

## KEY AND SOLUTIONS FOR REASONING

### Key for Practice Exercise – 1

1. (a) C	6. D	13. 12	20. C	27. D
(b) A	7. C	14. 72	21. D	28. D
2. (a) D	8. D	15. B	22. D	29. D
(b) D	9. C	16. C	23. C	30. B
3. D	10. A	17. D	24. D	
4. C	11. 1	18. D	25. C	
5. B	12. 48	19. B	26. D	

### ADDITIONAL QUESTIONS FOR PRACTICE

1. D	3. D	5. A	7. C
2. D	4. B	6. B	8. A

### Key for Practice Exercise – 2

1. A	6. D	11. D	16. D	21. B	26. 1
2. C	7. B	12. B	17. B	22. D	27. D
3. C	8. A	13. B	18. D	23. 10	28. A
4. B	9. B	14. A	19. A	24. 10	29. B
5. A	10. A	15. D	20. C	25. 8	30. C

### ADDITIONAL QUESTIONS FOR PRACTICE

1. C	3. D	5. D	7. D
2. B	4. D	6. C	

### Key for Practice Exercise – 3

1. D	6. A	11. D	16. 4000	21. D	26. D
2. B	7. C	12. A	17. 2000	22. C	27. A
3. C	8. D	13. B	18. D	23. A	28. B
4. B	9. D	14. 3	19. C	24. A	29. D
5. D	10. B	15. 4	20. C	25. C	30. C

### ADDITIONAL QUESTIONS FOR PRACTICE

1. A	2. A	3. C	4. C	5. B	6. A
------	------	------	------	------	------

### Key for Practice Exercise – 4

1. A	6. B	11. 2200	16. C	21. D
2. C	7. C	12. 1.5	17. D	22. B
3. B	8. D	13. 1100	18. D	23. C
4. A	9. D	14. 6600	19. A	24. C
5. D	10. B	15. A	20. B	25. D

### ADDITIONAL QUESTIONS FOR PRACTICE

1. D	3. A	5. D	7. A	9. C
2. A	4. B	6. C	8. B	10. C

### Key for Practice Exercise – 5

1. A	4. B	7. B	10. C	13. C	16. 100	19. 285	22. C	25. B
2. D	5. C	8. A	11. D	14. B	17. 90	20. B	23. D	26. A
3. C	6. D	9. D	12. A	15. D	18. 245	21. D	24. D	

### ADDITIONAL QUESTIONS FOR PRACTICE

1. D	3. D	5. D	7. B	9. D
2. A	4. C	6. C	8. C	

### Key for Practice Exercise – 6

1. D	5. A	9. B	13. B	17. 50	21. 370	25. 25
2. D	6. D	10. D	14. B	18. 40	22. C	26. 215
3. C	7. D	11. D	15. C	19. 60	23. B	27. 40
4. B	8. A	12. A	16. D	20. 110	24. A	28. 5

### ADDITIONAL QUESTIONS FOR PRACTICE

1. C	2. B	3. A	4. D	5. B	6. A	7. D
------	------	------	------	------	------	------

### Key for Practice Exercise – 7

1. B	6. C	11. D	16. B	21. B	26. B	31. A	36. B
2. D	7. B	12. B	17. C	22. C	27. A	32. A	37. D
3. A	8. A	13. C	18. B	23. A	28. A	33. B	38. A
4. D	9. C	14. C	19. D	24. A	29. D	34. B	39. C
5. B	10. A	15. B	20. B	25. B	30. C	35. D	40. A

### Key for Practice Exercise – 8

1. D	6. D	11. B	16. B	21. A	26. C
2. A	7. D	12. B	17. D	22. D	27. B
3. C	8. D	13. B	18. D	23. D	28. D
4. D	9. C	14. D	19. D	24. B	29. D
5. B	10. D	15. B	20. A	25. A	30. D

### Key for Practice Exercise – 9

16. D	19. C	22. A	25. D
17. D	20. C	23. D	
18. D	21. D	24. B	

### Key for Practice Exercise – 10

1. 4	5. 2	9. 4	13. 5	17. 2
2. 4	6. 3	10. 3	14. 5	18. 1
3. 3	7. 2	11. 1	15. 5	19. 3
4. 1	8. 4	12. 3	16. 4	20. 1

### Key for Practice Exercise – 11

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

### Key for Practice Exercise – 12

1. Cannot get a unique value	8. 96	23. 32
2. (i) 252	9. 64	24. 113
(ii) 100	10. 8	25. 96
(iii) 216	11. 48	26. 125
(iv) 392	12. 94	27. 61
(v) 448	13. 60	28. 10
3. cannot find a unique value	14. 8	29. 100
4. 14	15. 16	30. 148
5. (i) 8	16. 48	31. 218
(ii) 13	17. 32	32. 285
(iii) 15	18. 96	33. 565
(iv) 17	19. 64	34. 315
(v) 18	20. 2	35. 315
6. 8	21. 9	
7. 48	22. 37	

### Key for Practice Exercise – 13

- |      |         |          |       |       |
|------|---------|----------|-------|-------|
| 1. A | 6. D    | 11. 470  | 16. D | 21. A |
| 2. A | 7. C    | 12. 2012 | 17. C | 22. B |
| 3. C | 8. 120  | 13. C    | 18. B | 23. A |
| 4. D | 9. 130  | 14. D    | 19. D | 24. A |
| 5. B | 10. 100 | 15. C    | 20. B | 25. B |

### Key for Practice Exercise – 14

- |      |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|
| 1. B | 6. C  | 11. C | 16. C | 21. B | 26. A |
| 2. A | 7. A  | 12. C | 17. B | 22. C | 27. D |
| 3. D | 8. B  | 13. B | 18. B | 23. D | 28. A |
| 4. C | 9. C  | 14. D | 19. C | 24. A | 29. D |
| 5. C | 10. B | 15. C | 20. A | 25. C | 30. B |

