ Third poorest. Then D must be Z (as D ≠ 4, ∴ D > C) this means that D must be the second richest and third oldest.

Now D has first, second and third ranks in three of the parameters and as D ≠ 5. Hence, D must be the fourth heaviest.

As D is the third oldest, C must be the second oldest and the fourth richest (∴ C > D, E in age).

Then E must be the fourth eldest and B must be the third richest as well as the fourth tallest.

Now A or E is second or third heaviest. Similarly, A or E is second or third tallest. We complete the table as given below:

Person	Weight	Height	Richness	Age
A	Second or Third	Third or Second	1	5
B	5	4	3	1
C	1	5	4	2
D	4	1	2	3
E	Third or Second	Second or Third	5	4

38. Statement I (A is shorter than E) can complete the arrangement and fix the positions of A and E.
Statement II (E is lighter than A) makes A the second heaviest and the third tallest and E as the third heaviest and the second tallest thus completing the arrangement. Similarly, 'The youngest person (A) is heavier than the poorest person (E)', also helps in completing the arrangement. Hence, any one of these statements is sufficient to complete the arrangement.

39. Since in every comparison ranks 5, 4, 3, 2 and 1 are awarded, the sum of the ranks in any comparison is 5 + 4 + 3 + 2 + 1 = 15. Total sum of all ranks awarded is 15 × 4 (since there are 4 comparisons) = 60.

40. Second richest = D
Fourth richest = C
Fourth heaviest = D
Second shortest = B
Hence, the order is DCDB.

EXERCISE-3

Solutions for questions 1 to 4: In terms of cleverness, it is known that

A is cleverer than B, C is cleverer than B, E is the least clever of all, i.e., A > B and C > B, but there is no relation between A and C.

So, both A and C are cleverer than B and E is the last in order of cleverness. So, it is clear that neither A nor C can be 4th and B cannot be 1st or 2nd, as A and C are cleverer than him.

1	2	3	4	5
-	-	-	-	E

So, nothing can be decided about the exact order. In terms of scores, it is given that A scores less marks than D, i.e., D > A and C gets more marks than B, i.e., C > B, whereas E scores more than C, i.e., E > C so E > C > B. Now the order cannot be decided. It can be only said that E can be neither 4th nor 5th. B cannot be 1st and 2nd. D cannot be 5th and A cannot be 1st in the order of score.

1. If D is the cleverest of all, then the order is as follows:

1	2	3	4	5
D	A or C	C Or A	B	E

Then one of the orders can be, D, C, A, B, E.

2. If B is cleverer than D, then A or C stands first in terms of cleverness.

1	2	3	4	5
A/C	C/A	B	D	E

3. C stands second in order of marks. Then the third score may be of B or D. So, who gets the third position cannot be determined.

4. The order of cleverness or marks is not clearly given. So, it cannot be determined who is cleverer and also scores more marks than two people.

Solutions for questions 5 to 8: As, the total sum = 30 and least sum (1, 2, 3) = 6, and the highest sum is (2, 3, 4) = 9, the sum of the ranks must be 6, 7, 8 and 9.

From the given information, we have the following table.

	Rajesh	Tarun	Praneeth	Sravan
Quant	1			
Reasoning			3	
Verbal		4		
Total				9

As the sum of the ranks of Sravan is 9, the ranks must be 2, 3 and 4.

∴ Praneeth got the first rank in Verbal.

⇒ Tarun got the first rank in Reasoning.

In Reasoning, if Rajesh got the second rank and Sravan got the 4th rank, then Praneeth must have got the fourth rank in Quant. As only Rajesh can get the sum (1, 2, 3) as 6, Rajesh's rank in Verbal must be 3.

∴ Sravan's rank in Verbal must be 2nd, which is violating (4).

∴ In Reasoning, Rajesh got the fourth rank and Sravan got the second rank.

Now, only Praneeth can get the sum as 6.

∴ Praneeth's rank must be two in Quant.

Tarun's sum cannot be 7, Rajesh's rank in Verbal must be two.

∴ Sravan's ranks in Verbal and Quant are 3 and 4, respectively.

∴ Tarun got the third rank in Quant.

	Rajesh	Tarun	Praneeth	Sravan
Quant	1	3	2	4
Reasoning	4	1	3	2
Verbal	2	4	1	3
Total	7	8	6	9

5. Tarun got the third rank in Quant.

6. Sum of the ranks of Praneeth is 6.

7. Rajesh got the second rank in Verbal.

8. Sum of the ranks of Rajesh is 7.

Solutions for questions 9 to 12: Let each person be denoted by the first letter of his name.

From the given information we have:

	A	S	B	C	T	V
Height	2					
Weight				4		

From (2) and (6), we have

Height: V > S, V > C, S > T

⇒ V > S > T, V > C

Weight: V > S, V > C, B > A

From (1), neither B nor T got 2nd or 4th rank in any category.

∴ T's rank in height must be 5 or 6.

If T's rank in height is 6, then B's rank in weight will be 6, which violates (6).

T's rank in height is 5 and B's rank in weight is 5.

∴ A's rank in weight will be 6.

Also, as none of B, S, T, V can get the 6th rank in height, then C gets the 6th rank in height.

B and V got the first and the third ranks in height, respectively.

∴ S got the 4th rank in height.

Now, in weight, if V gets the first rank, then T must get the third rank.

In height, B must get the third rank.

⇒ V gets the 1st rank in weight as well, which violates (3).

∴ In weight, V gets the second rank.

∴ S gets the third rank.

⇒ T gets the first rank.

In height, B gets the first rank and V gets the third rank.

∴ The final results will be as follows:

	A	S	B	C	T	V
Height	2	4	1	6	5	3
Weight	6	3	5	4	1	2

9. Sunil got third rank in weight.

10. Chanty's rank in weight is 4.

11. Bunty got the 1st rank in height.

12. Five

Solutions for questions 13 to 15: The given data is that the five types of vegetables are Carrot, Tomato, Brinjal, Cabbage and Cauliflower.

In terms of freshness, it is given that:

Tomato is more fresh than Cauliflower, i.e., Tomato > Cauliflower.

Carrot is more fresh than Cabbage, i.e., Carrot > Cabbage.

Cauliflower is more fresh than Cabbage, i.e., Cauliflower > Cabbage.

Tomato is more fresh than Brinjal, i.e., Tomato > Brinjal.

So, Tomato is more fresh than Brinjal and Cauliflower.

Carrot and Cauliflower are more fresh than Cabbage.

Let us denote Tomato by To, Brinjal by Br, Cauliflower by Cl, Carrot by Cr and Cabbage by Cb.

The following things are known.

Freshness wise	To > Br To > Cl > Cab Cr > Cab
Weight wise	Cr > Br > To > Cl Cab > To

So, the order of freshness cannot be decided.

Tomato is heavier than Cauliflower, i.e., Tomato > Cauliflower.

Carrot is heavier than Brinjal, i.e., Carrot > Brinjal.

Cabbage is heavier than Tomato, i.e., Cabbage > Tomato.

Brinjal is heavier than Tomato, i.e., Brinjal > Tomato.

So, the order can be as follows:

Table I

1	2	3	4	5
Carrot	Brinjal	Cabbage	Tomato	Cauliflower
Cabbage	Carrot	Brinjal	Tomato	Cauliflower
Carrot	Cabbage	Brinjal	Tomato	Cauliflower

13. The order of freshness is:

Tomato, Brinjal, Cauliflower, Carrot, Cabbage

Tomato, Carrot, Cauliflower, Brinjal, Cabbage

Tomato, Carrot, Cauliflower, Cabbage, Brinjal

So, either Cabbage or Brinjal is the least fresh of all the vegetables.

14. If Cabbage is the heaviest, the order is in terms of the heaviest to the least heavy.

1	2	3	4	5
Cabbage	Carrot	Brinjal	Tomato	Cauliflower

So, Cabbage is the heaviest and Carrot is the 2nd heaviest.

15. If Carrot is not the freshest of all, then only Tomato is the freshest.

Solutions for questions 16 to 18: From (ii), the square and cube numbers can be (16, 64), (25, 27), (36, 64), (49, 27), and (81, 27). The weight of all the seven boys is a 2-digit number. (64, 64) is not possible, since no two boys have the same weight. Hence, D's weight can be 40, 26, 50, 38 and 54, respectively. From (iv) and the above data, the possible weights are as shown below.

Person	A	B	C	D	E	F	G
Case (i)		6		40			
Case (ii)		15		26			
Case (iii)		26		50			
Case (iv)		39		38			
Case (v)		71		54			

Case (i) is eliminated, since the weight of B is a single digit number. Case (iv) and case (v) are eliminated, since the people are standing in increasing order of their weights from left to right.

In case (ii), C's weight is 25 and E's weight is 27.

In case (iii), C's weight is 36 and E/F/G's weight is 64.

From (v), case (ii) is eliminated, since A's weight can be 9 or 18 or 27 and so on. A's weight cannot be 9, as 9 is a single digit and A's weight cannot be > 15.

In case (iii), A's weight is 18.

Persons	A	B	C	D	E	F	G
Case (i)	18	26	36	50	64		
Case (ii)	18	26	36	50		64	
Case (iii)	18	26	36	50			64

From (iii), in case (i) and case (ii) G's weight is = 26 + 50 = 76.
Case (iii) is eliminated as G's weight ≠ 76.
From (i):

$$\text{In case (i), E's weight} = \frac{50 + \text{F's weight} + 76}{3}$$

$$64 = \frac{126 + \text{F's weight}}{3}$$

∴ F's weight = 66.

$$\text{In case (ii), E's weight} = \frac{50 + 64 + 76}{3} = 63.3$$ not a 2-digit number.

Hence, case (ii) is eliminated.
∴ The seven people and their weights are as shown below.

People	A	B	C	D	E	F	G
Weights	18	26	36	50	64	66	76

16. F's weight is 66 kgs.

17. The difference between G's weight and A's weight is 58 kgs.

18. The weight of all the boys together is 336 kgs.

Solutions for questions 19 to 21: From the given information, we derive the following table.

Team	Win	Loss	Draw
A		2	
B		1	
C	–	–	5
D	2	2	1
E		1	1
F		3	1

As C had drawn a match with every other team the five matches should reflect in the other's score sheets also.
Hence, the number of matches drawn by A and B should be at least '1' each and E and F should be at least '2'.
It can be further seen that the number of matches drawn is 6, as we already have 9 losses in the loss column, we need to have 9 wins in the wins column.
Hence, the final score sheet is as follows.

Team	Win	Loss	Draw	Score
A	2	2	1	80
B	3	1	1	130
C	–	–	5	100
D	2	2	1	80
E	2	1	2	110
F	–	3	2	10

19. B and E advance into the finals.

20. A and D have the same score.

21. The total number of winners in the first round is 9.

Solutions for questions 22 to 25: From the information on time taken to traverse a stretch, we can determine their speeds in km/h. Further, at all signals, the maximum wait time in any direction is 9 minutes, this implies that the signal remains green for three minutes each direction. It also implies that the signal turns green after every 12 minutes in each direction: Towards north, signal turns green at 8.30, 8.42, 8.54, 9.06, 9.18, 9.30 and so on. Thus, in any hour, at any signal, the signal turns green at 6th, 18th, 30th, 42nd and 54th minutes invariably.

No given speed or travel matches the cycle of green signal at the signal posts.

Thus, invariably each person will wait at each signal post irrespective of his speed.

Speed KMPH	Travel time to reach next signal	Waiting time	Time to start next stretch
80	15 minutes	9 minutes	24 minutes
75	16 minutes	8 minutes	24 minutes
60	20 minutes	4 minutes	24 minutes
40	30 minutes	6 minutes	36 minutes

22. D's initial speed = 75 kmph
⇒ Time on 1st stretch = 16 minutes
Earliest time
⇒ Speed has to be increased = 80 kmph
⇒ Time taken on second and third signal stretches = 15 minutes.
⇒ Time taken = (16 + 8) + (15 + 9) + (15 + 0) = 63 minutes.
Earliest time = 8.30 + 63
= 9.33

23. 10 : 45 – 8 : 30 = 2 : 15 = 135 minutes
Choice (A) = 36 + 24 + 24 + 36 + 20
= 140 minutes
Choice (B) = 36 + 36 + 24 + 24 + 15
= 135 minutes

Choice (C) = 36 + 36 + 24 + 36 + 15
= 157 minutes
Choice (D) = 36 + 24 + 36 + 24 + 16
= 136 minutes.
Speeds in choice (B) takes B to Signal 5 by 10.45 p.m.

24. Initial speed = 80 kmph ⇒ Time to reach Signal 3
= (15 + 9) + x + 20 x can be 24 or 36
∴ Time to reach Signal 3 = 44 + 24 or 44 + 36
= 68 or 80 minutes
⇒ Time = 9.38 or 9.50

25. Starts at Signal 2 = 9.30
⇒ Time = 60 minutes = 24 + 36 (24 > 36) minimum waiting time = 4 + 6 = 10 minutes. Maximum waiting time = 9 + 6 = 15 minutes

6 Binary Logic

CHAPTER

Learning Objectives

In this chapter, you will:

- Understand the concept of Binary Logic, truth tellers, liars and alternators.
- Figure out how to reject a person based on his/her statements.
- Understand how to arrive at facts by identifying whether statements made by a person are true or false and identify whether a person is a truth teller or a liar or an alternator.
- Learn how to solve questions which have a combination of Binary Logic and other topics.

In some of the competitive exams, we come across questions which are to be answered based on the truth or falsity of statements given in the question. In these questions we come across three kinds of terms. They are 'Truth-Teller', 'Liar' and 'Alternator'. These terms may or may not be explicitly defined in the question. The following are the definitions of these terms, which can be applied while answering these questions, unless otherwise defined.

Truth-teller: A person whose each and every statement is true.

Liar: A person whose each and every statement is false.

Alternator: If the first statement of the person is true, then the next statement is false or vice versa.

The question does not specify as to which statement is true or false. It has to be found out by trial and error and by checking for consistency in the given statement.

If the question states that there is a truth teller among the given persons, we assume one person as the truth teller and list down statements stated by that person as facts. We compare the statements of the other persons with the facts listed out. If we do not come across any contradiction, we can conclude that our assumption holds good, otherwise we continue by assuming another person to be the truth teller.

In case there is no indication whether or not there is a truth teller, we go by assuming a fact. The following illustrations help in understanding the concept.

SOLVED EXAMPLES

6.01: Among the three people A, B and C, one is a truth-teller, one is a liar and the other is an alternator. Each of them made the following statements in reply to the question asked about them.

A: I am not the liar. C is the liar.
B: I am the liar. A is the truth-teller.
C: I am the alternator. B is the liar.

Find out who the truth-teller is, who the liar is and who the alternator is.

Sol: The statement, 'I am not the liar', could be that of a truth-teller or of a liar or of an alternator. Hence, we cannot find out the nature of A. From the statement of B, i.e., 'I am a liar', it can be concluded that B is the alternator, because neither a truth-teller nor a liar would say that he is a liar. Hence, the second statement of B, i.e., 'A is the truth-teller' is true. From the above, it can be concluded that the statement of C, i.e., I am the alternator is false. Hence, C is the liar. Let us check the truth in each of the statements of A, B and C with the help of the conclusions made.

A: I am not the liar (True). C is the liar (True).
B: am the liar (False). A is the truth-teller (True).
C: I am the alternator (False). B is the liar (False).

From the above, it is clear that the conclusions made, i.e., A is the truth-teller (both the statements are true), B is the alternator (one statement is true and the other is false) and C is the liar (both the statements are false) are correct. The questions asked may have one, two, three or even four statements made by each person.

Directions for questions 6.02 to 6.04: These questions are based on the following information.

Each of the boys Raman, Raghu and Rajan likes a different colour among red, blue and green. One of them always speaks the truth, one of them always lies and the third one alternates between the truth and lie. They made the following statements.

Raman : I like green.
Raghu likes red.
I am an alternator.
Raghu : Rajan likes Blue.
Raman does not like green.
I am a liar.
Rajan : I do not like red.
Raghu does not like red.
Raman is a liar.

6.02: Who is the alternator?
(A) Raman
(B) Raghu
(C) Rajan
(D) Cannot be determined

6.03: Who likes red colour?
(A) Raman
(B) Raghu
(C) Rajan
(D) Cannot be determined

6.04. Who is the liar?
(A) Raman
(B) Raghu
(C) Rajan
(D) Cannot be determined

Solutions for questions 6.02 to 6.04: We cannot take Raman as a truth-teller, since his third statement is contradicting.

Similarly, we cannot take Rajan as a truth-teller since his third statement is contradicting.

Rajan is a truth-teller.

Person	Statement 1	Statement 2	Statement 3	Colour
Raman	F	F	F	Red
Raqhu	F	T	F	Blue
Raian	T	T	T	Green

Hence, Rajan is a truth-teller.

6.02: Raghu is the alternator.

6.03: Raman likes red colour.

6.04: Raman is the liar.

6.05: Each one of the three friends Divya, Bhanu and Ravi went to a different place among Goa, Ooty and Shimla for summer vacation. They replied to the question, "Who went to Goa?", in the following manner:

Divya : I went to Shimla;
Ravi did not go to Ooty.
Bhanu : Divya did not go to Shimla;
Ravi did not go to Shimla.
Ravi : Bhanu did not go to Ooty;
I went to Goa.

If exactly two of the friends always tells the truth then who went to Ooty?
(A) Divya
(B) Bhanu
(C) Ravi
(D) Cannot be determined

Solution for question 6.05:

6.05: (i) Let us assume that Divya is truth-teller.

Name	Statement 1	Statement 2	Place
Divya	T	T	
Bhanu	F	T	
Ravi	F	T	Goa

It we take Ravi as a truth-teller, then we won't have two truth tellers.

Therefore, Divya went to Ooty.

(ii) If Bhanu is a truth-teller.