### Key for Practice Exercise – 15

- |      |      |       |       |       |       |       |       |       |
|------|------|-------|-------|-------|-------|-------|-------|-------|
| 1. B | 5. A | 9. D  | 13. C | 17. B | 21. D | 25. B | 29. A | 33. D |
| 2. C | 6. D | 10. A | 14. C | 18. D | 22. C | 26. C | 30. C | 34. D |
| 3. A | 7. C | 11. B | 15. D | 19. C | 23. B | 27. D | 31. C | 35. D |
| 4. B | 8. B | 12. A | 16. C | 20. B | 24. C | 28. B | 32. B |       |

### Key for Practice Exercise – 16

- |      |       |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|-------|
| 1. C | 6. A  | 11. C | 16. A | 21. A | 26. A | 31. D |
| 2. A | 7. D  | 12. B | 17. C | 22. D | 27. C | 32. D |
| 3. D | 8. B  | 13. D | 18. B | 23. D | 28. B | 33. B |
| 4. B | 9. D  | 14. C | 19. B | 24. D | 29. A | 34. B |
| 5. A | 10. B | 15. A | 20. A | 25. B | 30. C | 35. D |

## SOLUTIONS

### PRACTICE EXERCISE – 1

#### Solutions for questions 1 to 3:

1. From (i), We have

- 1 –
- 2 –
- 3 – D
- 4 – C
- 5 –
- 6 –

From (ii), We have

- 1 –
- 2 – A/E
- 3 – D
- 4 – C
- 5 – A/E
- 6 –

Combining i, ii and iii, we have

- 1 – B
- 2 – E
- 3 – D
- 4 – C
- 5 – A
- 6 – F

(a) E stands ahead of D and behind B. Choice (C)

(b) Five persons stand behind B. Choice (A)

2. From (iii), we have D E \_\_\_\_\_

From (i), we have D E B \_\_\_\_\_

From (ii), we have C D E B A

(a) E is to the immediate left of B.

Choice (D)

(b) These five persons can sit in C D E B A.

Choice (D)

3. From the given information, it can be said that all other persons are standing ahead of Swaroop. So, Swaroop must be standing in the last position. Bala, Ajay and Preeti are standing ahead of Harini. Hence, Harini must be standing in the fourth position. As the tallest person is standing behind Harini, Swaroop must be the tallest person. Bala is in the second position and as the shortest person is standing ahead of Bala and Ajay, Ajay must be standing in the third position and Preeti, the shortest person, must be standing in the first position. Therefore, the order of the positions can be represented as follows.

Preeti, Bala, Ajay, Harini, Swaroop.

Choice (D) cannot be true, as Harini is standing at the second position from the rear end of the row. Choice (D)

#### Solutions for questions 4 to 7:

From (iv), we get the following possible cases:

	1	2	3	4	5	6	7
Case (x)	F				E		
Case (y)		F				E	
Case (z)			F				E

From (ii), since D is to the right of E, case (z) is not possible.

From (iii), we get the following cases:

	1	2	3	4	5	6	7
Case (x <sub>1</sub> )	F	A/G			E	G/A	
Case (y <sub>1</sub> )	A/G	F				E	G/A
Case (y <sub>2</sub> )		F	A/G		G/A	E	

In case (y<sub>1</sub>), D cannot be to the right of E and in case (y<sub>2</sub>), B cannot be to the immediate left of C.

∴ Only case (x) prevails.

By applying (i) and (ii), we get the following arrangements.

1	2	3	4	5	6	7
F	A/G	B	C	E	G/A	D

4. E is to the immediate right of C. Choice (C)
5. Three persons are sitting between B and D. Choice (B)
6. Either G or A is five places away from F. Choice (D)
7. E can be to the immediate left of G. Choice (C)

#### Solutions for questions 8 to 10:

From (i) and (iii), we can say that Preethi is the second person from the front and Harati is the third person from the end.

From (iv), the positions of Riti and Keerti are first from the front and first from the end, but it can be in any order.

From (ii), we can say that Riti cannot be at the first position from front, since Swathi is in front of Riti. Hence, Keerti is the first person from the front and Riti is the first person from the end.

From (v), Deepthi cannot be immediately in front of Riti, since she is not the second person from the end. Hence, Pragati and Deepthi are in the third and the fourth positions from the front respectively. Hence, Swathi's position is the second from the end.

∴ The final arrangement is as follows.

↓ Front

Keerthi
Preethi
Pragati
Deepthi
Harati
Swathi
Riti

↑ End

8. Deepthi stands immediately in front of Harati. Choice (D)
9. Swathi is standing at the sixth position from the beginning of the queue. Choice (C)
10. Six persons are standing in front of Riti. Choice (A)

#### Solutions for questions 11 to 14:

From condition (1), A and F are not seated at the ends, also the persons sitting at the ends do not have hall-tickets whose number ends with 2.

From condition (2), since neither A nor F is at the ends, they form the middle pair.

B/E E/B A/F F/A C/D D/C

Since the last two digits of the hall ticket numbers are multiples of 6: 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96.

Using condition (4) we get,

B/E	E/B	A/F	F/A	C/D	D/C
18		42/48	48/42		78

Using condition (5) we get,

B	E	A	F	D	C
18	12	42/48	48/42	72	78

11. Ans: 1
12. Ans: 48
13. Ans: 12
14. Ans: 72

#### Solutions for questions 15 to 18:

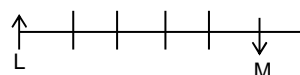
It is given that, T lives on an even numbered floor. There are exactly four floors between T's floor and Z's floor. There are at least two floors above and below on which Z lives. Hence, T lives on the top floor and Z lives on the third floor. Given, Y lives just below U's floor and above V's floor. V lives on odd numbered floor but is not the first floor. Hence, the only possibility is, U lives on the seventh floor, Y lives on the sixth floor and V lives on the fifth floor. Given, the number of floors between V's floor and X's floor is equal to the number of floors between W's floor and S's floor. S and W do not live on consecutive floors. The number of floors between S's floor and X's floor is not less than one. Hence, S, X and W lives on the fourth, the second and the first floors respectively. ∴ The floor arrangement is as shown below.