Name	Statement 1	Statement 2	Place
Divva	F	F	Ootv
Bhanu	T	T	Shimla
Ravi	T	T	Goa

6.06: In the Dhola award ceremony, Salman, Abhishek and Shah Rukh were nominated for the awards– Hero No. 1 and Zero No. 1. The awards were given to two persons. When the reporters asked them about the awards, each of them made two statements as follows. It is known that one among them always speaks truth, one always lies and the other one alternates between truth and lie in any order.

Salman: I did not get any award.
Shah Rukh got the Hero No. 1 award

Abhishek: I got the Hero No. 1 award
Shah Rukh got the Zero No.1 award

Shah Rukh: I got the Hero No. 1 award
Salman got the Zero No. 1 award

If at least one of the statements made by Abhishek is a lie, then who got the Hero No. 1 award?

(1) Salman
(2) Abhishek
(3) Shah Rukh
(4) Cannot be determined

Solution for question 6.06: Assuming both the statements of Salman as true, we get

Name	I	II	Award
Salman	T	T	-
Abhishek	F	F	Zero No. 1
Shah Rukh	I	F	Hero No. 1

Here Shah Rukh got the Hero No 1. award.

Assuming both the statement of Shah Rukh as true, we get,

Name	I	II	Award
Salman	F	T	Zero No. 1
Abhishek	F	F	–
Shah Rukh	T	T	Hero No. 1

In this case also Shah Rukh got the Hero No.1 award.

Directions for questions 6.07 to 6.08: These questions are based on the following information.

I met four students A, B, C and D. They have four different nick names among, Kaka, Mama, Baba and Lala. Each of them is from a different class among 1 through 4, not necessarily in the same order. When I asked them about their nick, name and the respective classes, each of them made three statements and no two of them made the same number of true statements. The statements made by them are as follows.

A: Baba is in class 2.
Kaka is in class 1.
Mama is in class 3.

B: My nick name is Mama.
I am in class 2.
Baba is in class 1.

C: My nick name is Lala.
I am in class 4.
Mama is in class 3.

D: My nick name is Lala.
I am in class 3.
Kaka is in class 1.

All the statements made by C are true and the second statement of either B or D is true but not both. Answer the following questions.

6.07: Whose nick name is Baba?
(1) A (2) D
(3) B (4) C

6.08: Who is in class 2?
(1) A (2) B
(3) D| (4) C

Solution for question 6.06: As none of them made the same number of true statements, one of them made three true statements, one made two true statements, one made one true statement and other one made no true statement.

It is given that all the statements of C are true. We get, C's name as Lala and he is in class 4.

Also Mama is in class 3.

$\therefore$ The third statement of A is also true.

So Kaka and Baba are in class one and two (in any order).

Therefore Third statement made by B or D is lie. Let us assume that the third statements of B is a lie. So , the third statement of D will be true, i.e. Kaka is in class 1. Then the first two statements of A become true which violates the conditions.

∴ The third statement of B is true. So, the third statement of D is a lie. One among A, B, C and D has made all false statements. As A, B and C has made at least one true statement all the statements made by D are false.

∴ D's nick name is not Lala and D is not in class 3. Kaka is not in class 1.

As D's second statement is false, B's second statement must be true. Hence B is in class 2 and his nick name is Kaka. Also the nick name of A is Mama and he is in class 3.

D's name is Baba, and he is in class 1.

	I	II	II	Class	Name
A	F	F	T	3	Mama
B	F	T	T	2	Kaka
C	T	T	T	4	Lala
D	F	F	F	1	Baba

6.07: D's nick name is Baba

6.08: B is in class 2.

EXERCISE-1

Directions for questions 1 to 8: Select the correct alternative from the given choices.

1. Amit, Ashok and Azad made one statement each.
The following are the statements made by them:
Amit: I am a liar.
Ashok: I am not a truth-teller.
Azad: I neither always make true statements nor always make false statements.
It is known that a truth-teller is one who always speaks the truth, while a liar is one who always lies (or makes false statements) and an alternator is one who alternates between a truth and a lie.
Whose statement is definitely true?
I. Amit's
II. Ashok's
III. Azad's
(A) Only I
(B) Only II
(C) Only III
(D) Only II and III

2. On 'Kya-Kya' island, there are two tribes, they are truth-tellers and liars. Truth-tellers always speak the truth and liars always lie. One day I met three Kya-Kya islanders A, B and C, and asked them 'Who among you is the truth-teller?' Following were their replies.
A : I am not a liar.
B : C is not a liar.
C : B is a truth-teller.
If it was known that exactly one person among the three was a truth-teller and the other two were liars, then who among them must be the truth-teller?
(A) A (B) B
(C) C (D) Cannot be determined

3. One day I met three people, named Anand, Bharat and Chandu each of whom belonged to a different tribe amongst truth-tellers, liars and alternators. When asked to introduce themselves, each of them gave two replies, as given below. Also, it is known that the truth-tellers always speak truth, the liars always lie and the alternators alternate between truth and lie, in any order.
Anand: I am the truth-teller. Bharat is the liar.
Bharat: I am not the liar. Chandu is the truth-teller.
Chandu: I am not the liar. Anand is not the truth- teller.
Who among these three people is the alternator?
(A) Anand (B) Bharat
(C) Chandu (D) Cannot be determined

4. A group of three players, namely Aalu, Kachaalu and Bhalu were playing poker and suddenly started to quarrel among themselves by blaming each other for cheating. It was found out that at least one person among the three cheated. When they were asked who cheated, their replies were as follows:
Aalu: I did not cheat.
Kachaalu cheated.
Kachaalu: I did not cheat.
Both Aalu and Bhalu cheated.
Bhalu: I did not cheat.
Only Kachaalu did not cheat.
If exactly one person among them always spoke truth, another always lied and the third alternated between the truth and lie, then which of the following statements can never be true in any case?
(A) Only Aalu and Bhalu cheated.
(B) Only Aalu and Bhalu did not cheat.
(C) Bhalu always spoke the truth.
(D) Bhalu alternated between truth and lie.

5. Sameer, Sameep and Sumer participated in a quiz contest and each one of them received exactly one title among the three titles, such as the winner, the 1st runner-up and the 2nd runner-up. When asked, 'Who among you three is the winner?', following were their replies:
Sameer: I am the winner.
Sameep is not the 1st Runner-up.
Sameep: I am the winner.
Sameer is the 2nd runner up.
Sumer: I am the winner.
Sameep is the 2nd runner-up.
It is also known that one among them always tells the truth, one always lies and one alternates between the truth and lie (not necessarily in that order).
Who can never be the 1st runner-up?
(A) Sameer (B) Sameep
(C) Sumer (D) Cannot be determined

6. Each person out of A, B and C had exactly one different title amongst the Good, the Bad and the Ugly. Also, each person always gave two answers to any question. Exactly one among them always spoke the truth, another always lied and the last person always alternates between truth and lie (in any order). When asked about their titles, following were their replies:
A: B is 'the Good'.
I am 'the Ugly'.
B: C is 'the Bad'
A is not 'the Good'.
C : B is 'the Ugly'.
A is not 'the Bad'.

Which among the following choices has the names of the persons who had the title the Good, the Bad and the Ugly, respectively?

(A) A, B, C (B) C, A, B
(C) B, C, A (D) A, C, B

7. John, Johny and Janardan participated in a race and each won a different medal among Gold, Silver and Bronze, not necessarily in that order. Each person among them gives two replies to any question, one of which is true and the other is false (in any order). When asked about the details of the medals obtained by them, the following were their replies:

John: I won the Gold medal.
Johny won the Bronze medal
Johny: John won the Silver medal.
I won the Gold medal.
Janardan: Johny won the Silver medal.
I won the Gold medal.

Which among the following is the correct order of the people who won the Gold medal, the Silver medal and the Bronze medal, respectively?

(A) John, Johny, Janardan
(B) Janardan, John, Johny
(C) Johny, Janardan, John
(D) Janardan, Johny, John

8. The inspector of police, Chulbul Pandey is questioning five suspects, namely Sheroo, Santhosh, Bhayankar, Chola, and Bhala about a bank robbery. They made the following statements.

Sheroo: Bhayankar robbed the bank.
Santhosh: Sheroo did not rob the bank.
Bhayankar: Santhosh is telling the truth.
Chola: Sheroo is telling the truth.
Bhala: Exactly one of us is telling the truth.

Chulbul Pandey just received evidence that Bhala is telling the truth. Then which of these statement is true?

(A) Sheroo robbed the bank.
(B) Bhayankar is telling the truth.
(C) Both Santhosh and Chola robbed the bank.
(D) Sheroo did not rob the bank.

Directions for questions 9 to 11: These questions are based on the following information.

Truth-teller: A person who always speaks the truth.
Liar: A person who always lies.
Alternator: A person who alternates between truth and lie, in any order.

9. Who among the above three kinds of person can make the following statement – 'I am not an alternator'?

(A) A truth-teller
(B) A liar
(C) An alternator
(D) Cannot be determined

10. Who among the above three kinds of person can make the following statement – 'I am not a truth-teller?'

(A) A truth-teller
(B) A truth-teller or a liar
(C) A liar or an alternator
(D) An alternator

11. Who among the above three kinds of persons can make the following statement – 'I am a truth-teller?'

I. A truth-teller
II. A liar
III. An alternator

(A) Only I
(B) Only I and III
(C) Only II and III
(D) Any one of I, II, III

Directions for questions 12 to 14: These questions are based on the following information.

A group of three people, namely Mohit, Nitin and Jayesh gave one statement each. There is one person who speaks the truth, one who tells lies and another whose statement cannot be classified as either true or false. Following are the statements made by them:

Mohit: I am not a liar.
Jayesh: I am a Liar.
Nitin: I neither speak the truth nor do I lie.

12. What is the name of the person whose statement can be classified as neither true nor as false?

(A) Mohit (B) Jayesh
(C) Nitin (D) Cannot be determined

13. Who tells lies?

(A) Jayesh (B) Mohit
(C) Nitin D) Cannot be determined

14. What is the nature of the statement given by Mohit?

(A) True
(B) False
(C) Cannot be classified as true or false
(D) Cannot be determined

Directions for questions 15 to 17: These questions are based on the following information.

There are four people, namely A, B, C and D each of whom plays exactly one game from a variety of sports, like Cricket, Football, Table-Tennis and Tennis. No game is played by two people. Each person gives two replies to any question asked to them. At least one person among them always speaks the truth and at least one person always tells lies. There is at least one person who always alternates between the truth and lie in any order.

When asked about the names of the people and the respective games played by them, following were their replies:

A: I play Cricket. C plays Cricket.
B: I play Tennis. D plays Tennis.

C: A plays Table-Tennis. B plays Cricket.
D: C plays Football. I play Table-Tennis.

It is also known that D plays Tennis and a definite arrangement can be obtained from the statements given by each person.

15. Who among the following plays Cricket?
(A) A (B) B
(C) C (D) D

16. Who among the following always speaks the truth?
(A) A (B) B
(C) C (D) D

17. Who are the two people who always alternate between the truth and lie?
(A) A and D (B) B and C
(C) D and B (D) A and C

Directions for questions 18 to 20: These questions are based on the following information.

In a country, there are three categories of people, such as truth-tellers, liars and alternators. Praveen met three people Honey, Bunny, and Cherry from that country. Each of the three people belongs to a different category. When asked about the details of the cites in the country, each of them made two statements.

Honey: City X is 30 km to the north of city Y. I am a liar.
Bunny: City W is 50 km away to the west of city Z. City M is 50 km away to the south of city W.
Cherry: City Y is not to the west of city Z. Honey is a truth-teller.

18. In which direction is city X with respect to city M?
(A) North-east (B) North-west
(C) North (D) Cannot be determined

19. If the distance between city Y and city Z is 10 km, then how far is city W from city X?
(A) 40 km (B) 50 km
(C) $30\sqrt{5}$ km (D) $40\sqrt{5}$ km

20. Who among them is a truth-teller?
(A) Honey (B) Bunny
(C) Cherry (D) Either (B) or (C)

Directions for questions 21 to 24: These questions are based on the following information.

Mahesh met four siblings of a family. When he asked them about their ages, their replies were as follows.

Tablo: I am the oldest.
I am older than Hablo.
Gablo: Pablo is not the oldest.
My age is less than 20 years.
Hablo: Tablo is the youngest.
The age of each one of us is a perfect square.
Pablo: Hablo is the second oldest.

The difference between the ages of any two consecutive siblings is not more than 10 years.

Mahesh also knew that no two among them has the same age and that Pablo is younger than Gablo. Each of them made one true statement and one false statement.

21. Who is the oldest?
(A) Tablo (B) Gablo
(C) Hablo (D) Cannot be determined

22. What is the age of the third oldest?
(A) 4 (B) 15
(C) 9 (D) 20

23. If Pablo is 16 years old, then what is the age of Tablo?
(A) 25 (B) 15
(C) 4 (D) 9

24. Who is the youngest?
(A) Tablo (C) Hablo
(B) Pablo (D) Cannot be determined

Directions for questions 25 to 27: These questions are based on the following information.

While travelling in a train, I met four people, each one of them belongs to a different state and they are from Uttar Pradesh (UP), Madhya Pradesh (MP), Tamil Nadu (TN) and Andhra Pradesh (AP). When I asked them about the state to which they belonged, each one of them made two statements. At least one person among them is a truth-teller (who always speaks the truth). At least one person among them is a liar (who always lies). At least one among them is an alternator (who alternates between the truth and lie in any order). Their replies were as follows.

Puneet: I am from AP.
Velu is from UP.
Velu: Navin is from MP.
Rajni is from AP.
Navin: I am from TN.
Puneet is from TN.
Rajni: I am from MP.
Velu is from MP.

It is also known that Puneet is from TN.

25. How many true statements are made by the four together?
(A) 3 (B) 4
(C) 5 (D) 3 or 4

26. The person from MP is a/an
(A) Truth-teller (B) Liar
(C) Alternator (D) Either (A) or (B)

27. Who are the two people who made the same number of true statements?
(A) Rajni and Navin (B) Puneet and Velu
(C) Velu and Rajni (D) Puneet and Navin

Directions for questions 28 to 30: These questions are based on the following information.

There is a group of three people, namely Ramu, Raman and Rajan-hailing from a different city, like Delhi, Mumbai and Chennai. Each person always gives two replies to any question asked. Out of these three, one person always speaks the truth, one always lies and the third one always alternates between truth and lie, in any order. When each was asked 'Which city do you belong to?', the following were their replies:

Ramu: I am from Delhi. Raman is from Mumbai.
Raman: I am from Delhi. Rajan is from Chennai.
Rajan: Ramu is from Mumbai. Raman is from Delhi.
Based on the above, answer the following questions.

28. Who among the three must be from Chennai?
(A) Ramu (B) Raman
(C) Rajan (D) Cannot be determined

29. To which city does Raman belong?
(A) Delhi (B) Mumbai
(C) Chennai (D) Chennai or Delhi

30. If there are exactly two people who always tell the truth, and the third person either always lies or alternates between truth and lie, then which of the following statements must be false?
(A) Rajan is not from Mumbai.
(B) Ramu is not from Delhi.
(C) Rajan is not from Chennai.
(D) Raman is from Delhi.

Directions for questions 31 to 33: These questions are based on the data given below.

To save our solar system from the attacks of the ETs from other galaxies, the representatives of all nine planets gathered at the 'Galaxy Hall' for a meeting. While entering the hall, each alien (representative of each planet) had to show his ID card to Mr. Gurkha, the gatekeeper. But three aliens, namely Eena, Meena and Deeka forgot their ID cards at the hotel. When asked, who represented which planet, the following were their replies.

Eena: Deeka is from Mars. Meena is from Saturn.
Meena: Eena is from Jupiter. Deeka is not from Saturn.
Deeka: Meena is from Saturn. I am from Jupiter.

It was known that exactly one amongst them belonged to the planet Jupiter, another belonged to the planet Saturn and the third belonged to the planet Mars. It was also known that each of them made at least one true statement.

31. Who is from Saturn?
(A) Eena (B) Meena
(C) Deeka (D) Cannot be determined

32. Which planet is Eena from?
(A) Mars (B) Jupiter
(C) Saturn (D) Cannot be determined

33. Which of following statements can never be true?
(A) Each of Eena and Meena always spoke the truth.
(B) Each of Eena and Meena spoke one truth and one lie.
(C) Deeka always spoke the truth.
(D) The first statement given by each person was always false.

Directions for questions 34 to 36: These questions are based on the following information.

I went to a bank, where I met three employees A, B and C of that bank. When I asked them 'Who is the manager?', their replies were as follows.

A : I am the manager.
B is a clerk.
C is a peon.
B : C is the manager.
I am not a peon.
A is a clerk.
C : Exactly one of my statements is false.
A is not a peon.
B makes exactly one false statement.

One among these three employees is a truth-teller. One of them is the manager, one is a clerk and the other is a peon. Each one of them is one among truth-teller, liar and an alternator.

Truth-teller is one who always speaks truth; alternator is a person who alternates between truth and lie and liar is a person who always lies.

34. Who is the truth-teller?
(A) B (B) C
(C) A (D) Cannot be determined

35. What is the designation of C?
(A) Manager (B) Clerk
(C) Peon (D) Cannot be determined

36. Who is a liar?
(A) C (B) A
(C) B (D) None of these

Directions for questions 37 to 40: These questions are based on the following information.

A group of three people, namely Achu, Babo and Chiki went to a stationery shop. Each of the three bought a different item from among Eraser, Pen and Pencil, each of which is of a different colour among Green, Red and Blue. Their friend Disha asked them 'What did you buy from the stationery shop?' Their replies were as follows.

Achu: I did not buy an eraser.
I bought a Red coloured item.
Babo bought a pencil.
Babo: I bought a pen.
Chiki bought a Green coloured item.
Achu bought a pencil.

Chiki: Babo bought an eraser.
I did not buy a pencil.
Achu bought a Green coloured item.

Each one of them is a truth-teller or a liar or an alternator. Truth-teller is one who always speaks truth; alternator is a person, who alternates between truth and lie and liar is a person who always lies. Disha knows that Babo bought a pencil.

37. If Achu is a truth-teller, then which item is in Red?
(A) Pen (B) Pencil
(C) Eraser (D) Cannot be determined

38. If Babo is an alternator, then who bought the Green coloured item?
(A) Achu (B) Babo
(C) Chiki (D) Cannot be determined

39. Which of the following statements is/are true?
(i) Achu is a truth-teller.
(ii) Babo is an alternator.
(iii) Chiki is a liar.
(A) Only (i) (B) (i) and (ii)
(C) (ii) and (iii) (D) None of these

40. If in all six false statements were made, then Chiki bought which coloured item?
(A) Red (B) Blue
(C) Green (D) Green or Blue

EXERCISE-2

Directions for questions 1 and 2: Select the correct alternative from the given choices.

1. There are three Pundits named Dwivedi, Trivedi and Chaturvedi sitting in a row from left to right in some order, consisting of three seats, such as extreme left, centre and extreme right. Each person gives two replies to any question asked to them, at least one of which is true. There is exactly one person who always speaks the truth. When asked about their respective positions in the row, the following were their replies:

Dwivedi: I sat at the extreme left end.
Trivedi sat at the centre.
Trivedi: Dwivedi sat between me and Chaturvedi.
I sat at the extreme right end.
Chaturvedi: I did not sit at the extreme left end.
Dwivedi did not sit at the extreme right end.

It is also known that a definite arrangement can be obtained by assessing their statements. What is the order in which they sat from the extreme left end to the extreme right end of the row?
(A) Dwivedi, Trivedi, Chaturvedi
(B) Chaturvedi, Trivedi, Dwivedi
(C) Dwivedi, Chaturvedi, Trivedi
(D) Trivedi, Dwivedi, Chaturvedi

2. Which of the following can be inferred from the given information?
I. Dwivedi's two statements are true.
II. Trivedi's second statement is false.
III. Chaturvedi's first statement is false.
(A) Only I
(B) Only I and III
(C) Only II and III
(D) None of the statements can be inferred.

Directions for questions 3 to 5: These questions are based on the following information.

A group of five people, namely Rahul, Ajay, Sandeep, Dhanush and Madhav are sitting in a row facing North. When their friend Charan called them, each of them made a statement about their seating positions.

Rahul: Sandeep is sitting two places away to the right of me.
Sandeep: I am sitting in the middle of the row.
Ajay: Madhav is sitting to the right of Sandeep.
Dhanush: Rahul is sitting two places away to the right of me.
Madhav: I am not at any of the ends.

Charan knows that on any day, exactly one of his five friends lie while others speak truth.

3. Who among them made a false statement?
(A) Rahul (B) Sandeep
(C) Dhanush (D) Cannot be determined

4. Who is sitting at the right end of the row?
(A) Rahul (B) Ajay
(C) Dhanush (D) Cannot be determined

5. Who is sitting in the middle of the row?
(A) Sandeep (B) Rahul
(C) Madhav (D) Cannot be determined

Directions for questions 6 to 9: These questions are based on the following information.

While going on a road, I met three people, namely Mona, Roma and Koma. Each of them belongs to a different profession among Engineer, Doctor and Professor and each of them owns a different car, such as Swift, Indigo and Micra. Each of them made three statements as given below.

Mona: Roma is a Doctor.
I am an Engineer.
Koma owns Micra.
Roma: I am not a Professor.
Mona owns Swift.
Koma does not own Indigo.
Koma: Mona is not a Professor.
I am an Engineer.
Roma does not own Indigo.

Among the three people, one of them is a truth-teller who always speak truth; one is a lair, who always lies and the other person is an alternator, who alternates between truth and lie, in any order.

6. Who owns a Swift?
(A) Mona (B) Roma
(C) Koma (D) Cannot be determined

7. Who is an Engineer?
(A) Mona (B) Roma
(C) Koma (D) Cannot be determined

8. Who is the alternator?
(A) Roma (B) Koma
(C) Mona (D) Either (A) or (B)

9. Who is the liar?
(A) Mona (B) Koma
(C) Roma (D) Either (B) or (C)

Directions for questions 10 to 12: These questions are based on the following information.

A group of four people, namely Chibi, Cakora, Ceasar and Chaila have accounts in a different social networking site. One of their friends asked them, 'Who is on WhatsApp?' Their replies were as follows.

Chibi: I am on WhatsApp.
Chaila is on Facebook.
Ceasar is on Twitter.
Cakora is on Instagram.
Cakora: Chibi is not on Facebook.
Chaila is on Twitter.
I am not on WhatsApp.
Ceasar is on neither Facebook nor Instagram.
Ceasar: I am on either WhatsApp or Facebook.
Chibi is on Twitter.
Chaila is not on WhatsApp.
Cakora is not on Facebook.
Chaila: Cakora is not on Twitter.
I am on WhatsApp.
If Cakora is on Facebook, then only Chibi is on Instagram.
Ceasar is on Facebook.

Among these four people, one of them is a truth-teller who always speaks truth; one is a liar, who always lies; one is an alternator, who alternates between truth and lie and the remaining one is any one of these three (i.e., truth teller, liar and alternator).

10. Who is a truth-teller?
(A) Chibi (B) Cakora
(C) Ceasar (D) Chaila

11. Who is on Twitter?
(A) Chibi (B) Cakora
(C) Ceasar (D) Chaila

12. Liar is on
(A) Instagram (B) WhatsApp
(C) Twitter (D) Facebook

Directions for questions 13 to 17: These questions are based on the following information.

Four people Pavan, Naveen, Madan and Sravan are the top four rankers in each of the subjects, such as Maths, Physics, Chemistry and Commerce, not necessarily in the same order. No person got the same rank in any two subjects. When asked about their ranks in each of these subjects, they made the following statements.

Pavan: Madan is the fourth ranker in Chemistry.
Sravan is the fourth ranker in Physics.
Naveen is the first ranker in Maths.
Naveen: I am the first ranker in Commerce.
Sravan is the first ranker in Chemistry.
Madan is the first ranker in Physics.
Madan : I am the first ranker in Commerce.
Sravan is the fourth ranker in Chemistry.
Pavan is the third ranker in Maths.
Sravan : Pavan is the third ranker in Commerce.
I am the fourth ranker in Maths.
Naveen is the second ranker in Physics.

It is known that, each of them made a true and a false statement alternately and in total, they made equal numbers of true and false statements.

13. Who is the third ranker in Chemistry?
(A) Pavan (B) Naveen
(C) Madan (D) Cannot be determined

14. What is the rank of Sravan in Physics?
(A) 4 (B) 3
(C) 2 (D) Cannot be determined

15. In which subject did Naveen get a better rank than Madan but a worse rank than Pavan?
(A) Maths (B) Commerce
(C) Physics (D) Chemistry

16. What is the rank of Naveen in Commerce?
(A) 2 (B) 3
(C) 4 (D) 1

17. In which subject did Pavan get a worse rank than both Naveen and Sravan?
(A) Maths (B) Physics
(C) Chemistry (D) Commerce

Directions for questions 18 to 22: These questions are based on the following information.

Four boys Abhay, Bharat, Chandu, and David are inhabitants of an island, each studying in a different class among VII, VIII, IX and X, not necessarily in the same order. On that island, each person belongs to one of the categories: Truth-tellers (who always speak the truth), liars (who always lie) and alternators (who alternate between true and false statements, in any order). When asked about their studies and categories, they made the following statements.

Abhay : David is not a truth-teller.
Chandu is not studying in IX.
I am studying in VII.
Bharat: Chandu is not a truth-teller.
Abhay is studying in VIII.
David is not studying in IX.
Chandu: Bharat is studying in VIII.
Bharat is a liar.
Abhay is not studying in X.
David: Abhay is not an alternator.
Bharat is studying in X.
Chandu is not studying in VIII.

18. Who is studying in Class X?
(A) Abhay (B) Bharat
(C) Chandu (D) Cannot be determined

19. Who among them is an alternator?
(A) Only Abhay (B) Only Bharat
(C) Only Chandu (D) Only David

20. How many of Abhay's statements is/are true?
(A) 3 (B) 2
(C) 1 (D) 0

21. In which class did David study?
(A) X (B) IX
(C) VIII (D) VII

22. What is the difference between the total number of true and false statements?
(A) 4 (B) 2
(C) 0 (D) Cannot be determined

Directions for questions 23 to 25: These questions are based on the data given below.

On True Lies island, there are four categories of people namely Trues, who always speak the truth; Liars, who always lie; Altrues, whose first statement is true and make alternate true and false statements and Allies, whose first statement is false and make alternate false and true statements.

A person from True Villa who visited the True Lies island has to make a telephone call to True Villa. He comes across a group of four people, where each member of the group belongs to a different category. He asks them about the availability of telephone with them. Each person has a badge attached to his shirt with the name of a category to which he does not belong. The following are the statements made by each of them. The category on their badges is given in brackets.

A (Trues):
I. Allies have telephones.
II. I have a telephone.
B (Liars):
I. I belong to Trues.
II. I do not have a telephone.
C (Altrues):
I. I do not have a telephone.
II. Only one of us has a telephone.
D (Allies):
I. The Liars have telephones.
II. I belong to Altrues.

In any category, either each member has a telephone or none has a telephone.

23. Who belong to the Trues category?
(A) A (B) B (C) C (D) D

24. Which of the following is true?
(A) B has a telephone.
(B) C has a telephone.
(C) Both B and C have telephones.
(D) Neither B nor C has a telephone.

25. How many categories have a telephone?
(A) 0 (B) 1 (C) 2 (D) 3

Directions for questions 26 to 28: These questions are based on the data given below.

John, James, Jack and Jeromy are compared with each other in terms of height, weight, age and wealth. Each of them gives three statements to any question, such that the three statements given by each person are alternately true and false in any order. The first statement made by exactly two people is false. When asked about the characteristic possessed by each of them, the following were their replies:

John: I am the tallest.
Jack is the heaviest.
James is the richest.
Jack: Jeromy is the shortest.
I am the youngest.
John is the second tallest.
Jeromy: James is the lightest.
Jack is the poorest.
John is the eldest.
James: I am the tallest.
Jack is the lightest.
Jeromy is the second youngest.

It is also known that no person gets the same rank (or position) in any two of the four comparisons and no comparison has two persons having the same rank.

26. Who among the following is the second heaviest?
(A) John (B) Jack
(C) Jeromy (D) James

27. Who is elder, wealthier, heavier, but shorter than James?
I. Jack
II. Jeromy
III. John
(A) Only I (B) Only II
(C) Only III (D) II and III

28. How many people weigh more than James?
(A) Zero (B) One
(C) Two (D) Three

Directions for questions 29 to 31: These questions are based on the following information.

Alex, Bhavna and Charan are standing, not necessarily in that order but in different positions in a queue of 10 people. The numbering in the queue starts with position 1 at the beginning to position 10 at the end of the queue.

When asked about their positions in the queue, they gave the following replies:

Alex: Charan is three places ahead of me.

The number of people behind Bhavna is one more than the number of people ahead of Charan.

If I interchange my position with Charan, I would be in position seven.

Bhavna: I am fourth from the end of the queue.

The sum of the numbers of our positions is a unit multiple of 5.

I am exactly between Alex and Charan.

Charan: All of Alex's statements are false.

If I interchange my position with Alex, I would be in position seven.

Bhavna's first and second statements are true.

It is known that exactly two of the three people alternate between truth and lie in any order and Charan is one of them.

29. What is the position of Bhavna with respect to Alex?
(A) Immediately behind Alex.
(B) Two positions behind Alex.
(C) Three positions ahead of Alex.
(D) Cannot be determined

30. Which of the following statements is true?
I. Alex is in position seven.
II. All the statements of Bhavna are false.
III. Alex alternates between true and false statements in that order.
(A) Only II (B) Only I and II
(C) Only I and III (D) I, II and III

31. Which of the following additional conditions, if true, gives the exact positions of the three people?
(A) Bhavna is not behind Alex.
(B) Bhavna is immediately behind Alex.
(C) Charan is not ahead of Bhavna.
(D) None of the above

Directions for questions 32 to 34: These questions are based on the following information.

P, Q and R when asked a question give three statements as reply in the following manner.

P – always replies in only one type of statements, such as in truth or lie.

Q – never replies in the same type of statements as P.

R – is neither consistent in all his statement types nor alternates between the two types of statements.

At the bus – stop, I asked 'Which bus goes to the airport?' Their replies were as follows:

P: Take the north – bound bus.
The next bus arrives in 15 minutes.
It takes 45 minutes to reach the airport.

Q: The north – bound bus comes from the airport.
You have to wait for 20 minutes for the bus.
It takes 30 minutes to reach the airport.

R: Take the south – bound bus.
You have to wait for another quarter of an hour for the bus.

It takes anywhere between 1 hour to 1 hour 30 minutes to reach the airport.

32. Which of the following represents the reply that R gave?
(A) Truth – Truth – Lie
(B) Lie – Truth – Truth
(C) Lie – Lie –Truth
(D) Truth – Lie – Lie

33. Which of the following is definitely true?
I. P always lies.
II. Q always lies.
III. The north – bound bus goes to the airport.
(A) Only I (B) Only II
(C) Only I and II (D) Only II and III

34. How long does it take before I reach the airport from the bus-stop?
(A) 45 minutes
(B) 50 minutes
(C) Between 1 hour and 1 hour 30 minutes
(D) 30 minutes

Directions for questions 35 to 37: These questions are based on the data given below.

On the eve of Army Day Parade, I met five Army men, namely Ranjeet, Ranmeet, Ranpreet, Randheer and Ranveer each of whom had exactly one different rank from amongst Lieutenant, Captain, Colonel, Major and Brigadier, not nec-

essarily in the same order. Each of these people always gave three replies to any question asked to them. Except one person, all the other four speak at least one true statement. Except one person, all the other four tell at least one lie. Exactly one person among them alternates between the truth and lie, in any order. When I asked them about their respective ranks, following were their replies:

Ranjeet:	Ranmeet is the Brigadier. Ranpreet is the Major. Ranveer is the Colonel.
Ranmeet:	Randheer is the Major. Ranjeet is the Captain. Ranpreet is the Lieutenant.
Ranpreet:	Ranjeet is the Colonel. Randheer is the Brigadier. Ranmeet is the Captain.
Randheer:	Ranveer is the Lieutenant. Ranjeet is the Major. Ranpreet is the Captain.
Ranveer:	Ranmeet is the Colonel. Ranpreet is the Major. I am the Lieutenant.

Only one definite arrangement exists based on their statements, which gives out their ranks.

35. Who among the following always makes one true statement and two false statement but does not alternate between truth and lie?

(A) Ranjeet (B) Ranpreet
(C) Randheer (D) Ranmeet

36. What is the rank of the person who alternates between the truth and lie, in any order?

(A) Brigadier (B) Captain
(C) Major (D) Colonel

37. Match the following:

Army men	Ranks
(i) Ranjeet	(A) Lieutenant
(ii) Ranmeet	(B) Captain
(iii) Ranpreet	(C) Colonel
(iv) Randheer	(D) Major
(v) Ranveer	(E) Brigadier

(A) (i) – (a) (B) (i) – (b)
(ii) – (b) (ii) – (c)
(iii) – (c) (iii) – (e)
(iv) – (d) (iv) – (a)
(v) – (e) (v) – (d)
(C) (i) – (c) (D) (i) – (c)
(ii) – (e) (ii) – (b)
(iii) – (d) (iii) – (d)
(iv) – (b) (iv) – (e)
(v) – (a) (v) – (a)

Directions for questions 38 to 40: There questions are based on the following information.

In a family, there are four members, namely Bingo, Tingo, Mingo and Pingo. Each member of that family belongs to one of the following category, such as truth-tellers (who always speaks truth), liars (who always lies) and the alternators (who alternates among truth and lie, in any order). They made the following statements when they are asked about their professions.

Bingo:	I am a truth-teller. I am the Manager. Tingo is the Chartered Accountant.
Mingo:	I am a truth-teller. I am the Engineer. Professor is an alternator.
Tingo:	I am a truth-teller. I am the Professor. Pingo is the Engineer.
Pingo:	I am an alternator. I am the Professor. Bingo is a liar.

It is also known that their professions are one among Manager, Engineer, Chartered Accountant and Professor (may not be in that order). And no two people are of the same profession.

38. If Tingo is the Manager, then who is the Chartered Accountant?

(A) Bingo
(B) Mingo
(C) Pingo
(D) Either (A) or (B)

39. If there is only one Liar and he is not Bingo, then who is the Engineer?

(A) Pingo
(B) Bingo
(C) Mingo
(D) Cannot be determined

40. From which of the given conditions, we will get a complete idea about them?

I. There are exactly two liars.
II. There are exactly two alternators.
III. There is no truth-teller.

(A) Only I
(B) Only II
(C) Any two of the above three
(D) Only III

EXERCISE-3

Directions for questions 1 to 3: These questions are based on the information given below.

A group of four friends, namely A, B, C and D sit around a square table not necessarily in the same order. Exactly one person sits on each side and everyone is opposite to exactly one person. Each person makes two statements for any question asked to him. It was known that there is exactly one person who always speaks the truth and exactly one person who alternates between truth and false. When asked about their respective positions around the table, the following were their replies:

A: D sits opposite to me. C sits to the left of D.
B: A sits to my left. D sits to the right of C.
C: B sits to my right. D sits to my left.
D: C sits opposite to me. B sits to my right.

It was also known that a definite arrangement can be obtained by assessing their statements.