Floor no	Person
8	T
7	U
6	Y
5	V
4	S
3	Z
2	X
1	W

15. Except (Z, U) the remaining pairs live on even and odd numbered floors. Choice (B)
16. There are four floors. Choice (C)
17. V lives just above S's floor. Choice (D)
18. X and W live on consecutive floors. Choice (D)

#### Solutions for questions 19 to 22:

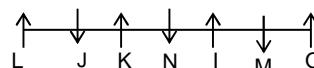
Given N is three places away from L and is second to the right of M, who faces south. L sits at an end. M and L are not adjacent to each other and are facing different directions. Hence the possible case is,



Given I is to the immediate left of N. J is neither adjacent to M nor I. Hence N is facing south and I is to the immediate right of M. Given K sits second to the left of I. I and N face different directions. Hence, K sits to the immediate right of N, I faces north and J sits exactly between L and K. O sits to the immediate left of M. Given O is to the left of J and is to the right of K. O faces north.

Hence, J faces south and K faces north.

∴ The final arrangement is as shown below.



19. O is at the end of the row. Choice (B)
20. Three persons. Choice (C)
21. J is to the immediate left of K. Choice (D)
22. Four persons. Choice (D)

### Solutions for questions 23 to 26:

From (1) and (3) we can say that B<sub>3</sub> is to the immediate right to B<sub>6</sub>. B<sub>6</sub> is opposite G<sub>5</sub> who is immediate left of G<sub>2</sub> i.e.,

B <sub>3</sub>	B <sub>6</sub>	
	G <sub>5</sub>	G <sub>2</sub>

It is given that G<sub>2</sub> is not at right extreme end. Neither B<sub>4</sub> nor B<sub>1</sub> are at any extreme end. G<sub>6</sub> is to the left of G<sub>3</sub> and G<sub>1</sub>. G<sub>6</sub> is not at an extreme end.

∴ The possible arrangements are.

Case (i):  $\begin{array}{ccccccc} \text{xB}_4/\text{B}_1/\text{B}_3 & & & \text{B}_3 & \text{B}_6 & \text{xB}_4/\text{B}_1/\text{B}_3 \\ & & & & \text{G}_5 & \text{G}_2 \\ & & & & & \text{xG}_2 \end{array}$

Case (ii):  $\begin{array}{ccccccc} \text{xB}_4/\text{B}_1/\text{B}_3 & & \text{B}_3 & \text{B}_6 & & \text{xB}_4/\text{B}_1/\text{B}_3 \\ & & & \text{G}_5 & \text{G}_2 & \\ & & & & & \end{array}$

Case (iii):  $\begin{array}{ccccccc} \text{xB}_4/\text{B}_1/\text{B}_3 & & \text{B}_3 & \text{B}_6 & & \text{xB}_4/\text{B}_1/\text{B}_3 \\ & & & \text{G}_5 & \text{G}_2 & \\ & & & & & \end{array}$

Case (iv):  $\begin{array}{ccccccc} \text{xB}_4/\text{B}_1/\text{B}_3 & & & & & \text{xB}_4/\text{B}_1/\text{B}_3 \\ & \text{B}_3 & \text{B}_6 & & & \\ & & \text{G}_5 & \text{G}_2 & & \\ & & & & & \text{xG}_6 \end{array}$

But from the given information, case (i) is eliminated as G<sub>2</sub> is not at right extreme end.

Also we can eliminate case (ii), as in this arrangement B<sub>3</sub> is opposite to G<sub>3</sub>, which is not possible.

We can also eliminate case (iv), as B<sub>3</sub> is not at any extreme end.

∴ The final arrangement is as follows.

B <sub>5</sub>	B <sub>3</sub>	B <sub>6</sub>	B <sub>1</sub> /B <sub>4</sub>	B <sub>4</sub> /B <sub>1</sub>	B <sub>2</sub>
G <sub>4</sub>	G <sub>6</sub>	G <sub>5</sub>	G <sub>2</sub>	G <sub>3</sub>	G <sub>1</sub>

23. B<sub>5</sub> and G<sub>4</sub> are sitting at the ends. Choice (C)

24. Either B<sub>4</sub> or B<sub>1</sub> is opposite G<sub>3</sub>. Choice (D)

25. If B<sub>1</sub> is to the immediate right of B<sub>2</sub>, then B<sub>4</sub> is to the immediate left of B<sub>6</sub>. Choice (C)

26. No one is sitting second to the left of the girl sitting opposite B<sub>3</sub>. Choice (D)

### Solutions for questions 27 to 30:

Given that A, F, G, I and C sat along the diagonal positions and from (iii) and (v) the arrangement is as follows

	F	
	H	G

As E cannot be placed in the diagonal position and from (iv), the arrangement is,

E	F	
I	H	G

And from (i), the final arrangement will be

A	B/D	C
E	f	D/B
I	H	G

27. Since there are two cases, it is not possible to decide who sits to the immediate left of D. Choice (D)

28. If B sits behind C, then both F and H are behind D. Choice (D)

29. Clearly, from the solution given above, the statement, "D and B were not sitting in the same row or in the same column" is not useful to find the arrangement. Hence it is redundant. Choice (D)

30. Clearly, (ii) and (iv) are definitely false. Choice (B)

### ADDITIONAL QUESTIONS FOR PRACTICE

#### Solutions for questions 1 to 4:

From (i) and (ii), we can say that B cannot sit at the left end and second from the left end in row-I, since B is to the right of at least two other persons.