1. Who always speaks the truth?
(A) A (B) B
(C) C (D) D

2. Who among them are liars?
(A) A and B (B) C and D
(C) A and D (D) Cannot be determined

3. Who sits opposite to D?
(A) A (B) B
(C) C (D) Cannot be determined

Directions for questions 4 to 6: These questions are based on the information given below.

Among the four members of a family K, L, M and N, there is one couple, their son and their daughter. When asked about their relationships, the following were their replies.

K: N is my husband.
M is my daughter.
L: K is my mother.
M is my son.
M: K and L are of the same gender.
L is my sister.
N: L is of the same gender as I.
M is my son.

It was also known that only one of them always speaks the truth.

4. Among the four, who cannot be the truth-teller?
(A) K (B) L
(C) M (D) Cannot be determined

5. Among them, if there are two people who always tell lies, then who always speaks the truth?
(A) K (B) M
(C) N (D) Cannot be determined

6. Among them, if there are two people who always alternate between the truth and lies, then who speaks the truth always?
(A) K (B) L
(C) M (D) Cannot be determined

Directions for questions 7 to 10: These questions are based on the information given below.

There is a group of four players, namely Abhinav, Bipash, Chandar and Danny, each of them hailing from different cities, like Hyderabad, Mumbai, Delhi and Kolkata. Each of them plays a different game among Chess, Badminton, Tennis and Bridge and they are of different heights. Each of them gives three statements to any question such that the three statements given by each person are alternately true and false in any order. The second statement made by exactly two people is true and Abhinav is one of them. When asked about them, the following were their replies.

Abhinav: Bipash is from Delhi.
Chandar plays Chess.
Danny is not the tallest.
Bipash: Abhinav is from Kolkata.
Chandar is not the shortest.
Danny plays Badminton.
Chandar: Abhinav is the 2nd tallest.
Bipash plays Tennis.
Danny is from Delhi.
Danny: Abhinav plays Chess.
Bipash is from Mumbai.
Chandar is not from Hyderabad.

7. Who is from Delhi?
(A) Abhinav (B) Bipash
(C) Chandar (D) Danny

8. Who is the Chess player?
(A) Abhinav (B) Bipash
(C) Chandar (D) Cannot be determined

9. Who is the shortest person?
(A) The Badminton player.
(B) The Chess player.
(C) The person from Delhi.
(D) The person from Kolkata.

10. Which two persons' second statements are true?
(A) Abhinav, Bipash
(B) Abhinav, Chander
(C) Abhinav, Danny
(D) Cannot be determined

Directions for questions 11 to 15: These questions are based on the following information.

A group of five people, namely Amar, Bharat, Chandu, Dinesh and Eswar are of different heights, weights and ages. It is also known that each of them speaks truth and lie in alternate fashion. Five people are ranked from 1 to 5 according to the decreasing order of their heights, weights and ages. No person is ranked the same in any two parameters. The following are the statements made by four people.

Amar: Bharat is the 3rd tallest.
Dinesh is the 3rd youngest.
Eswar is the lightest.

Bharath: Chandu is the tallest.
Amar is the 3rd oldest.
Eswar is the oldest.

Chandu: Bharath is 2nd youngest.
Bharath is the 2nd tallest.
Amar is the 3rd heaviest.

Dinesh: Eswar is the shortest.
Bharath is 4th lightest.
Amar is the 2nd tallest.

11. Who among them is the tallest?
(A) Chandu (B) Dinesh
(C) Bharath (D) Amar

12. Who among them is the oldest?
(A) Amar (B) Dinesh
(C) Eswar (D) Chandu

13. Who among them is the lightest?
(A) Eswar (B) Dinesh
(C) Bharath (D) Chandu

14. Who among them is the 2nd shortest?
(A) Dinesh (B) Amar
(C) Bharath (D) Eswar

15. Who among them is the 3rd youngest?
(A) Dinesh (B) Eswar
(C) Chandu (D) Bharath

Directions for questions 16 to 19: These questions are based on the following information.

Three people Gretta, Fischer and Schindler are talking about their heights. It is known that each of them is of a different height. Each of them belongs to one of the three categories, truth-tellers (who always speak truth), liars (who always tell lies) and the alternators (who alternately make a true and a false statement). They made the following statements.

Gretta: I am the tallest.
I always speak truth.
Fischer always lies.

Fischer: I am not the tallest.
Gretta is a liar.
Schindler is the shortest.

Schindler: Gretta is a liar.
I am not an alternator.
I am not the shortest.

16. Who is/are truth teller(s)?
(A) Gretta or Fischer (B) Schindler
(C) None of them (D) Cannot be determined

17. Who is the tallest?
(A) Fischer (B) Schindler
(C) Gretta (D) Cannot be determined

18. How many true statements have they together made?
(A) Four (B) Five
(C) Three (D) Three or four

19. Who is/are alternator(s)?
(A) Schindler and Gretta
(B) Fisher and Schindler
(C) Fisher
(D) Schindler

Directions for questions 20 to 23: These questions are based on the following information.

Four very naughty siblings Pringle, Qusac, Robert and Swank are going to meet their father's childhood friend who is meeting them after 30 years. Their father's friend doesn't have any information about these siblings. Each of them wrote the following two statements on a piece of paper. They mentioned only the first letter of their respective names on the paper so that the friend cannot find out the gender by name.

P: I have two sisters and a brother.
S is my brother.

Q: Both the statements of S are false.
R is my brother.

R: One statement of P is true and the other one is false.
I am S's sister.

S: I have two brothers and a sister.
Q is my sister.

It is known that exactly one person among them made two true statements and that person is not R, and exactly one person made both false statements.

20. Who definitely made one true and one false statement?
(A) Pringle (B) Qusac
(C) Robert (D) Swank

21. Who is/are definitely male?
(A) Pringle and Robert
(B) Swank
(C) Swank and Pringle
(D) Robert and Qusac

22. Who made two false statements?
(A) Pringle (B) Qusac
(C) Robert (D) Qusac or Swank

23. Which of the following is true?
(A) Swank's second statement is false.
(B) Robert's second statement is true.
(C) Qusac's first statement is true.
(D) Pringle's second statement is true.

Directions for questions 24 and 25: These questions are based on the following information.

Karuna and Sharmila are studying in the same class. Their teacher came to know that today is the birthday of either Karuna or Sharmila, but not of both.

The teacher asked them whose birthday is it today? They made the following statements.

Karuna: Today it is not my birthday.
Today it is Sharmila's birthday.
Sharmila: Both the statements of Karuna are false.
It is not the birthday of any one of us.

It is known that each of their statements is either true or false.

24. If Sharmila's first statement is false, whose birthday is on that day?
(A) Karuna's
(B) Sharmila's
(C) Both of them
(D) Cannot be determined

25. Which of the following is true?
(A) Karuna did not make even one true statement.
(B) Either both the statements of Karuna are true or both are false.
(C) Sharmila's second statement is definitely true.
(D) Neither Karuna nor Sharmila made two false statements.

ANSWER KEYS

Exercise-1

1. (B)	8. (A)	15. (B)	22. (C)	29. (B)	36. (D)
2. (A)	9. (D)	16. (C)	23. (D)	30. (C)	37. (A)
3. (C)	10. (D)	17. (C)	24. (D)	31. (B)	38. (C)
4. (C)	11. (D)	18. (D)	25. (B)	32. (D)	39. (D)
5. (B)	12. (B)	19. (B)	26. (C)	33. (D)	40. (A)
6. (D)	13. (C)	20. (B)	27. (D)	34. (C)	
7. (B)	14. (A)	21. (B)	28. (C)	35. (C)	

Exercise-2

1. (C)	8. (A)	15. (D)	22. (A)	29. (D)	36. (D)
2. (D)	9. (A)	16. (A)	23. (B)	30. (B)	37. (D)
3. (C)	10. (B)	17. (D)	24. (B)	31. (B)	38. (C)
4. (D)	11. (D)	18. (C)	25. (B)	32. (D)	39. (C)
5. (A)	12. (A)	19. (D)	26. (C)	33. (A)	40. (C)
6. (A)	13. (B)	20. (A)	27. (B)	34. (B)	
7. (C)	14. (C)	21. (B)	28. (C)	35. (C)	

Exercise-3

1. (B)	5. (C)	9. (B)	13. (D)	17. (A)	21. (B)	24. (B)
2. (B)	6. (A)	10. (C)	14. (B)	18. (D)	22. (D)	25. (B)
3. (B)	7. (D)	11. (A)	15. (A)	19. (C)	23. (D)	
4. (B)	8. (C)	12. (C)	16. (D)	20. (C)		

SOLUTIONS

EXERCISE-1

1. Amit makes the statement, 'I am a liar'. If Amit is a truth-teller, he would never call himself a liar. Also, if Amit is a liar, he would never admit that he is a liar. Hence, Amit is an alternator and his statement is False. Ashok's statement 'I am not a truth-teller'. If Ashok is a truth-teller, he would not tell otherwise. If Ashok is a liar, then his statement can imply that his statements is either a lie or cannot be classified as a truth or lie. But a liar would not admit that he is a liar. Hence, Ashok is an alternator and his statement is true. Azad's statement – I neither make a true statement nor makes a false statement. If Azad is a truth –teller, then he would not claim that he does not make true statements.
Hence, Azad could either be a liar or an alternator.
If Azad is a liar, his statement is false and if he is an Alternator, his statement is true. Thus, only Ashok's statement is definitely true.

2. Let us analyse the statements given by A, B and C as below.
A: 'I am not a Liar'.
If A is the truth-teller, then this statement given by him is true, hence, A must be the truth-teller.
B: 'C is not a liar'.
If B is the truth-teller, then C must be a truth-teller. But we cannot have two truth-tellers. Hence, B cannot be a truth-teller. ⇒ B is a liar.
C: 'B is a truth-teller'.
If C is the truth-teller, then B is also a truth-teller which means there are two truth-tellers. As it is given that exactly one person among them is a truth-teller, hence, C cannot be a truth-teller. ⇒ C is a liar.
∴ We find that A is a truth-teller and B and C are liars.

3. Turn by turn, we should assume each person to be the truth-teller and then analyse the arrangement.
(i) Assuming Anand to be the truth-teller: If Anand is the truth-teller, then Bharat must be the liar, which means that C must be the alternator. As Bharat is a liar, both his statements must be false (Bharat's first statement is 'I am not the Liar' which is false as he is a Liar and his 2nd statement that 'Chandu is the truth-teller' is false, because as per Anand, Chandu is the alternator). Hence, Chandu is the alternator, whose first statement is true and second is false.
(ii) Assuming Bharat to be the truth-teller: If both the statements given by Bharat are true, then both Bharat and Chandu must be the truth-tellers, which is not possible – as there is exactly one truth-teller among these three people.
(iii) Assuming that Chandu is the truth-teller: If both the statements given by Chandu are true, then even Bharat becomes the truth-teller, which is not desired.
Hence, Anand is the truth-teller, which means that Chandu must be the alternator.

4. ('✓' means cheated; '✘' means did not cheat)
(i) Assuming Aalu always spoke the truth:

	I	II	Cheated
Aalu	T	T	✘
Kach	F	F	✓
Bhalu	T	F	✘

In this case only Kachalu cheated. Hence, (2) is possible.
(ii) Assuming Kachalu always spoke the truth:

	I	II	Cheated
Aalu	F	F	✓
Kach	T	T	✘
Bhalu	F	T	✓

In this case, only Aalu and Bhalu cheated. Hence, (1) can be true.
(ii) Assuming Bhalu always spoke the truth:

	I	II	Cheated
Aalu			
Kach			?
Bhalu	T	T	✘

Both the statements made by Bhalu contradict each other. Hence, Bhalu can never be the person who always spoke the truth.

5. (T → True; F → False)
(i) Assuming that Sameer is the truth-teller: we get the following arrangement:

	Statement I	Statement II		
Sameer	T	T	Truth-teller	Winner
Sameep	F	F	Liar	2nd runner-up
Sumer	F	T	Alt.	1st runner-up

(ii) Assuming Sameep is the truth-teller, we get the following arrangement:

	Statement I	Statement II	
Sameer	F	T	2nd runner-up
Sameep	T	T	Winner
Sumer	F	F	1st runner-up

(iii) Assuming Sumer is the truth-teller, we get the following arrangement:

	Statement I	Statement II		
Sameer	F	T	Alternator	1st runner-up
Sameep	F	F	Liar	2nd runner-up
Sumer	T	T	Truth-teller	Winner

Hence, either Sameer or Sumer can be the 1st runner-up, but not Sameep.

6. If A always speaks the truth, then B is 'the Good', A is 'the Ugly'. Hence, C is 'the Bad'; which also means that B is also the truth-teller. Hence, neither A nor B is the truth-teller. Therefore, C must be the truth-teller, which gives us the following arrangement.

A → the Good

C → the Bad

B → the Ugly

7. Each among John, Johny and Janardan is an alternator. Let John's first statement be true and second be false.

	I	II	Medal
John	T	F	Gold
Johny	F	F	Silver
Janardan	T	F	Bronze

Hence, Johny is not an alternator, which means our initial assumption was false.

Let John's first statement be false and second be true:

	I	II	Medal
John	F	T	Silver
Johny	T	F	Bronze
Janardan	F	T	Gold

Hence, Janardan → Gold medal

John → Silver medal

Johny → Bronze medal

8. Since Bhala is telling the truth, there is exactly one among the five who is telling the truth and it has to be Bhala. The rest of them are lying.

We have the following:

Suspect	Statement	Implication
Sheroo	F	Bhayankar did not rob the bank.
Santhosh	F	Sheroo robbed the bank.
Bhayankar	F	Santhosh is lying ⇒ Sheroo robbed the bank.
Chola	F	Bhayankar did not rob the bank.
Bhala	T	

Hence, it can be inferred by Chulbul Pandey that Sheroo robbed the bank.

9. 'I am not an alternator' could be the statement of a truth-teller. Can it be a statement of a liar? If so, the statement for a liar this statement would be correct / true, which a liar would not make. Hence, it cannot be the statement of a liar. It can surely be that of an alternator when that particular statement is false and either his /her prior or later statement is true. Thus, both (A) and (C) are possible.

10. Refer to the explanation given for Ashok's statement in question 1.

Here, the person is an alternator.

11. 'I am a truth-teller' can be the statement of

– a truth-teller since he never lies.

(or)

– a liar since he always lies

(or)

– an alternator since he alternates in this fashion: Truth, Lie, Truth, Lie… (or) Lie, Truth, Lie, Truth etc.

Hence, any one of I, II, III is possible.

Solutions for questions 12 to 14: The statement given by Jayesh is 'I am a Liar'. If Jayesh always speaks the truth, he will not call himself a liar. Similarly, if Jayesh is a liar, then he will not speak the truth by admitting that he is a liar. Hence, Jayesh is the person whose statement is neither true nor false. Then, Nitin's statement must be false, as only one person whose statement cannot be classified as true and false and that is Jayesh. Hence, Mohit always speaks the truth. Therefore,

Mohit → Always speaks the truth.

Jayesh → Neither speaks the truth nor tells lies.

Nitin → Always tells lies.

12. Jayesh is the one whose statement cannot be classified as either true or false.

13. Nitin always tells lies.

14. Mohit always tells the truth.

Solutions for questions 15 to 17: It is known that D plays Tennis, which means that the 2nd statement made by B must be true, whereas the 2nd statement made by D must be false. As A says that he and C both play cricket, A cannot be the person who always speaks the truth, as each person plays exactly one game and exactly one game is played by each person. This means only C can always speak the truth, as there must be at least one person who always speaks the truth.

We take this as the basis and get the arrangement as given below:

	I	II	Game played
A	F	F	Table-tennis
B	F	T	Cricket
C	T	T	Football
D	T	F	Tennis

15. B plays Cricket.

16. C always speaks the truth.

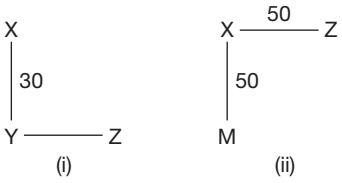
17. D and B alternate between truth and lie.

Solutions for questions 18 to 20: From, the second statement made by Honey, it can be said that Honey is an alternator and the second statement must be false and first statement must be true.

Now, from the second statement made by Cherry, it can be said that Cherry is a liar. So, Bunny is a truth-teller.

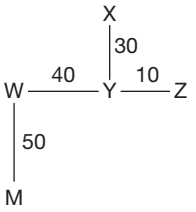
	I	II
Honey	T	F
Bunny	T	T
Cherry	F	F

∴ The representation of cites is as follow.



18. City X can be in North-east, North-west or North with respect to city M.

19. Under the condition, the representation of cites is as follows.



∴ The distance between X and W is $\sqrt{30^2 + 40^2} = 50$ km.

20. Bunny is a truth-teller.

Solutions for questions 21 to 24: First let us assume that the first statement of Tablo is true, then the second statement must be false. But in this case the second statement also becomes true, as Tablo is the oldest.

So, the first statement of Tablo is false and the second statement is true.

Therefore, Tablo is not the oldest and Tablo will be either the second or the third oldest.

So, the first statement of Hablo, i.e., Tablo is the youngest is false.

∴ The second statement of Hablo, i.e., the age of each one among them is a perfect square is true.

As Tablo is older than Hablo, Hablo will be either the third or the fourth oldest.

The first statement of Pablo, i.e., Hablo is the second oldest is false.

∴ The second statement of Pablo, i.e., the difference between the ages of any two consecutive siblings is not more than 10 years is true.

Their ages can be among 1, 4, 9, 16 and 25.

It is given that Pablo is younger than Gablo.

The first statement of Gablo is true, i.e., Pablo is not the oldest.

That means, his second statement is false, i.e., Gablo's age is not less than 20 years.

∴ Gablo's age is 25 years.

The age of the second and the third oldest are 16 and 9 years, respectively.

The youngest child can be either one or four years old.

The above discussion is represented in the following table.

	I Statement	II Statement	Remarks	
Tablo	F	T	Not the oldest	Second or third oldest
Gablo	T	F	Oldest	Age 25 years
Hablo	F	T	Not the oldest or the second oldest	Third or the fourth oldest
Pablo	F	T	Not the oldest	Second, third or fourth oldest

21. Gablo is the oldest.

22. The third oldest is 9 years old.

23. Given, Pablo is 16 years old.
Hence, he is the second oldest.
In this case, Tablo has to be the third oldest.
∴ Tablo is 9 years old.

24. The youngest is either Pablo or Hablo.

Solutions for questions 25 to 27: Given that Puneet is from TN.
∴ The first statement of Puneet, i.e., Puneet is from AP is false.
The first statement of Navin is false and the second statement of Navin is true.
It is also given that there should be at least one person whose both statements are true.
That person cannot be Rajini as both the statements of Rajni cannot be true simultaneously.
∴ Velu's both the statements are true.
Navin is from MP.
Rajini is from AP.
Velu is from UP.
∴ Puneet's second statement is true.
Thus, both the statements of Rajni are false.
The final table is as follows:

Name	Place	1st Statement	2nd Statement
Puneet	TN	F	T
Velu	UP	T	T
Navin	MP	F	T
Rajni	AP	F	F

25. There are four true statements.

26. The person from MP is an alternator.

27. Puneet and Navin made same numbers of true statements.

Solutions for questions 28 to 30:
(i) Assuming Ramu always speaks the truth:

	I	II	City
Ramu	T	T	Delhi
Raman	F	T	Mumbai
Rajan	F	F	Chennai

This arrangement works out for answering the first two questions.
(ii) Assuming Raman always speaks the truth:

	I	II	City
Ramu	F	F	Mumbai
Raman	T	T	Delhi
Rajan	T	T	Chennai

(iii) Assuming Rajan always speaks the truth:

	I	II	City
Ramu	F	F	Mumbai
Raman	T	T	Delhi
Rajan	T	T	Chennai

Arrangement (ii) and (iii) help in answering the third question.

28. Rajan is from Chennai.

29. Raman belongs to Mumbai.

30. Rajan is not from Chennai is false.

Solutions for questions 31 to 33: Let us analyse the cases one by one for the person who always speaks the truth.
(T → Truth; F → False)
(i) Eena always speaks the truth:

	I	II	Planet
Eena	T	T	Jupiter
Meena	T	T	Saturn
Deeka	T	F	Mars

(ii) Deeka always speaks the truth:

	I	II	Planet
Eena	F	T	Mars
Meena	F	T	Saturn
Deeka	T	T	Jupiter

In the above two cases, Eena and Meena always speak the truth in case (i) and Deeka always speaks the truth in case (ii).

31. In either of the cases (i) or (ii), Meena is from Saturn.

32. In case (i), Eena is from Jupiter and in case (ii), Eena is from Mars. Hence, it cannot be determined.

33. (1) is true in case (i)
(2) is true in case (ii)
(3) is true in case (ii)
(4) is true in neither (i) nor (ii).

Solutions for questions 34 to 36: Let us assume, A is truth-teller, then

	Statements			
	I	II	III	Designation
A	T	T	T	Manager
B	F	T	F	Clerk
C	F	T	F	Peon

Let us assume, B is a truth-teller. Then, B's third statement is contradicting. Hence, B is not a truth-teller.
Let us assume, C is a truth-teller then C's first statement is contradicting. Hence, C is not a truth-teller.

34. A is the truth-teller.

35. C is a peon.

36. None of these

Solutions for questions 37 to 40: Achu's third statement is true since Babo bought a pencil. Hence, Babo's first and third statement and Chiki's first statement are false. Chiki's second statement is true. Hence, Chiki's third statement should be false. Now, Babo's second statement is either true or false and Achu's first statement should be true since Achu is either a truth-teller or an alternator. Hence, the possible cases are as follows.

(i)

	Statements				
Name	**I**	**II**	**III**	**Item**	**Colour**
Achu	T	T/F	T	Pen	Red/Blue
Chiki	F	T	F	Eraser	Green
Babo	F	T	F	Pencil	Blue/Red

(ii)

	Statements				
Names	**I**	**II**	**III**	**Item**	**Colour**
Achu	T	T/F	T	Pen	Red/Blue
Babo	F	F	F	Pencil	Green
Chiki	F	T	F	Eraser	Blue/Red

37. If Achu is a truth-teller, then the Pen is in Red colour.

38. If Babo is an alternator, then Chiki bought Green coloured item.

39. None of the statements is true.

40. If a total of six false statements are made, then Achu should be an alternator, Babo should be a liar. Hence, Chiki bought a Red coloured item.

EXERCISE-2

Solutions for questions 1 and 2:

1. Let Dwivedi be the truth-teller:

	I	II	Position
Dwivedi	T	T	Extreme left
Trivedi	F	F	Centre
Chaturvedi	T	T	Extreme right

In this case, we get two truth-tellers (Dwivedi and Chaturvedi) and one liar (Trivedi) which violates the given conditions.
Let Trivedi be the truth-teller:

	I	II	Position
Dwivedi	F	F	Centre
Trivedi	T	T	Extreme right
Chaturvedi	F	T	Extreme left

Hence, Dwivedi's both statements are false, which is against the conditions given. Hence, Chaturvedi must be the truth-teller, in which case we get the following arrangements.

Case (i):

	I	II	Position
Dwivedi	T	F	Extreme left
Trivedi	F	T	Extreme right
Chaturvedi	T	T	Centre

Case (ii):

	I	II	Position
Dwivedi	T	T	Extreme left
Trivedi	F	F	Centre
Chaturvedi	T	T	Extreme right

Case (iii)

	I	II	Position
Dwivedi	F	F	Centre
Trivedi	T	F	Extreme left
Chaturvedi	T	T	Extreme right

In case (ii) and case (iii), both statements of Trivedi and Dwivedi, respectively are false. This is against the given condition.
Hence, the correct order from extreme left to extreme right is Dwivedi, Chaturvedi and Trivedi.

2. Based on the explanation to the previous questions, we have only one possible arrangement:

	I	II	Position
Dwivedi	T	F	Extreme left
Trivedi	F	T	Extreme right
Chaturvedi	T	T	Centre

Hence, none of the statements can be inferred.

Solutions for questions 3 to 5: The statement made by Rahul, Sandeep and Dhanush cannot be true at the same time. If the statement made by Rahul and Dhanush are true, then Rahul will be sitting in the middle of the row and so, the statement made by Sandeep will be false.

And the statements made by Ajay and Madhav are true. If the statements made by Rahul and Dhanush are true, then Sandeep will be at the right end and Sandeep's statement will be false.

Now, the statement made by Ajay must be false, but Ajay's statement is true.

∴ Sandeep's statement must be true and one among Rahul and Ajay must have made a false statement.

Now, from the statements made by Sandeep, Ajay and Madhav, the arrangement of the persons will be as follows.

_____ _____ Sandeep Madhav _____

From the above arrangement the statement made by Dhanush must be false.

∴ The final arrangement will be as follows.

Rahul Dhanush/Ajay Sandeep Madhav Ajay/Dhanush

3. Dhanush made a false statement.

4. Either Ajay or Dhanush is sitting at the right end of the row.

5. Sandeep is sitting in the middle of the row.

Solutions for questions 6 to 9:

Case I: Let Mona be a truth-teller.
Now, Mona is an Engineer, Rama is a Doctor. So, Koma must be a Professor. Koma owns Micra.
Now, the first statement made by Rama must be true. So, Rama must be an alternator. Hence, her second statement must be false and third statement must be true.
∴ Mona owns Indigo and Rama must own Swift.
Koma must be a liar.
But, her third statement is true.
Hence, case I is invalid.

Case II: Let Rama be a truth-teller. Then Mona owns swift, Rama owns Indigo and Koma owns Micra.
Now, Mona's third statement is true and Koma's third statement is false.
So, Mona must be an alternator and Koma must be a liar, which is not possible because if Koma is a liar Mona is a truth teller.
Hence, case II is invalid.

Case III: Let Koma be the truth-teller, then the first two statements made by Mona must be false and so she must be a liar and Roma must be an alternator.

	Professor	Car	Category
Mona	Doctor	Swift	Liar
Roma	Professor	Micra	Alternator
Koma	Engineer	Indigo	Truth-teller

6. Mona owns Swift.

7. Koma is an engineer.

8. Roma is the alternator.

9. Mona is a liar.

Solutions for questions 10 to 12: Let us assume, Chibi is a truth-teller, then Cakora is none among the truth-teller, alternator and liar. Hence, Chibi is not a truth-teller.

Let us assume that Cakora is a truth-teller, then

	Statements				
Name	I	II	III	IV	
Chibi	F	F	F	F	Instagram
Cakora	T	T	T	T	Facebook
Ceasar	T	F	T	F	WhatsApp
Chaila	T	F	T	F	Twitter

Let us assume that Ceasar is a truth-teller, then Cakora is none among the truth-teller, alternator and liar. Hence, Ceasar is not a truth-teller. Let us assume that Chaila is a truth-teller, then Chibi is none among the truth-teller alternator and liar. Hence, Chaila is not a truth-teller.

10. Cakora is the truth-teller.

11. Chaila is on Twitter.

12. The liar is on Instagram.

Solutions for questions 13 to 17: As they made equal number of true and false statements, for two of them, the first statements are true and for the other two, the first statements are false.

Let us assume that Pavan's first statement is false. Therefore, his statements must be false, true, false in that order. Thus his 2nd statement being true, Sravan is the fourth rank-

er in Physics. Now, from Madan's 2nd statement, Sravan being the fourth ranker in Chemistry must be false. Therefore, the remaining 2 statements of Madan must be true. Sravan's 2nd statement, that he is the fourth ranker in Maths must be false, which means Sravan's remaining 2 statements are true. But Sravan's 1st statement and Madan's 3rd statement cannot be true simultaneously. So, our assumption that Pavan's first statement being false was wrong.

So, Pavan's first statement is true. Pavan's statements are true, false and true. Madan is the fourth ranker in Chemistry and Naveen is the first ranker in Maths. Madan's 2nd statement is false, which proves that Madan's other 2 statements are true. Madan's statements are true, false, true. So, Madan is the first ranker in Commerce and Pavan is the third ranker in Maths.

Naveen's first statement as well as Sravan's first statements are false. So, the statements made by Naveen and Sravan must be of the type: False, true and false.

	Maths	Physics	Chemistry	Commerce
Pavan	3	1		
Naveen	1			
Madan			4	1
Sravan	4		1	

From the above table it can be concluded that Madan is the second ranker in Maths and the third ranker in Physics.

⇒ In Chemistry, Naveen is the third ranker and Pavan is the second ranker.

⇒ In Commerce, Pavan is the fourth ranker, Sravan is the third ranker and Naveen is the second ranker.

∴ In Physics, Naveen is the fourth ranker and Sravan is the second ranker.

	Maths	Physics	Chemistry	Commerce
Pavan	3	1	2	4
Naveen	1	4	3	2
Madan	2	3	4	1
Sravan	4	2	1	3

13. Naveen is the third ranker in Chemistry.

14. Sravan is the second ranker in Physics.

15. Naveen got better rank than Madan only in Chemistry.

16. Naveen got second rank in Commerce.

17. In Commerce, Pavan got worse rank than both Naveen and Sravan.

Solutions for questions 18 to 22: Let the first statement of Abhay be false.

⇒ David is a truth-teller.

∴ Bharath is studying in Class X.

Also, Abhay must not be an alternator which implies that Abhay is a liar.

⇒ Chandu is studying in Class IX.

As Abhay is studying in Class VII is false, Abhay is studying in Class VIII and David is studying in Class VII.

But the above results are contradicting the first and the third statements of Chandu, the first being true and the third being a lie.

∴ Abhay's first and third statements are true.

⇒ Abhay is studying in Class VII.

⇒ Chandu's third and first statements are true.

⇒ Bharath is studying in Class VIII.

⇒ David's third and first statements are true and second statement is false.

∴ David is an alternator.

⇒ Abhay is not an alternator.

∴ Abhay is a truth-teller.

⇒ Chandu is not studying in Class IX.

Chandu is studying in Class X and David is studying in Class IX.

∴ Bharath's second and third statements are false.

⇒ Bharath is a liar.

⇒ Chandu's second statement is also true. The final arrangement is as follows.

	I	II	III	Studying
Abhay	T	T	T	VII
Bharath	F	F	F	VIII
Chandu	T	T	T	X
David	T	F	T	IX

18. Chandu is studying in Class X.

19. Only David is an alternator.

20. Abhay made three true statements.

21. David is studying in Class IX.

22. Required difference = 8 – 4 = 4.

Solutions for questions 23 to 25: It is given that no person belongs to the category that is mentioned on his badge.

Consider the second statement made by D. If it is true, then his second statement should be false (which is a contradiction). Therefore, his second statement should be false and he belongs neither to Altures nor to Allies.

⇒ He belongs to Liars. Therefore, his first statement should be false. Hence, Liars do not have a telephone.

Consider the first statement of A as false. This implies that Allies do not have a telephone and that A belongs to Allies. Now the second statement cannot be true as it leads to contradiction.

Therefore, A belongs to Altrues (As D belongs to Liars and A does not belong to Trues or Allies) and Allies have telephone.

Now B and C belong to Trues and Allies not necessarily in the same order. Therefore, the second statement of each of B and C should be true. As B does not have telephone, he cannot belong to Allies. Therefore, he belongs to Trues and C belongs to Allies.

	I	II
A	T	F
B	T	T
C	F	T
D	F	F

23. B belongs to Trues.

24. As C belongs to Allies, he has a telephone.

25. Only one category has telephone, i.e., Allies.

Solutions for questions 26 to 28: Here, the only way the arrangement works is by assuming that the three statements given by each of John and Jeromy must be False, True, False.

Then we get the following arrangement.

	I	II	III
John	F	T	F
Jack	T	F	T
Jeromy	F	T	F
James	T	F	T

As each pattern is followed by exactly two people, the statements given by Jack and James must be in the order of True, False and True.

Then, the final arrangement as per the individual rankings is as given below:

	Height	Weight	Age	Wealth
John	2	4	1	3
Jack	3	1	2	4
Jeromy	4	2	3	1
James	1	3	4	2

Hence, the questions can be answered based on the above table.

26. Jeromy is the second heaviest.

27. Jeromy is the desired person.

28. James is the third heaviest, which means there are two people who weigh more than James.

Solutions for questions 29 to 31: It can be clearly inferred that Bhavna's second statement cannot be true because sum of three different numbers starting with 1 cannot be a unit multiple of 5. It is possible only when two numbers are equal ⇒ – 1 + 1 + 3 or 1 + 2 + 2 – which is a violation that all the three people are in different positions.

We have the following about Bhavna's statements and the impact on Charan's statements:

	I	II	III
Alex			
Bhavna		F	
Charan	F	T	F

This is because Charan alternates between truth and lie statements in any order.

Now, Charan's IInd statement (True) ⇒ Alex is currently is position seven.

So, Alex's IIIrd statement would become false because Alex is already in position seven, implying he would not be in position seven after interchanging position with Charan.

This also implies that Bhavna's Ist statement is false since the fourth position from the end of the queue would be the seventh position from the beginning and Alex is already in position 7.

So, we have the following:

	I	II	III	Positions
Alex			F	7
Bhavna	F	F		
Charan	F	T	f	

Now, Bhavna cannot alternate between true and lie statements. So, Alex must be the second person to alternate between true and lie statements.

So, the final arrangement is as follows.

	I	II	III	Positions
Alex	F	T	F	7
Bhavna	F	F	F	?
Charan	F	T	F	?

The positions of Bhavna and Charan cannot be uniquely determined as illustrated below.

Position	(i)	(ii)	(iii)	(iv)	(v)
1				B	C
2	C		B		
3					
4		B			
5					

Position	(i)	(ii)	(iii)	(iv)	(v)
6		C			
7	A	A	A	A	
8	B		C		
9				C	B
10					

29. The position of Bhavana with respect to Alex cannot be uniquely determined.

30. I – Is true.
II – Is true.
III – Is false since Alex alternates in the order as false, true, false.

31. Choice (B) gives us a unique arrangement as shown earlier in case (i).

Solutions for questions 32 to 34: If P always speaks the truth, then Q always lies R.
If P always lies R, then Q always speaks the truth.
In either case, R cannot be speaking all truths or all lies.
R cannot alternate between truth and lies either.
So, we have the following:
Case (i)

	I	II	III
P	T	T	T
Q	F	F	F
R	F	T	f

Case (ii)

	I	II	III
P	F	F	F
Q	T	T	T
R	T	F	LF

In case (i), R becomes an alternator which violates the given condition.
Hence, case (ii) in the correct arrangement and the south – bound bus goes to the airport.

32. R replies in the manner: Truth – lie – lie

33. Only statement I is true.

34. (20 minutes to wait for the bus) + (30 minutes of travel time) = 50 minutes to reach the airport.

Solutions for questions 35 to 37: Let us rename the five army personnel as below:
Ranveer → Veer
Ranjeet → Jeet
Randheer → Dheer
Ranmeet → Meet
Ranpreet → Preet

It is known that except one person (who must be a Liar whose all 3 statements are all false) each of the other four spoke at least one true statement. Also, except one person (who must be the truth-teller whose all 3 statements must be true) each of the other four tells at least one lie, i.e., one false statement.

Also, exactly one person always alternated between the truth and lie (an alternator) in any order – (True False True) or (False True False).

This means that there must be two people, each of whom speaks at least one true and at least one false statement, but none of them is an alternator. Let us assume each person to be a truth-teller and find a definite arrangement.

Let Ranjeet be the truth-teller.