Hence the possible arrangements are:

Case (a):

row-II	South↓		R			Q	
row-I	North↑	F/D	D/F	B	C		

Case (b):

row-II	South↓	R			Q		
row-I	North↑	F/D	D/F		B	C	

Case (c):

row-II	South↓	R			Q		
row-I	North↑		F/D	D/F	B	C	

From (iv), we can eliminate case (d), since we cannot place P. From (iii), we can eliminate case (a) and case (b), since D cannot face the person who is third to the right of T, who faces e.

Case (d):

row-II	South↓	R			Q		
row-I	North↑	F/D		D/F	B	C	

Hence in case (c), t sits at the left end, a sits at the right end and p sits opposite d.

From (v), we can say that S is the neighbour of Q and T. Hence U faces F.

∴ The final arrangement is as follows.

row-II	South↓	R	U	P	Q	S	T
row-I	North↑	A	F	D	B	C	E

1. U faces F. Choice (D)

2. S sits second to the left of P. Choice (D)

3. A sits second to the left of D is true. Choice (D)

4. P sits third to the right of T. Choice (B)

#### Solutions for questions 5 to 8:

From (i), (iii) the possible arrangements are as Rajesh cannot sit adjacent to Bhanu

Case (1) Ravi Rajesh Bhanu \_\_\_\_\_

Case (2) Ravi \_\_\_\_\_ Rajesh \_\_\_\_\_ Bhanu

Case (3) \_\_\_\_\_ Ravi \_\_\_\_\_ Rajesh \_\_\_\_\_ Bhanu

Case (4) \_\_\_\_\_ Ravi \_\_\_\_\_ Rajesh \_\_\_\_\_ Bhanu

From (ii), As Vinay cannot be at any extreme ends, but has to sit to the left of Ravi, we can eliminate case (1), case (2) case (3) Therefore,

\_\_\_\_\_ Vinay Ravi \_\_\_\_\_ Rajesh \_\_\_\_\_ Bhanu.

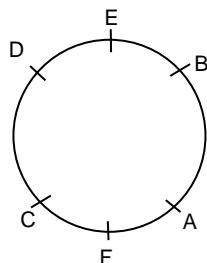
From (iv), we get the final arrangement, as we cannot place Barath or Laxmi at the left extreme,

Trinesh Vinay Ravi Laxmi Rajesh Barath Bhanu

5. Vinay is sitting to the immediate right of Trinesh. Choice (A)
6. Two persons are sitting between Laxmi and Bhanu. Choice (B)
7. Laxmi is a neighbour of Ravi. Choice (C)
8. Except Ravi and Laxmi, in rest all the second person is sitting to the immediate left of the first person. Choice (A)

### PRACTICE EXERCISE – 2

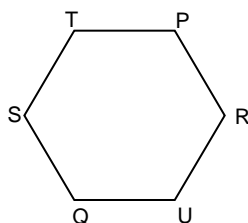
1. It is given that A is two places away to the left of E, who is adjacent to B and D. D is to the right of E and A is sitting between B and F. These conditions give us the following arrangement.



∴ A is sitting opposite D.

Choice (A)

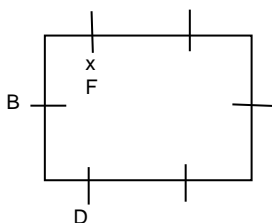
2. The final arrangement is as follows.



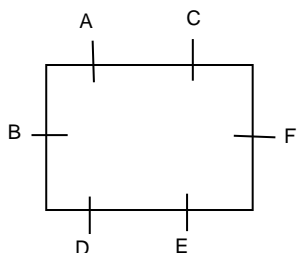
∴ S is sitting opposite R.

Choice (C)

3. From (i), we have



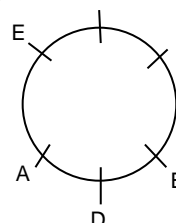
Form (ii), we have



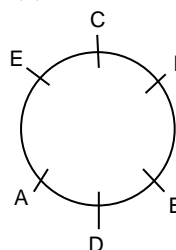
(a) F sits opposite B.

Choice (C)

4. From (i) and (ii) we have



From (i), (ii) and (iii), we have

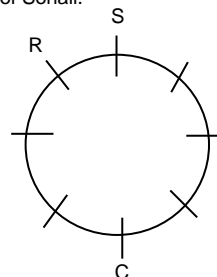


(a) F is two places away to the left of E.

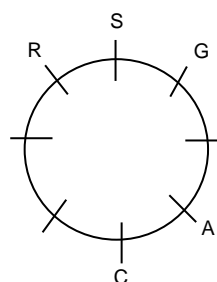
Choice (B)

### Solutions for questions 5 to 7:

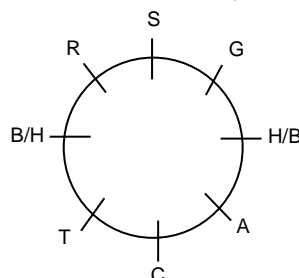
Let us represent the persons with the first letter of their respective names. It is given that Charan is opposite Sohail and Ravi is to the right of Sohail.



Abhijeet is sitting two places away from Ghansyam i.e., Abhijeet and Ghansyam are in alternate positions. But Ghansyam is not adjacent to Charan. Hence, we get the following arrangements.



It is given that Tarun is neither adjacent to Ravi nor to Ghansyam.