	I	II	III	Ranks
Jeet	T	T	T	Lieut./Capt.
Meet	F	?	F	Brigadier
Preet	F	F	F	Major
Dheer	F	F	F	Capt./Lieut.
Veer	F	T	F	Colonel

In this arrangement, both Preet and Dheer tell lies (all 3 statements are false), which violates the conditions as there is exactly one liar among them. By similar approach, when we assume that Ranpreet always speaks the truth, then we get the following arrangement.

	I	II	III	Ranks
Jeet	F	?	F	Colonel
Meet	F	F	?	Captain
Preet	T	T	T	Major /Lieut.
Dheer	?	F	F	Brigadier
Veer	F	?	?	Lieut./Major

Now, either Veer or Jeet is the alternator, Veer cannot be the alternator, because if his last statement is false (which means that Veer is not the Lieutenant but he is the Major), then his second statement must be true (i.e., Preet is Major), which is not possible, as exactly one person between Preet and Veer must be the Major.

Hence, Jeet must be the Alternator and his second statement must be true.

Now, we rearrange the above deductions as below.

	I	II	III	Ranks
Jeet	F	T	F	Colonel
Meet	F	F	F	Captain
Preet	T	T	T	Major
Dheer	T	F	F	Brigadier
Veer	F	T	T	Lieutenant

Based on this arrangement (which is the only definite arrangement), we answer the questions as below.

35. First statement given by Randheer is true and the rest are false.

36. Ranjeet, the Colonel, alternates between the truth and lie, in the order lie – truth – lie.

37. From the table, choice (D) gives the correct order.

Solutions for questions 38 to 40: From the given statement it is clear that Pingo cannot be the truth-teller. (As truth-teller cannot say that, I am an alternator).

He can be either an alternator or a liar.

If Pingo is the Professor, then his first statement is contradicting.

Hence, he cannot be the Professor.

If Bingo is a truth-teller, then Tingo's second statement must be false.

⇒ Tingo's first statement cannot be true. Therefore, Tingo must be a liar.

Now, Bingo is the Manager, Tingo is the Chartered Accountant (CA) and Pingo is not the Engineer. Therefore, Pingo must be a Professor, which is not possible.

∴ Bingo is not a truth-teller.

If Mingo is the Engineer, we have two possibilities, they are:

Case (A1):

Professor	Name	I	II	III
CA	B	F	F	F
Engineer	M	T	T	T
Professor	T	F	T	F
Manager	P	T	F	T

Case (A2):

Professor	Name	I	II	III
Manager	B	F	T	F
Engineer	M	T	T	T
Professor	T	F	T	F
CA	P	F	F	F

If Tingo is a truth-teller, then we get two possible cases, they are:

Case (B1):

Profession	Name	I	II	III
Manager	B	F	T	F
CA	M	F	F	F
Professor	T	T	T	T
Engineer	P	F	F	F

Case (B2):

Profession	Name	I	II	III
CA	B	F	F	F
Manager	M	F	F	F
Professor	T	T	T	T
Engineer	P	T	F	T

It is also possible that there is no truth-teller, but all of them cannot be liars, there must be at least an alternator (according to the statements of Pingo), i.e., if Pingo is a liar, then Bingo cannot be a liar and vice versa.

If Bingo is an alternator, we have one possibility:

Case (C):

Profession	Name	I	II	III
Manager	B	F	T	F
Professor	M	F	F	F
Engineer	T	F	F	F
CA	P	F	F	F

If only Pingo is an alternator, we have two possibilities:

Case (D1):

Profession	Name	I	II	III
Not Manager	B	F	F	F
Not Engineer	M	F	F	F
Manager/Engineer	T	F	F	F
Manager/CA	P	T	F	T

If Mingo is an alternator, then we get the following:

Case (D2):

Profession	Name	I	II	III
Professor	B	F	F	F
Engineer	M	F	T	F
Manager	T	F	F	F
CA	P	T	F	T

38. In case D2, Tingo is the Manager. Pingo is the Chartered Accountant. In case D1, if Tingo is the Manager, then Pingo will be the Chartered Accountant.

39. Here, Pingo's III statement is false and hence, his first statement is also false. So, Pingo is a liar. As no other is liar, the II statements of all others must be true.

∴ Mingo is the Engineer. This is case A2.

40. If we take any two of the statements, we will get case D2.

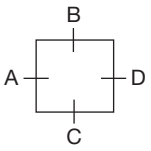
EXERCISE-3

Solutions for questions 1 to 3:

Case (i):

Let us assume that A speaks the truth.

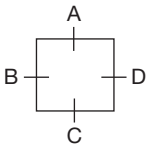
The arrangement is:



	I	II	
A	T	T	Truth-teller
B	F	T	Alternator
C	F	F	Liar
D	F	T	Alternator

Case (ii):

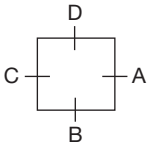
Let us assume that B is the truth-teller, then the arrangement is:



	I	II	
A	F	T	Alternator
B	T	T	Truth-teller
C	F	F	Liar
D	F	F	Liar

Case (iii):

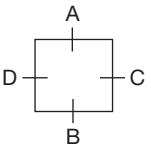
Let us assume that C is the truth-teller, then the arrangement is:



	I	II	
A	F	F	Liar
B	F	F	Liar
C	T	T	Truth-teller
D	F	F	Liar

Case (iv):

Let us assume that D is the truth-teller, then the arrangement is:



	I	II	
A	F	F	Liar
B	F	F	Liar
C	F	F	Liar
D	F	F	Truth-teller

As it was given that there is exactly one person who alternates between the truth and lies, the arrangement in case (ii) is the valid one.

1. B is the truth-teller.

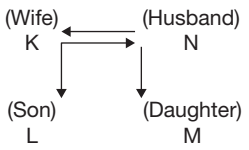
2. C and D are the liars.

3. B sits opposite to D.

Solutions for questions 4 to 6: Among the four members, there is one couple, their son and their daughter. The statements given by L is definitely false because, according to his statements there are three generations. So, L cannot be the truth-teller.

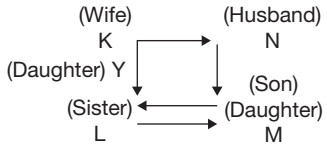
Case (i):

Let us assume that K is the truth-teller, then



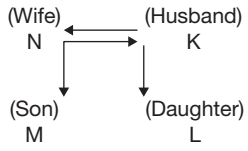
	I	II	
K	T	T	Truth-teller
L	T	F	Alternator
M	F	F	Liar
N	T	F	Alternator

Case (ii):
Let us assume that M is the truth-teller, then the arrangement is as follows.



	I	II	
K	T	F	Alternator
L	T	F	Alternator
M	T	T	Truth-teller
N	F	T	Alternator

Case (iii):
Let us assume that N is the truth-teller.



	I	II	
K	F	F	Liar
L	F	F	Liar
M	F	T	Alternator
N	T	T	Truth-teller

4. L can never be the truth-teller.

5. In case (iii), N is the truth-teller, and K and L are the liars.

6. In case (ii), N and L are the alternators and K is the truth-teller.

Solutions for questions 7 to 10: It is given that each of the four people alternates between truth and lies in any order and that the second statement of exactly two people, one of them being Abhinav is true. This implies that the first and the last statement of each of these two people is false. Hence, from Abhinav's statements, which are in the order of false, true and false, we know the following.

Bipash is not from Delhi.
Chandar plays Chess.
Danny is the tallest.
Now, with the above information, let us check the first statement of each of the other three people.
From the above information, the truth or falsity in the first statement of Bipash and Chandar cannot be found out. But we know that Danny's first statement is false. Hence, the second statement of Danny is true. Since, there are only two people, whose second statement is true, we get the following information.
Abhinav: Bipash is from Delhi - False
Chandar plays Chess – True ⇒ Chandar – Chess
Danny is not the tallest – False ⇒ Danny – Tallest
Bipash: Abhinav is from Kolkata – True
⇒ Abhinav – Kolkata
Chandar is not the shortest – False
⇒ Chandar – Shortest
Danny plays badminton – True
⇒ Danny – Badminton

Chandar: Abhinav is the 2nd tallest – True
⇒ Abhinav – 2nd tallest
Bipash plays Tennis – False
⇒ Bipash does not play Tennis
Danny is from Delhi – True ⇒ Danny – Delhi

Danny: Abhinav plays Chess – False
Bipash is from Mumbai – True ⇒ Bipash - Mumbai
Chandar is not from Hyderabad - False
⇒ Chandar – Hyderabad
From the above information, we get the following arrangement.

7. Danny is from Delhi.

8. Chandar is the Chess player.

9. The person who plays Chess is the shortest.

10. The second statement made by Abhinav and Danny are true.

Solutions for questions 11 to 15: From the given data:
As Amar and Dinesh belong to same group, their last statements cannot be simultaneously true.
Hence, their 2nd statements must be true.
Similarly, Bharath and Chandu's second statements are false.
The final table of heights and weights is as follows.

	Height	Weight	Age
1st	Chandu	Dinesh	Eswar
2nd	Dinesh	Bharath	Chandu
3rd	Eswar	Amar	Dinesh
4th	Amar	Eswar	Bharath
5th	Bharath	Chandu	Amar

11. Chandu is the tallest.

12. Eswar is the oldest.

13. Chandu is the lightest.

14. Amar is the 2nd shortest.

15. Dinesh is the 3rd youngest.

Solutions for questions 16 to 19: Schindler said 'I am not an alternator'. From this, we can conclude that he is either a truth-teller or an alternator.

Case (i): Schindler is a truth-teller.
Since all the statements of Schindler are true, we can conclude from his statements that (a) Gretta is a liar and (b) he is not the shortest. Considering that Gretta is a liar, we can conclude that Gretta is not the tallest and that Fischer is not a liar. From the facts derived so far, we can conclude that Fischer's second statement is true and the third one is false. Hence, he must be an alternator. Thus, his first statement is false. This implies that Fischer is the tallest.
Since Schindler is not the shortest, he must be the second tallest and Gretta the shortest. Thus, the final arrangement is as follows.

Tallest	Fischer	Alternator
2nd tallest	Schindler	Truth-teller
Shortest	Gretta	Liar

Case (ii): Schindler is an alternator. In this case, his first and the third statements are true and the second one is false. From his statements, we get the same facts as we derived above. As a result, all other information that we have derived will also be the same except that Schindler is an alternator.

Tallest	Fischer	Alternator
2nd tallest	Schindler	Alternator
Shortest	Gretta	Liar

16. Either Schindler is the truth-teller or none of them is a truth-teller.

17. Fischer is the tallest.

18. They together made either three or four true statements.

19. Fischer is definitely an alternator.C)

Solutions for questions 20 to 23:

Case (i): Both the statements of P are true.
Facts from P's statements: S is male, Q and R are females.
Hence, R's first statement is false and the second one is true. S's second statement is true and the first one is false. Now, whether P is male or female, the above deductions hold good.

Thus, in this case, both the statements of Q are false. Each of R and S made one true statement and one false statement.

Case (ii): Both the statements of Q are true.
Facts from Q's statements: R is male and both the statements of S are false.
Facts from S's statements: Q is male and S has three brothers or three sisters or two sisters and a brother.
Hence, for each of P and R, one statement should be true and the other one is false. Clearly, P's first statement is false. Hence, his second statement is true, which implies that S is also male. Now, R's first statement is true and second one is true. Since Q and R are males and the first statement S is false, P should also be male.
Thus, in this case, both the statements of S are false. Each of R and P made one true statement and one false statement. All of P, Q, R and S are male.

Case (iii): Both the statements of S are true.
Facts from S's statements: Q is female and both P and R are males.
In such case, Q's first statement is false and the second one is true. R's second statement is false. Now R's first statement cannot be true, because in such case there will be three people for each of whom one statement is true and the other one is false. Hence, R's second statement must also be false. This means that either both the statements of P are true or both are false. But in both the cases, the given data is violated. Hence, S cannot be the one with both true statements. Thus cases (i) and (ii) are valid.

20. R definitely made one true and one false statement.

21. Swank definitely is male.

22. Either Qusac or Swank made two false statements.

23. Statement (D) is true.

Solutions for questions 24 and 25: It is given that it is the birthday of one of the two. Hence, Sharmila's second statement is false.

Let Sharmila's first statement be true or false.

Case (i): Sharmila's first statement is true.
It implies that Karuna is lying. Hence, it is Karuna's birthday but not Sharmila's.

Case(ii): Sharmila's first statement is false.
It implies that either both the statements of Karuna are true or one of them is true and the other one is false.
If the first statement of Karuna is true and the second one is false, it implies it is not the birthday of any one of them. If the first statement is false and the second one is true, then it is the birthday of both of them. But both the cases violate the given information. Thus, it can be concluded that both the statements of Karuna must be true. Hence, it is the birthday of Sharmila.

24. If Sharmila's first statement is false, it would be Sharmila's birthday.

25. Statement (B) is true.

7 Venn Diagrams

CHAPTER

Learning Objectives

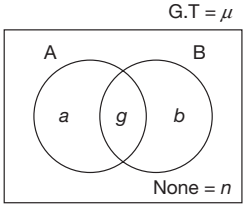
In this chapter, you will:

- Understand the concept of Venn diagrams – the need for representing sets in a graphical manner and properties of a set.
- Understand the use of Venn diagrams to explain the logical relationships between two or more sets.
- Learn how to interpret the statements (such as 'at least', 'at most', 'exactly', 'A or B but not C', 'A and B but not C' etc.) given in the questions and how to assign values to each category of variables within a Venn diagram.
- Gain knowledge of how to deal with Venn diagrams having two, three and four sets.

❒ INTRODUCTION

A **VENN DIAGRAM** is a diagrammatical representation of two or more sets/groups, which may/may not have some common elements (like women and athletes – some women may also be athletes), using geometric shapes to represent each set. Venn diagrams illustrate a logical relationship between the sets. In the theory given below we illustrate Venn diagrams with two, three and four sets.

Venn Diagrams Involving Two Variables

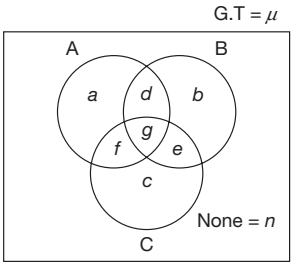


In the above diagram, A and B represent two different sets and the various regions can be referred to as given below.

$A = a + g$; $B = b + g$

Only A = a; Only B = b
Exactly one set = $a + b$
A and B = g; Only A and B = g
Exactly two sets = g
At least one set = Exactly one + Exactly two
$= a + b + g = T$
Grand total (G.T = μ) = $a + b + g + n = T + n$
A + B = $a + b + 2g = T + g$
A or B = $a + b + g = T$
Does not belong to A = $b + n$
Does not belong to B = $a + n$

Venn Diagram with Three Variables



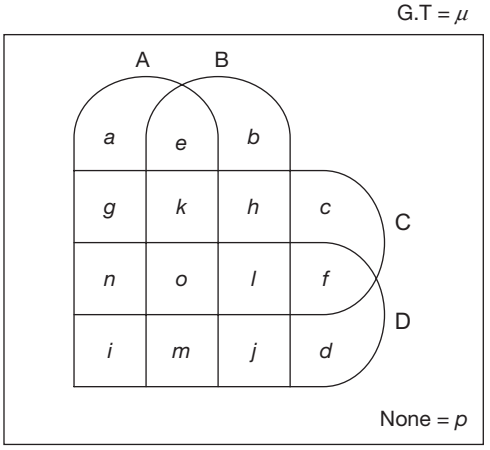
Here A, B and C are three different sets and the various regions can be referred to as given below.

A = a + d + g + f; Only A = a
B = b + d + g + e; Only B = b
C = c + f + g + e; Only C = c
Exactly one set = a + b + c
A and B = d + g; B and also C = e + g; C as well as A = f + g
Only A and B = d; A and B but not C = d
Only B and C = e; B and C but not A = e
Only C and A = f; C and A but not B = f
Exactly two sets = d + e + f
A, B and C = All the three = Only A, B and C = g;
Exactly three sets = g
None among A, B and C = n
At least one set = Exactly one + Exactly two + Exactly three = a + b + c + d + e + f + g = μ − n
At least two sets = Exactly two + Exactly three = d + e + f + g
At least three sets = Exactly three = g
At most one sets = Exactly one + None = a + b + c + n
At most two sets = Exactly two + Exactly one + None = d + e + f + a + b + c + n = μ − g
At most three sets = Exactly three + Exactly two + Exactly one + None = g + d + e + f + a + b + c + n = μ
A + B + C = a + b + c + 2(d + e + f) + 3g
= Exactly one + 2 (Exactly two) + 3 (Exactly three)
= (Exactly one + Exactly two + Exactly three) + Exactly two + 2 (Exactly three)
= At least one + Exactly two + 2 (Exactly three)
= At least one + (Exactly two + Exactly three) + Exactly three
= At least one + At least two + At least three
Does not belong to A = b + e + c + n
A or B or C = a + b + c + d + e + f + g = At least one.
A or B = a + b + d + e + f + g
A or B but not C = a + d + b
Neither A nor B = c + n
(A and B) or C = d + c + f + g + e
A and (B or C) = d + g + f

Venn Diagram Involving Four Variables

Here, A, B, C and D are four different sets and the various regions can be referred to as given below.