5. Harish is opposite Badrinath.

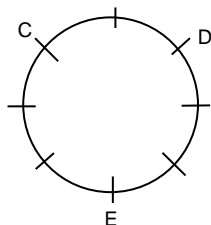
Choice (A)

6. Abhijeet is opposite Ravi. Choice (D)

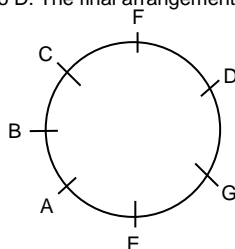
7. Ravi is two places away to the left of Tarun. Choice (B)

#### Solutions for questions 8 to 10:

It is given that C is sitting third to the left of E and D is not the neighbour of either C or E.



B is sitting second to the right of F, who is not adjacent to E. A is not adjacent to D. The final arrangement as follows.



8. C is sitting to the right of F. Choice (A)

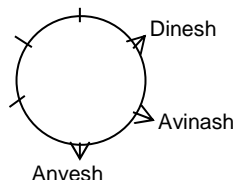
9. G is sitting between D and E. Choice (B)

10. B is sitting to the left of A. Choice (A)

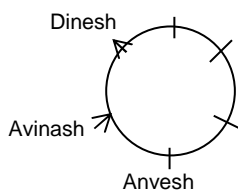
#### Solutions for questions 11 to 14:

From (ii), Anvesh is facing outside the centre and he is sitting to the immediate right of Avinash and Avinash is adjacent to Dinesh, who is facing away from the centre. This may be possible in two ways.

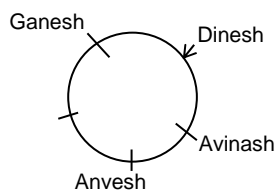
Case (i):



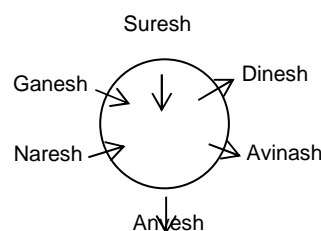
Case (ii):



From (i), Ganesh is sitting second to the left of Dinesh. Hence, case (ii) is not possible. the arrangement is as follows:



From (i), Ganesh, is facing towards the centre and is sitting adjacent to Suresh hence the arrangement is as follows.



11. Suresh, Naresh, Ganesh are facing towards the centre. Choice (D)

12. Dinesh is sitting to the immediate left of Suresh. Choice (B)

13. If Anvesh and Avinash interchange their positions, Avinash is sitting to the immediate right of Anvesh. Choice (B)

14. Suresh is sitting opposite Anvesh. Choice (A)

#### Solutions for questions 15 to 18:

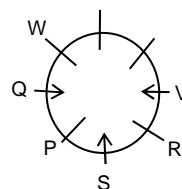
It is given that S is facing the centre and sits second to the left of V. We can say that V is either facing the centre or away from the centre.

But it is given that P sits to the immediate left of S but is not the neighbour of V. Hence, we can say that V is not facing away from the centre.

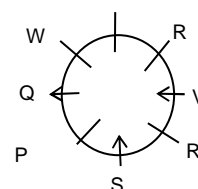
It is given that Q is the neighbour of P and W, R sits third to the right of Q, hence we can say that R sits either to the immediate left of V or to the immediate right of V.

Hence the possible arrangements are as follows.

Case (a)



Case (b)



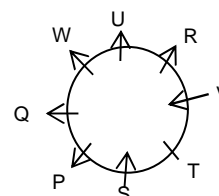
It is given that T sits second to the left of P. Hence, case (a) is eliminated.

In case (b), P is facing away from the centre, T sits second left of P and U sits second to the right of Q.

It is given that neighbours of R are facing different directions; hence U is facing away from the centre.

It is given that neighbours of U are facing the same direction, which P is facing, hence we can say that W and R facing away from the centre, but we cannot find the direction in which T is facing.

∴ The final arrangement is as follows.



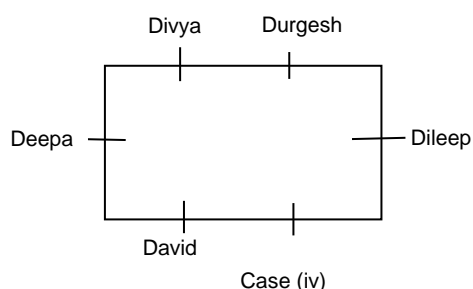
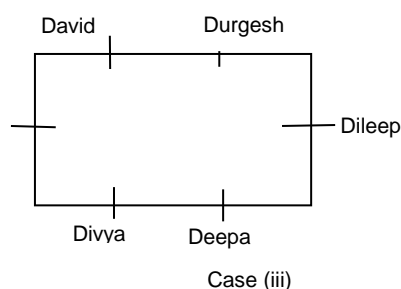
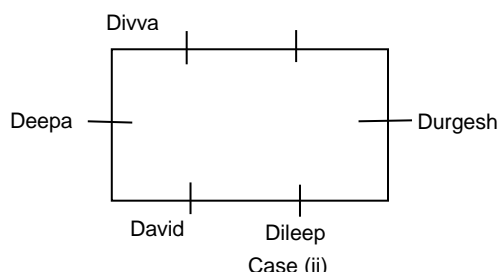
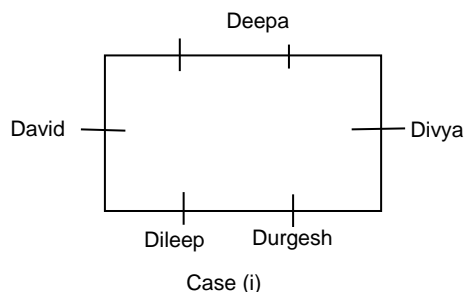
15. Either P or R sits second to the left of T. Choice (D)

16. Either five or six persons facing away from the centre, since the direction of T is not known. Choice (D)

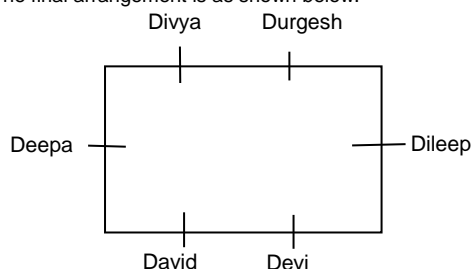
17. V sits third to the right of W. Choice (B)  
 18. Four persons are sitting between P and V, when counting from the right side of P. Choice (D)

**Solutions for questions 19 to 22:**

It is given that Durgesh is sitting to the right of Dileep. Hence we can say that either one of them sits at a longer side or both of them sit at a longer side. It is also given that David is sitting opposite Divya and Deepa is to the immediate right of Divya. Now, we get the following four possible cases.



It is given that Devi is sitting opposite the person who is adjacent to Divya. Hence, we can eliminate case (i), (ii) and (iii).  
 $\therefore$  The final arrangement is as shown below.

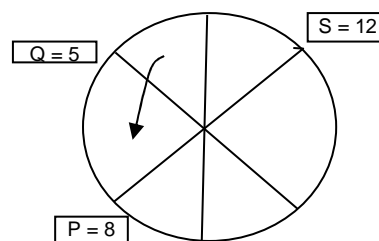


19. Divya is sitting to the immediate right of Durgesh. Choice (A)  
 20. Dileep is sitting second to the left of Divya. Choice (C)  
 21. Dileep is sitting opposite Deepa. Choice (B)

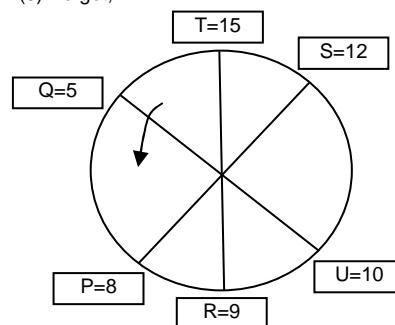
22. Except Devi, Durgesh, in all the other pairs, the persons are adjacent to each other. Choice (D)

**Solutions for questions 23 to 26:**

From (4) Q is the individual who has received 5 calls (minimum). Therefore, using 1, 2, and 3 we have:



Calls are any number from of : 3,6,9,12,15,18, 4, 8, 12,16, 5,10,15  
 With condition (3) P=8 and S=12 is the only possibility. Using condition (5) we get,

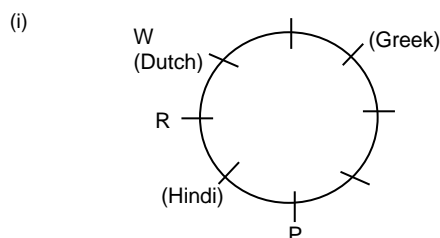


Between 9 and 12 we have only 10, so U=10. T=15,16 or 18 but since it has to be odd only 15 is possible.

23. U rectified ten calls. Ans 10  
 24. The difference is  $15 - 5 = 10$ . Ans 10.  
 25. P is second to the left of 8, who received eight calls. Ans 8  
 26. The ratio is  $3 : 3 = 1$  Ans 1

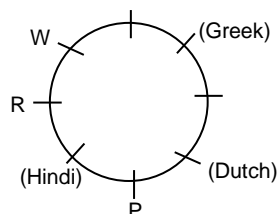
**Solutions for questions 27 to 30:**

Given, P sits third to the left of the person who is learning Greek. Only two persons sit between R and the person learning Greek. Hence R sits second to the left of P. The person who is learning Dutch is a neighbour of either P or R but not to both. Hence the one learning Dutch sits either to the immediate left of R or to the immediate right of P. Given, N is second to the left of the person learning Hindi, who is adjacent to P. Hence, we get the following cases.

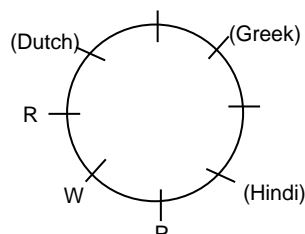




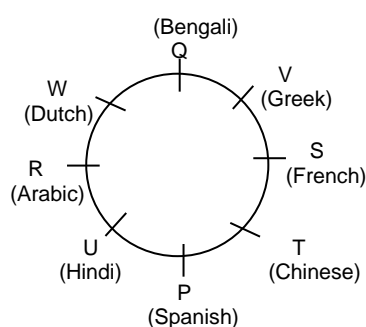
(ii)



(iii)



Also given, neither P nor W is learning French or Chinese, the persons who are learning French and Chinese sit adjacent to each other. Hence the persons who are learning French and Chinese sit between P and the person who is learning Greek. And case (ii) and (iii) are eliminated. As only one person sits between the person learning French and Q, who is learning Bengali hence Q sits second to the left of R. Given, S sits second to the right of the person who is learning Spanish, hence S sits second to the right of P. Given, neither T nor V is learning Hindi and V is not learning Chinese. Therefore the final arrangement is as shown below.

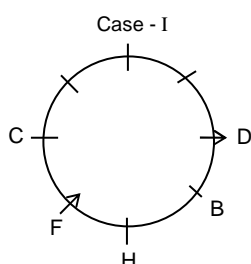


27. S sits second to the right of P. Choice (D)  
28. Four persons. Choice (A)  
29. T is learning Chinese. Choice (B)  
30. W is learning Dutch. Choice (C)

### ADDITIONAL QUESTIONS FOR PRACTICE

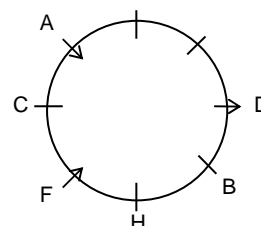
#### Solutions for questions 1 to 3:

From the given information we get the following arrangements

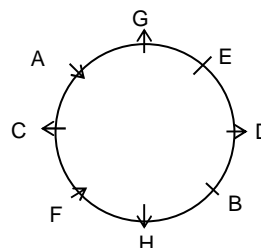


A is third to the left of D and H is third to the right of A. From this we get the following.