A = a + e + g + k + n + o + i + m; Only A = a
B = b + e + h + k + l + o + j + m; Only B = b
C = c + f + h + l + k + o + g + n; Only C = c
D = d + f + j + l + m + o + i + n; Only D = d



Exactly one set = a + b + c + d
A and B = e + k + o + m; Only A and B = e
A and C = g + k + o + n; Only A and C = g
A and D = n + o + i + m; Only A and D = i
B and C = k + h + o + l; Only B and C = h
B and D = m + j + o + l; Only B and D = j
C and D = n + o + l + f; Only C and D = f
Exactly two sets = e + f + g + h + i + j
A, B and C = k + o; Only A, B and C = k
B, C and D = l + o; Only B, C and D = l
A, B and D = m + o; Only A, B and D = m
A, C and D = n + o; Only A, C and D = n
Exactly three sets = k + l + m + n
A, B, C and D = All the four = Exactly four set = o;
None among A, B, C and D = p

NOTE

Note the following for a n-set Venn diagram:

Name of the region (pocket of intersection of the sets)	Number of regions (pockets of intersections of the sets)	For a 5-set situation
Exactly 1, X	${}^{n}C_{1}$	5
Exactly 2, Y	${}^{n}C_{2}$	10
Exactly 3, Z	${}^{n}C_{3}$	10
Exactly 4, A	${}^{n}C_{4}$	5
Exactly 5, B	${}^{n}C_{5}$	1
None, N	${}^{n}C_{0}$	1
Total number of regions	2^{n}	32

SOLVED EXAMPLES

Directions for questions 7.01 to 7.04: These questions are based on the information given below.

The class teacher has posed two questions A and B to the 160 students of her class. 65 students could not answer question A, 80 students could not answer question B and 40 students answered both the questions.

7.01: How many students could not answer any of the two questions?
(A) 30 (B) 25
(C) 40 (D) 15

7.02: How many students answered only question A?
(A) 95 (B) 60
(C) 50 (D) 55

7.03: How many students could not answer exactly one question?
(A) 130 (B) 55
(C) 95 (D) 11

7.04: The number of students who answered only question B is what percentage of the number of students who answered question B?
(A) 50% (B) 60%
(C) 25% (D) $33\frac{1}{3}$ %

Solution for questions 7.01 to 7.04

Total number of students = 160

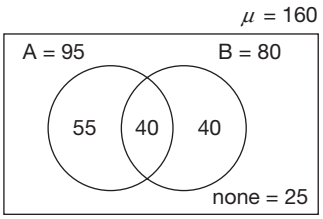
65 could not answer A

$\Rightarrow$ 160 − 65 = 5 answered question A.

80 could not answer B $\Rightarrow$ 160 − 80 = 80 answered question B.

40 students answered both the questions.

Venn diagram based on the above data is as follows.



$\Rightarrow$ 25 students could answer neither of the questions.

7.01: 25 students could not answer any of the two questions. Hence, the correct option is (B)

7.02: 55 students answered only A. Hence, the correct option is (D)

7.03: 40 + 55 = 95 students could not answer exactly one question. Hence, the correct option is (C)

7.04: 40 students answered only B.

$$\text{Required } \% = \frac{40}{80} \times 100 = 50\%$$

Hence, the correct option is (A).

Directions for questions 7.05 to 7.08: These questions are based on the following data.

In a colony, the residents read different newspaper, among The Hindu. The Times of India and Dainik Bhaskar. It is known that 52% of the residents read at most one newspaper. 42% of the residents read The Times of India or Dainik Bhaskar but not The Hindu. 54% of the residents read The Times of India. 24% of the residents read both The Hindu and The Times of India. 36% of the residents read exactly two newspapers. 10% of the residents read only The Hindu and Dainik Bhaskar. The number of residents, who read all the three newspapers is twice the number of residents who read none of these newspapers. 2,800 residents read only the Times of India and Dainik Bhaskar.

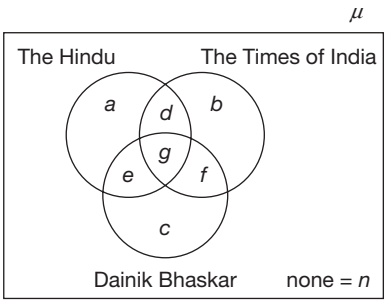
7.05: How many residents read only The Hindu?
(A) 4000 (B) 600
(C) 3200 (D) 3400

7.06: How many residents do not read any of the newspapers?
(A) 1800 (B) 1600
(C) 1450 (D) 1200

7.07: How many residents read at least two newspapers?
(A) 9600 (B) 8000
(C) 8400 (D) 10200

7.08: How many residents are there in the colony?
(A) 22000 (B) 16000
(C) 20000 (D) 18000

Solution for questions 7.05 to 7.08: Let us represent the given information in a Venn diagram, as follows.



Given. 52 % of the residents read at most one newspaper,

$$a + b + c - n = 52\% \quad (1)$$

42 % of the residents read Times of India or Dainik Bhaskar but do not read Hindu.

$$f + b + c = 42\% \quad (2)$$

54% of the residents read The Times of India

$$d + b + g + f = 54\% \quad (3)$$

24% of the residents read both the Hindu and The Times of India.

$$d + g = 24\% \quad (4)$$

35% of the residents read exactly two newspapers,

$$d + e + f = 36\% \quad (5)$$

10% of the residents read only The Hindu and Dainik Bhaskar

$$e = 10\% \quad (6)$$

The number of residents who read all the three newspapers is twice the number of people who read none

$$g = 2n \quad (7)$$

2800 residents read only the Times of India and Dainik Bhaskar.

$$f = 2800 \quad (8)$$

By subtracting eqn (4) from (3), we get

$$b + f = 30\% \quad (9)$$

By subtracting eqn (9) from (2), we get

$$c = 12\% \quad (10)$$

From equation (1) and (5), we get

$$a + b + c + n + d + e + f = 88\%$$

$$\therefore \quad g = 100 - 88 = 12\%$$

Thus, $n = 6\%$

From equation (4), we get $d = 12\%$

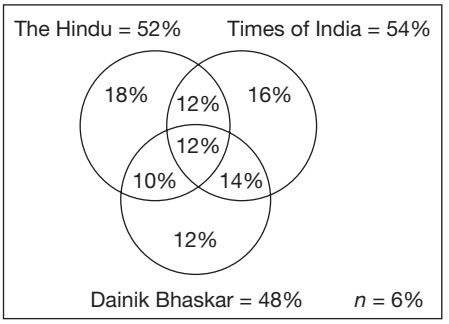
From eqn. (5), we get

$$f = 14\%$$

From eqn. (2), we get

$$b = 16\%$$

$\therefore$ The final diagram is as follows



Given

$$f = 14\% \text{ of total} = 2600$$

$\therefore$ Total no. of residents in the colony

$$= \frac{2800 \times 100}{14} = 20000$$

7.05: 18% of the residents read only Hindu.

$$\frac{2800 \times 6}{100} = 3600$$

Hence, the correct option is (B).

7.06: 6% of the residents do not read any of the news papers.

$$\frac{20000 \times 6}{100} = 1200$$

7.07: Residents who read at least two newspapers = (Residents who read exactly two + exactly three)

$$d + e + f + g = (12 + 12 + 10 + 14)\% = 48\%$$

$$\therefore \quad \frac{20000 \times 48}{100} = 9600$$

Hence, the correct option is (A).

7.08: Total number of residents = 100%

20,000 people are there in the colony.

Hence, the correct option is (C).

Directions for questions 7.09 to 7.12: These questions are based on the information given below.

A survey was conducted among some people It was found that 330 people watch Discovery channel, 330 people watch Star World, 315 people watch BBC and 285 people watch Star News. The number of people who watch each combination of exactly three channels is 40. The number of people, who watch only Discovery channel and BBC is 50. 80 people watch only Discovery channel, 100 people watch only Star World, 90 people watch only BBC and 70 people watch only Star News. 30 people watch only BBC and Star News, while

10 people watch ail the four channels. Each person watches at least one channel.

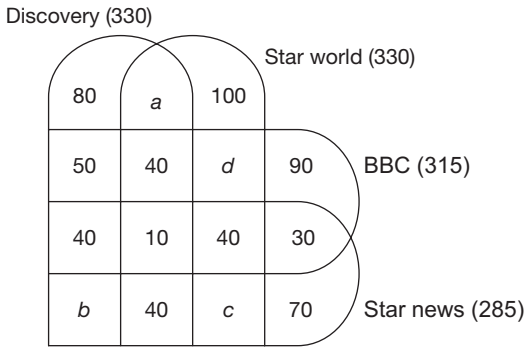
7.09: How many people watch only Discovery channel and Star World?
(A) 140 (B) 50
(C) 180 (D) 230

7.10. How many people watch BBC but not Discovery channel?
(A) 240 (B) 320
(C) 150 (D) 175

7.11. How many people watch exactly two channels?
(A) 200 (B) 220
(C) 310 (D) 180

7.12. How many people took part in the survey?
(A) 1000
(B) 1260
(C) 710
(D) Cannot be determined

Directions for questions 7.09 to 7.12: From the given information, we have the following venn diagram.



$$50 + 40 + d + 90 + 40 + 10 + 40 + 30 = 315$$
$$\Rightarrow \quad d = 315 - 300$$
$$d = 15$$
$$a + b + b\,80 + 40 + 40 + 10 + 40 = 330$$
$$\Rightarrow \quad a + b = 70 \qquad (1)$$

Similarly,

$$a + c + 100 + 40 + 10 + 40 + 40 + 15 = 330.$$
$$\Rightarrow \quad a + c = 85 \qquad (2)$$

and

$$b + c + 40 + 10 + 40 + 30 + 70 + 40 = 285$$
$$\Rightarrow \quad b + c = 55 \qquad (3)$$

By adding equations (1), (2) and (3), we get

$$2(a + b + c) = 210$$
$$\Rightarrow \quad a + b + c = 105 \qquad (4)$$

From equation (4) and (1), we get

$$c = 35$$

Similarly,

$$b = 20$$
$$a = 50.$$

7.09: People watch only Discovery and Star World $= a = 50$.

7.10: $90 + 30 + 40 + 15 = 175$ people watch BBC but do not watch Discovery.

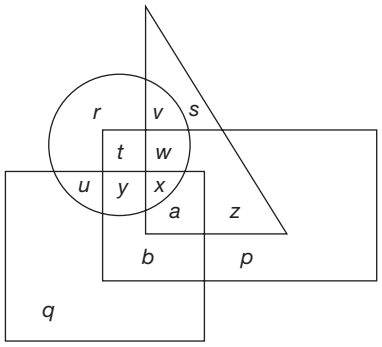
7.11: $50 + 50 + 15 + 30 + 20 = 200$ people watch exactly two channels.

7.12: 710 many people took part in the survey.

EXERCISE-1

Directions for questions 1 to 5: These questions are based on the following diagram.

In the following diagram, the circle represents all the people who like Maaza, the square represents all the people who like Thumbs Up, the Triangle represents all the people who like Mirinda and the Rectangle represents all the people who like Coca-Cola.



1. Which of the following represents the people who like Coca-Cola and Thumbs Up?
(A) *r* (B) *u*
(C) *b* (D) *q*

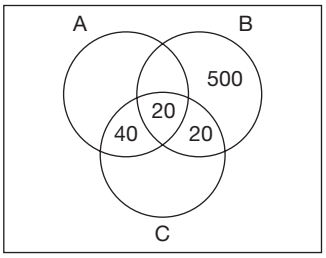
2. Which of the following represents the people who like Mirinda but not Thumbs Up?
(A) *v, s, w, x* (B) *v, s, z, a*
(C) *v, w, x, a* (D) None of these

3. Which of the following represents the people who like Maaza and Thumbs Up?
(A) *u, t, w* (B) *v, w, x*
(C) *b, a, x* (D) *u, y, x*

4. Which of the following represents the people who like both Maaza and Mirinda but not any of the other two?
(A) *y* (B) *v*
(C) *u* (D) None of these

5. Which of the following represents the people who like Mirinda, Maaza, Coca-Cola but not Thumbs Up?
(A) *b* (B) *r*
(C) *s* (D) *w*

Directions for questions 6 to 10: The following Venn diagram represents the 1200 employees of a company. Each of the employees is a member of at least one of three clubs, such as A, B and C. Using the given data, answer the questions that follow.



Total member of Club A = 420
Total member of Club B = 590
Total member of Club C = 340

6. How many employees are member of Club C only?
(A) 250 (B) 240
(C) 180 (D) 260

7. How many employees are member of both Club A and Club B?
(A) 50 (B) 80
(C) 70 (D) 60

8. How many employees are not member of Club B?
(A) 340 (B) 610
(C) 630 (D) 290

9. How many employees are member of Club A or Club C?
(A) 850 (B) 700
(C) 975 (D) 675

10. How many employees are member of exactly two clubs?
(A) 110 (B) 130
(C) 98 (D) 78

Directions for questions 11 to 15: These questions are based on the following information.

In a class of 150 students, 45 take History, 65 take Geography and 10 take both History and Geography.

11. How many students take only Geography?
(A) 45 (B) 10
(C) 55 (D) 65

12. How many students take only History?
(A) 65 (B) 35
(C) 10 (D) 45

13. How many do not take either History or Geography?
(A) 10 (B) 35
(C) 100 (D) 140

14. How many students take at least one subject?
(A) 10 (B) 90
(C) 50 (D) 100

15. How many students do not take any of the two subjects?
(A) 90 (B) 10
(C) 50 (D) 100

Directions for questions 16 to 18: These questions are based on the following information.

In a class of 150 students, 50 students passed in Mathematics, 40 students failed only in Chemistry and 20 students failed in both the subjects.

16. How many students passed in both the subjects?
(A) 20 (B) 15
(C) 10 (D) 16

17. How many students passed exactly in one subject?
(A) 25 (B) 120
(C) 140 (D) 145

18. How many students failed in at least one of the subjects?
(A) 130 (B) 125
(C) 145 (D) 140

Directions for questions 19 to 23: These questions are based on the following information.

In a survey conducted among 200 mobile phone using families, it was found that 140 use Panasonic, 120 use Nokia and 143 use Siemens. 95 use both Panasonic and Nokia, 85 use both Nokia and Siemens and 93 use both Panasonic and Siemens. 70 families use mobile phones of all the three companies.

19. How many families use mobilephones of only Siemens?
(A) 50 (B) 35
(C) 70 (D) 143

20. How many families use mobilephones of both Panasonic and Nokia but not Siemens?
(A) 25 (B) 57
(C) 165 (D) 95

21. How many families use mobilephones of exactly one company?
(A) 63 (B) 67
(C) 70 (D) 200

22. How many families use neither Panasonic nor Siemens?
(A) 40 (B) 120
(C) 110 (D) 10

23. How many families use none of the mobile phones?
(A) 10 (B) 70
(C) 0 (D) Cannot be determined

Directions for questions 24 to 28: Study the following data and the table to answer the questions that follow.

A survey was conducted among 100 students in a class who read detective novels written by Conan Doyle or Agatha Christie or both. Due to some recording error in the computer most of the figures were missing. The following table shows the remaining data.

	Doyle	Christie	Both	Total
Male				
Female	40			
Total		70		100

Further it is known that
(A) 37% of the students read both Doyle and Christie.
(B) The ratio of males to females is 1 : 1.
(C) 50% of the females read books of both the authors.

24. How many males read books by both the authors?
(A) 10 (B) 12
(C) 37 (D) 45

25. How many students read books by only Christie?
(A) 70 (B) 10
(C) 33 (D) 23

26. How many females read books by only Doyle?
(A) 25 (B) 40
(C) 35 (D) 15

27. How many students do not read books by both the authors?
(A) 12 (B) 27
(C) 37 (D) 63

28. How many males read books by Doyle?
(A) 27 (B) 67
(C) 12 (D) 15

Directions for questions 29 to 33: These questions are based on the following information.

Out of 200 people who attended a birthday party 120 had cool drink, 100 had ice cream, 80 had cake and 10 had none of these three. 100 people had exactly one of the three items.

29. How many people had exactly two of the three items?
(A) 70 (B) 80
(C) 110 (D) 85

30. If 20 people had only cool drink and ice cream, then how many people had only cake?
(A) 12 (B) 18
(C) 20 (D) 10

31. If 15 people who had only cool drink, had cake also and 5 people who had only ice cream and cake had cool drink also, then how many people had at least two of the three?
(A) 135 (B) 105
(C) 78 (D) 119

32. If 30 people had only ice cream, then how many people had at least one of cake and cool drink but not ice cream?
(A) 105 (B) 98
(C) 87 (D) 90

33. What is the maximum possible number of people who had only cool drink?
(A) 90 (B) 87
(C) 118 (D) 120

Directions for questions 34 to 37: These questions are based on the following information.

A total of 800 people participated in a consumer survey. The survey was conducted to get an idea about the popularity of the four soaps, such as Dove, Pears, Lux and Liril. Each participant liked at least one of the four products. The number of people who liked Liril is 450, those who liked Lux is 270 and those who liked Dove is 325. 100 liked only Pears, 50 liked only Lux and 90 liked only Liril. 50 liked only Dove and Pears, 60 liked only Dove and Lux, 90 liked only Dove and Liril, 30 liked only Pears and Lux, 120 liked only Pears and Liril, 60 liked only Lux and Liril. 20 liked only Dove, Pears and Lux, 15 liked only Dove, Lux and Liril, 25 liked only Pears, Lux and Liril.

34. How many people liked Dove and Pears but not Lux?
(A) 50 (B) 90
(C) 100 (D) 70

35. How many people liked at least two products?
(A) 480 (B) 560
(C) 600 (D) 520

36. How many people liked neither Dove nor Pears?
(A) 200 (B) 250
(C) 180 (D) 150

37. How many people liked either Lux or Liril?
(A) 590 (B) 630
(C) 570 (D) 610

Directions for questions 38 to 40: These questions are based on the following information.

Each of 780 bags contains at least one of raisins, almonds and peanuts. 375 bags contain raisins and 315 bags contain almonds. 75 bags contain both raisins and almonds, 90 bags contain both raisins and peanuts, 45 bags contain both almonds and peanuts.