#### Case - II



E is third to the right of C is possible only, when C is facing away from the center, then G also facing away from the center. The final arrangement as follows.

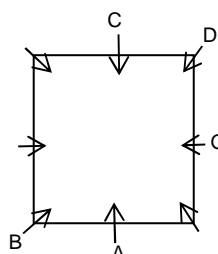


1. B is sitting second to the right of F. Choice (C)  
2. G is facing away from the center and E is to the right of G. Choice (B)  
3. Cannot be determined. Choice (D)

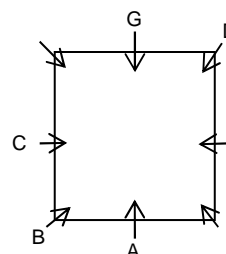
#### Solutions for questions 4 to 7:

From (i), (ii) and (iii) B sits diagonally opposite D, who sits third to the right of A and C sits second to the right of G.

The possibilities are,  
Case (a)



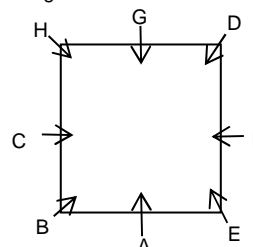
Case (b)



From (iv), we can eliminate case (a) as we can not place E at the corner and E sits to the immediate right of A in case (b).

From (v), H sits to the immediate left of C and F sits to the immediate left of D.

∴ The final arrangement is as shown below.



4. F faces C. Choice (D)  
5. A sits second to the left of F. Choice (D)  
6. B sits third to the right of G. Choice (C)  
7. E sits diagonally opposite H is true. Choice (D)

# PRACTICE EXERCISE – 3

## Solutions for questions 1 to 3:

- From the given information  
A is not red.  
D is not violet or white.  
B is painted blue.  
C is painted orange.

	A	B	C	D	E
Colour	X Red			X violet X White	
		Blue	Orange		

So D is red.

And A, E can be any of violet or white colour buildings.

Choice (D)

2.

	P	Q	R	S	T
Profession	Police officer	X Doctor X Lawyer	Teacher	X Banker X Lawyer	

It follows from the above that T is the lawyer, S is the doctor and Q is the banker.

Choice (B)

- From (i) and (iii) it can be said that C is an RTI activist. From (ii) and (iii) it can be said that E and F are RTI activists. From (iv) and (v) it can be said that A is a journalist and (J, K) are politicians. From (v), one among I and D, one is a journalist and one is an RTI activist.

Politicians	Journalists	RTI activist
B, H, J, K	G, L, A, I/D	C, E, F, D/I

Choice (C)

## Solutions for questions 4 and 5:

From (i) and (vi), Thomas is the architect.

From (v) and the above result, Kapil is the lawyer.

From (iii) and the above result, Kranthi is the professor.

From (iv), (ii) and the above results, Aravind is the engineer, Sunil is the doctor and Lala is the journalist.

- Lala – Journalist.

Choice (B)

- Kranthi.

Choice (D)

## Solutions for questions 6 to 8:

Let us tabulate the given information

Name of the person	P	Q	R	S	T
Company	X LTS	X PTS X LTS		CTS	DTS
City	X Delhi X Kolkata	X Kolkata	Hyderabad	X Mumbai X Delhi	Kolkata

As S does not stay in Mumbai, Delhi or Hyderabad and works with CTS,

⇒ S stays in Chennai and T works with DTS and stays in Kolkata.

⇒ R works with LTS, Q works with HTS and P works with PTS.

⇒ P stays in Mumbai and Q stays in Delhi.

The final distribution is as follows

Name of the person	P	Q	R	S	T
Company	PTS	HTS	LTS	CTS	DTS
City	Mumbai	Delhi	Hyderabad	Chennai	Kolkata

- P stays in Mumbai.

Choice (A)

- R works with LTS and stays in Hyderabad.

Choice (C)

- None of them is true.

Choice (D)

From (ii) we can say that B and D are in shift III and they work on either Monday or Tuesday.

From (iii) as A works on Wednesday but not in shift II, thus A works in shift I. Thus H works in shift II.

## Solutions for questions 9 to 13:

From (i) we can say that on Monday and Tuesday there are 3 shifts, and on Wednesday there are 2 shifts. Thus, 3 persons work on both Monday and Tuesday and only 2 persons work on Wednesday.

From (iv) C works in shifts II and thus, F and G works on Wednesday, From (i) E does not work Wednesday, thus C works on Wednesday.

Now, we can say that E works in shift II and on Monday.

From (v) F works on Monday and G works on Tuesday.  
Thus, we get the following arrangement.

Person	Day	Shift
A	Wed	I
B	Mon / Tue	III
C	Wed	II
D	Tue / Mon	III
E	Mon	II
F	Mon	I
G	Tue	I
H	Tue	II

9. F works in shift I on Monday. Choice (D)  
 10. E-Monday – II is the correct combination. Choice (B)  
 11. We do not know the exact information about B and D. Thus, it cannot be determined. Choice (D)  
 12. F, G and A work in shift I. Choice (A)  
 13. As B works on Monday, D works on Tuesday. Thus, only (2) is true. Choice (B)

#### Solutions for questions 14 to 17:

From (2),

AP → Production target is 2000 tonnes (least) and area target is 1500 hectares (least)

Hence, from (1), yield target 2.5 for Gujarat's possible with yield target of 5000 tonnes and area target of 2000 hectares. Similarly, for Karnataka  $2.86 = 3000/3500$ .