38. Find the maximum possible number of bags which contain exactly two of raisins, almonds and peanuts.
(A) 240 (B) 180
(C) 210 (D) 150

39. Find the minimum possible number of bags which contain either peanuts or almonds.
(A) 525 (B) 620
(C) 640 (D) 600

40. If the number of bags which contain exactly two of raisins, almonds and peanuts is four times the number of bags which contain all the three, then how many bags contain only raisins?
(A) 210 (B) 240
(C) 270 (D) 180

EXERCISE-2

Directions for questions 1 to 4: These questions are based on the following information.

In a colony, 30 families read both The Hindu and Indian Express. 40 families read neither of these two news papers. 40% of the families read The Hindu and 55% of the families read Indian Express.

1. How many families are there in the colony?
(A) 150 (B) 200
(C) 160 (D) 250

2. How many families read at least one of the newspapers?
(A) 110 (B) 120
(C) 65 (D) 160

3. What percentage of the total number of families read at most one newspaper?
(A) 60% (B) 30%
(C) 70% (D) 85%

4. What percentage of the total number of families read The Hindu only?
(A) 25% (B) 30%
(C) 10% (D) 15%

Directions for questions 5 to 8: These questions are based on the following information.

In a class, 60% of the students passed in Finance. Among those passed in Finance, 33⅓ passed in Marketing. 150 students failed in both the subjects. 1/3rd of the students who passed in Marketing failed in Finance.

5. How many students are there in the class?
(A) 350 (B) 660
(C) 550 (D) 500

6. What percentage of the students failed in Finance only?
(A) 40% (B) 30%
(C) 50% (D) 10%

7. All the students who failed in at least one subject are given grace marks and it was found that the number of students who failed in both the subjects is decreased by 60% and the number of students who failed in exactly one subject went up by 20%. How many students passed in both the subjects?
(A) 120 (B) 140
(C) 80 (D) 60

8. After all the students who failed in exactly one subject have taken a re-exam in the subject in which they failed it was found that the number of students who passed in both the subjects increased by 60. What is the least value for the percentage of students in the class who failed only in Marketing?
(A) 20% (B) 28%
(C) 38% (D) 40%

Directions for questions 9 to 13: These questions are based on the following information.

Among all the students of a school half of the students learn exactly one martial art, such as Kung Fu, Karate and Judo. Half of the students who learn Karate do not learn any other martial art. The number of students who learn all the three martial arts is equal to 50/3% of those who learn exactly two among the three martial arts and is equal to 1/3rd of those who learn none of the three martial arts.

9. If 50 students learn all the three arts, then how many students learn exactly one of the three arts?
(A) 480 (B) 500
(C) 700 (D) 550

10. If 30 students learn none of the three arts, then what is the maximum possible number of students who learn Karate?
(A) 95 (B) 85
(C) 120 (D) 140

11. If there are 500 students in the school, then what is the maximum possible number of students who learn Kung Fu?
(A) 400 (B) 350
(C) 300 (D) 275

12. If 90 students learn exactly two of the three martial arts, then how many students are there in the school?
(A) 360 (B) 220
(C) 200 (D) 300

13. If out of 600 students of the school, 150 students learn Karate, then how many students learn only Kung Fu and Judo?
(A) 135 (B) 165
(C) 210 (D) 180

Directions for questions 14 to 16: These questions are based on the following table.

	Number of magazine readers						Total including non-readers	
	Business World		Business Times		Both			
Age group	Male	Female	Male	Female	Male	Female	Male	Female
< 15 years	145	65	155	65	50	30	260	115
15–34 years	175	125	105	85	40	50	265	190
≥ 35 years	115	135	120	100	35	45	215	195

14. How many males in 15–34 years age group do not read any of the 2 magazines?
(A) 15 (B) 45
(C) 75 (D) 25

15. Approximately, what percentage of the BT readers are above 15 years of age?
(A) 75% (B) 45%
(C) 65% (D) 80%

16. What percentage of females, who read neither BT nor BW are below 15 years of age?
(A) 30% (B) 60%
(C) 40% (D) 20%

Directions for questions 17 to 20: These questions are based on the following information.

A group of 1000 students at a summer camp are engaged in at least two of the activities, such as painting, swimming, dancing, singing or karate. It is further known that the number of students engaged in every combination of exactly two activities is three times the number of students who are engaged in every combination of exactly three activities. Also, the number of students engaged in all the five activities is a third of that engaged in exactly four activities. The number of students engaged in every combination of exactly four activities is the same.

17. If the number of students engaged in all the five activities is 100, then the number of students engaged in only painting and karate is
(A) 150 (B) 45
(C) 450 (D) Cannot be determined

18. If the number of students engaged in exactly three activities is 1.5 times the number of students engaged in all the five activities, then which of the following is true?
(A) The number of students engaged in only swimming, dancing and painting is 15.
(B) The number of students engaged in all the five activities is 100.
(C) Both (A) and (B)
(D) Neither (A) nor (B)

19. If the number of students enrolled in painting, swimming, dancing, singing and karate are 750, 800, 400, 900 and 600 respectively, then which of the following is definitely false?
(A) The number of students engaged in only painting, dancing, singing and karate is 90.
(B) The number of students engaged in exactly two activities is 300.
(C) The number of students engaged in exactly three activities is lesser than that engaged in only dancing, singing, swimming and karate.
(D) The number of students engaged in all the five activities is 150.

20. In the previous question, if the number of students engaged in painting is not known then which of the following can be that value?
(A) 270 (B) 90
(C) 360 (D) 120

Directions for questions 21 to 24: These questions are based on the following data.

A survey of 300 respondents showed that 135 of them read Business India, 125 read Business Today and 115 read Business World. Further, 42 of the respondents read Business India and Business Today, 48 read Business Today and Business World, 43 read Business India and Business World and 30 of the respondents read all the three magazines.

21. How many respondents read Business India or Business World?
(A) 199 (B) 272
(C) 207 (D) 175

22. If seven of the respondents who were previously reading only Business India now start reading a second magazine also and five of the respondents who were previously reading only Business India now stop even that, then how many respondents read Business India now?
(A) 75 (B) 132
(C) 142 (D) 130

23. If 15 respondents who were reading Business India stop reading Business India and instead start reading Business Today, then what is the maximum number of respondents who will now be reading only Business India?
(A) 120 (B) 65
(C) 78 (D) 93

24. If 16 of the respondents, who were reading Business Today, stop reading Business Today and instead start reading Business World, then what is the maximum number of respondents who will now be reading Business India and Business World?
(A) 59 (B) 55
(C) 75 (D) 63

Directions for questions 25 to 27: These questions are based on the following data.

In a colony, a survey was conducted regarding the ownership of three different types of vehicles, such as car, scooter and bicycle.

- The number of residents owning all three vehicles is the same as those owning none.
- The number of residents owning any two out of the three vehicles is the same as those owning any other two which in turn is the same as those owning none of the three.
- The number of residents owning scooters alone is the same as those owning cars alone and each in turn is twice those owning bicycles alone.
- Half the number of residents who own a bicycle also own at least one of the other two vehicles.

25. If the number of residents who own only bicycles is 150, then what is the total number of residents in the colony?
(A) 500 (B) 1000
(C) 750 (D) 1250

26. If 15 residents do not own any of the three vehicles, then how many residents are there in the colony?
(A) 100 (B) 200
(C) 500 (D) 300

27. What percentage of the residents own a scooter or a car but not a bicycle?
(A) 65% (B) 55%
(C) 75% (D) 45%

Directions for questions 28 to 30: These questions are based on the following information.

Among the 450 employees of a company 195 are members of Club A. 175 are members of Club B and 185 are members of Club C. 55 are members of clubs A and B. 40 are members of clubs B and C. 45 are members of clubs A and C. 25 employees are members of all the three clubs.

28. If 10 employees who are members of Club A take the membership of Club B also and 15 employees who are members of Club A withdraw from it and take the membership of Club C, then how many employees have membership of Club A?
(A) 120 (B) 140
(C) 180 (D) 145

29. If 50 employees who are members of Club B withdraw from it and take the membership of Club C, then what is the maximum possible number of employees that are members of clubs A and C?
(A) 60 (B) 62
(C) 58 (D) 75

30. If 20 employees who have the membership of Club A withdraw from it and take the membership of Club C, then what is the least possible number of employees who are members of clubs B and A?
(A) 20 (B) 10
(C) 15 (D) 35

Directions for questions 31 to 33: These questions are based on the following data.

In a college library, four different business newspapers, such as Economic Times (ET), Business Standard (BS), Business Line (BL) and Financial Express (FE) are available. All students visit the library regularly but 20% of them do not read any business newspaper.

The four newspapers given in the above order are read by 230, 180, 180 and 220 students, respectively. The number of students reading exactly 2 newspapers for any two newspapers is 20. There are 30 students who read all the four newspapers but there is nobody who reads exactly three out of the four newspapers.

31. How many students do not read any newspaper at all?
(A) 75 (B) 100
(C) 225 (D) 150

32. What percentage of the people reading Business Standard also read at least one other newspaper?
(A) 35% (B) 55%
(C) 50% (D) 65%

33. If all the students in the college including those who do not read any newspaper read at least one newspaper, (out of the four newspapers above) which he is not reading at present, then what is the least number of students reading all the four newspapers?
(A) 60 (B) 25
(C) 15 (D) 30

Directions for questions 34 to 36: These questions are based on the following information.

Each of N students participated in at least one of the track events, such as in high jump, long jump and 100 m dash. 27 students participated in high jump, 27 students participated in long jump and 52 students participated in 100 m dash.

34. The number of students who participated in exactly one of the three events is 51, find the maximum possible number of students who participated in exactly two of the three events.
(A) 22 (B) 30
(C) 34 (D) 26

35. The number of students who participated in exactly one of the three events is atleast equal to that who participated in exactly two of three events which is atleast equal to that of those who participated in all the three events. Find the maximum possible number of students who participated in all the three events.
(A) 16 (B) 18
(C) 17 (D) 19

36. If the number of students who participated in at least two of the three events is 26, then find the minimum possible value of N.
(A) 50 (B) 54
(C) 52 (D) 46

Directions for questions 37 to 40: These questions are based on the following information.

A group of 100 students participated in at least one of the following events. The events are 100 m dash, 200 m dash, 400 m dash and 800 m dash. 40 students participated in each of the 100 m dash, 200 m dash, 400 m dash and 800 m dash. An equal number of students participated in only the 100 m dash, only the 200 m dash, only the 400 m dash and only the 800 m dash. An equal number of students participated in each pair of 100 m dash, 200 m dash, 400 m dash and 800 m dash. An equal number of students also participated in each combination of three of the events. 15 students participated in all the four 100 m dash, 200 m dash, 400 m dash and 800 m dash.

37. Find the maximum possible number of students who participated in only the 400 m dash.
(A) 20 (B) 25
(C) 15 (D) 30

38. Find the maximum possible number of students who participated in all the three 100 m dash, 200 m dash and 400 m dash.
(A) 27 (B) 19
(C) 23 (D) 29

39. If 16 students participated in only the 100 m dash, find the number of students who participated in the 100 m dash and at least one other.
(A) 24 (B) 20
(C) 16 (D) 28

40. Using the information in the previous question, find the maximum possible number of students who participated in only the 100 m dash and 200 m dash.
(A) 1 (B) 2
(C) 3 (D) 4

EXERCISE-3

Directions for questions 1 to 3: These questions are based on the following data.

A group of people went for a pilgrimage tour, out of 245 pilgrims, 105 visited Badrinath, 95 visited Kedarnath and 95 visited Somnath. Fifteen of them visited all three shrines, while 190 visited exactly one of the three shrines. The number of pilgrims who visited exactly two out of the three shrines is three times as many as those who have not visited any one of the three shrines.

1. If the number of pilgrims who have visited at least one of the two shrines Kedarnath and Somnath is 165, then how many pilgrims visited only Kedarnath and Somnath?
(A) 20 (B) 30
(C) 10 (D) 15

2. If 180 pilgrims visited at least one of the two shrines Kedarnath or Badrinath, then how many pilgrims visited only Somnath?
(A) 55 (B) 40
(C) 35 (D) 60

3. If there is nobody who visited only Badrinath and Somnath, then how many people visited only Kedarnath?
(A) 90 (B) 80
(C) 70 (D) 50

Directions for questions 4 to 7: These questions are based on the following information.

Each of the students, who are residents of Kalpana Chawla Bhawan, likes at least one among the four different brands of cool drinks, such as Coca-Cola, Thumbs Up, Limca and Sprite. 65 students like Thumbs Up and Coca-Cola. 77 students like Sprite and Thumbs Up. 73 students like Coca-Cola and Limca. 76 students like Limca and Thumbs Up. 74 students like Sprite and Coca-Cola. There are 67 students who like exactly one brand. The number of students who like only Limca, Thumbs Up and Coca-Cola is same as the number of students who like only Sprite, Thumbs Up and Coca-Cola. The number of students who like Sprite, Limca and Thumbs Up but not Coca-Cola is same as the number of students who like Sprite, Limca and Coca-Cola but not Thumbs Up. The number of students, who like only Coca-Cola and Sprite is 14. The number of students who like only Sprite and Limca and only Thumbs Up and Coca-Cola are 10 and 15, respectively. The sum of the number of students who like Thumbs Up, the number of students who like Coca-Cola, the number of students who like Sprite and the number of students who like Limca is 557.

4. How many students like both Sprite and Limca but not all the four?
(A) 60 (B) 50
(C) 55 (D) 44

5. What is the total number of students?
(A) 247 (B) 250
(C) 235 (D) 252

6. How many students like only Coca-Cola and Limca?
(A) 16 (B) 17
(C) 13 (D) 15

7. If 25 students like only Thumbs Up or only Sprite, then how many like Coca-Cola or Limca?
(A) 42 (B) 208
(C) 152 (D) 210

Directions for questions 8 to 12: These questions are based on the following information.

A survey was conducted among a group of football fans to know how many of them like the football teams Barcelona, Liverpool, Real Madrid, Manchester United and Bayern Munich.

(i) 57 out of the 125 fans who like Real Madrid also like Manchester United.
(ii) 10 fans like exactly three clubs. 10 fans like only Liverpool.
(iv) It is known that no one who likes Barcelona likes Real Madrid or Manchester United.
(v) The number of fans who like Bayern Munich and Barcelona is the same as those who like only Real Madrid and Manchester United and 4 more than those who like Barcelona and Liverpool.
(vi) The number of fans who like Bayern Munich and Manchester United is the same as that who like only Liverpool and Real Madrid, which in turn is one third of those who like only Real Madrid.
(vii) The number of fans who like Barcelona, Bayern Munich, Manchester United and Liverpool are 112, 75, 88 and 92, respectively.
(viii) No one who likes Bayern Munich likes Liverpool or Real Madrid.

8. How many like exactly two clubs?
(A) 183 (B) 152
(C) 137 (D) 154

9. How many like only Bayern Munich or only Barcelona?
(A) 45 (B) 51
(C) 33 (D) Cannot be determined

10. How many like the club Manchester United but not Liverpool?
(A) 66 (B) 72
(C) 81 (D) 71

11. How many like exactly one club?
(A) 102 (B) 94
(C) 123 (D) 96

12. Among the Barcelona fans, how many like at least two more clubs?
(A) 90 (B) 57
(C) 64 (D) None

Directions for questions 13 to 16: These questions are based on the following data.

In a class, 30% of the students gave their names to participate in the NSS and 75% to participate in the NCC. Three students participate in neither of these, where two and six students wanted to participate in both.

13. How many students are there in the class?
(A) 100 (B) 75
(C) 60 (D) 80

14. What percentage of students wants to participate only in the NSS?
(A) 30% (B) 25%
(C) 15% (D) 20%

15. What percentage of students wants to participate in only one programme either in NSS or NCC?
(A) 85% (B) 90%
(C) 75% (D) 20%

16. How many students want to participate in at least one programme?
(A) 97 (B) 87
(C) 147 (D) 57

Directions for questions 17 to 20: These questions are based on the following data.

In a school, 60% of the students passed in English and 25% of the students who passed in English passed in the foreign language also, whereas 66⅔% of the students who passed in the foreign language failed in English. Twenty students failed in both English and the foreign language.

17. What is the total strength of the school?
(A) 250 (B) 150
(C) 200 (D) 100

18. What per cent of the students passed in exactly one of the two subjects, such as in English and the foreign language?
(A) 15% (B) 65%
(C) 45% (D) 75%

19. The students who failed in exactly one subject are allowed to take a re-exam and it was found that the number of students who passed in both the subjects increased by 20%. What is the least value for the percentage of students in the school who pass only in English?
(A) 42% (B) 46%
(C) 34% (D) 28%

20. All the students who failed in one or more subjects are given grace marks and it was found that the number of students passing in exactly one subject went up by 4 and the number of students who failed in both the subjects dropped by 40%. What per cent of the school now pass in both subjects?
(A) 40% (B) 15%
(C) 12% (D) 17%

Directions for questions 21 to 25: These questions are based on the following data.

There are three trade unions Viram, Vishram and Be-kam and 3600 workers in a company. Becoming a member of a trade union is optional. A worker can be a member of more than one of the three trade unions also.

There are 500 workers who are members of at least two trade unions while Vishram has 1400 members. There are 100 workers who are members of only Viram and Be-kam, whereas 200 Vishram members also are Be-kam members; 550 workers are members of only Be-kam where as 20% of Viram members are members of exactly one more union. An eighth of all the workers in the company are members of exactly two unions.

21. How many workers are members of all the three unions?
(A) 150 (B) 75
(C) 50 (D) 100

22. How many workers are not members of any union?
(A) 100 (B) 200
(C) 300 (D) 400

23. How many workers are members of only Viram or only Be-kam?
(A) 3200 (B) 2700
(C) 1400 (D) 1700

24. If 10 workers give up their Be-kam membership and take up Vishram membership, then how many workers will now have membership of all the three unions?
(A) 40 (B) 50
(C) 60 (D) 45

25. How many workers are members of Vishram but not members of Be-kam?
(A) 400 (B) 800
(C) 1200 (D) 1600