From (2), for Andhra Pradesh yield target  
 $= 2000/1500 = 1.33$   
 $TN > 1.33 > Maharashtra$

From (3), for TN yield target 2 is possible, under the given condition, only for a production target of 4000 tonnes and area target of 2000 hectares.

From (4), it can be said that for Maharashtra the production target is 3000 tonnes area target is 3000 hectares. Hence, yield target is 1.

Final Table

State	Yield	Productor Target	Area Target
Gujarat	2.5 (1)	5000 (1)	2000 (3)
Karnataka	0.86 (5)	3000 (4)	3500 (1)
Andhra Pradesh	1.33 (3)	2000 (5)	1500 (5)
Tamil Nadu	2 (2)	4000 (2)	2000 (4)
Maharashtra	1 (4)	3000 (3)	3000 (2)

14. The rank of Gujarat in terms of area target is 3. Ans : 3  
 15. The rank of Karnataka in terms of production target is 4. Ans : 4  
 16. Kanataka's  $2 \times 3500 = 7000$   
 New target = 7000  
 So, Excess target =  $7000 - 3000 = 4000$  Ans : 4000  
 17. New yield = 1, so production is 2000  
 $\Rightarrow$  2000 hectares more required to maintain production target. Ans : 2000

#### Solutions for questions 18 to 22:

18. The statement is placing a restriction on selection of P but not on selection of Q. The statement means that we cannot select P without Q. But Q can be selected without P. At the same time the statement is not specifying that one of P and Q must be selected. Choice (D)

19. The statement is placing a restriction on selection of Q but not on selection of P. The statement means that we cannot select Q without P. But P can be selected without Q. At the same time the statement is not specifying that one of P and Q must be selected. Choice (C)  
 20. This statement means that selection of P is necessary for the selection of Q. In other words Q cannot be selected without P. At the same time it does not mean that Q will be selected every time P is selected. Hence the possible ways of selecting P and Q is same as that of "Only if P is selected, then Q can be selected". Choice (C)  
 21. This statement means that at least one of P and Q must be selected. Hence, only (i), (ii) and (iii) are possible. Choice (D)  
 22. According to the given conditions Iron and Aluminium cannot be taken together, wood and silver cannot be taken together.  
 $\therefore$  The possible combination is Iron, Copper, Silver, Gold. Choice (C)

#### Solutions for questions 23 to 25:

We have to select two men and three women.

From (ii), if E, F and H are not selected, then three women cannot be selected from the remaining two women. Hence, A and D are not selected. From (i), C and F are to be selected.

$\therefore$  Among the remaining men i.e., G and I, one is to be selected. From (iii), if C and G are selected, then B, E and F are the women to be selected.

Hence, (C,G,B,E,F) is the only possible team.

From (iv), if C and I are the selected men, then the possible teams are  
 (C, I, F, B, H), (C, I, F, B, J) and (C, I, F, H, J).

23. Among the men, C must be selected. Choice (A)  
 24. If E is selected, the team will be (C, G, B, E, F). Hence, B must be selected. Choice (A)  
 25. There are four possible combinations. Choice (C)

#### Solutions for questions 26 to 29:

26. According to the given conditions the possible teams are:

- (a) Singer (50), Vilonist, Flutist, Pianist  
 (b) Singer (20), Violinist, Percussionist, Pianist.  
 From the above (D) is false. Choice (D)

27. When the percussionist and only one singer are selected, the other two can be selected from the remaining three in three ways.  
 Since the singer can be the older one or the younger one, we get six ways. When both the singers are selected, the fourth one in the team can be any one among the violinist, flutist and pianist.  
 Thus the team can be selected in nine ways. Choice (A)

28. The team consists of less than 50 years, they are 4 individuals less than 50 years. Hence, a team of three can be selected in  ${}^4C_3 = 4$  ways. Choice (B)

29. One of the possible teams is:  
 Singer (50), Vilonist (40), Flutist (30), Singer (2)) and Pianist (10).  
 From the above (A), (B) and (C) are false.  
 If pianist is not selected, the singer becomes the youngest. Hence, the pianist must be selected. Choice (D)

30. A singer and two other specialists in musical instruments are to be selected. The singer can be selected in two ways and the two specialists (out of available four) can be selected in  ${}^4C_2$  ways.

$$\therefore \text{Total number of ways} = 2 \times {}^4C_2 = 2 \times \frac{4 \times 3}{1 \times 2} = 12 \text{ ways}$$

Choice (C)

## ADDITIONAL QUESTIONS FOR PRACTICE

### Solutions for questions 1 to 3:

The given information can be tabulated as follows.

Name of the person	Tribe	Country	Language
A			
B		Bhutan	French
C	Q		Dutch
D			
E	T	China	
F			

From (i) and (iii), C and F belong to Pakistan. Since no two persons have the same combination of country and language, F does not know Dutch. From (iv) and (vi), F does not know French and he does not belong to tribe R. Hence, D belongs to tribe R and knows French. Since two persons belong to Bhutan and one each to China and Mangolia, one of A and D belongs to Bhutan and the other one to Mangolia. Since no two persons have the same combination of country and language, R does not belong to Bhutan. Hence, R belongs to Mangolia and A belongs to Bhutan. From (vii), as U knows Dutch, it has to be A. This implies that the person who belongs to tribe P is either B or F. But from (ii), F is the one who belongs to tribe P and knows the language Swedish. Now it can be concluded that B belongs to tribe S and E knows Spanish.

The final arrangement as follows:

Name of the person	Tribe	Country	Language
A	U	Bhutan	Dutch
B	S	Bhutan	French
C	Q	Pakistan	Dutch
D	R	Mangolia	French
E	T	China	Spanish
F	P	Pakistan	Swedish

- A belongs to Bhutan. Choice (A)
- F belongs to tribe P. Choice (A)
- They both belong to the same country. Choice (C)

### Solutions for questions 4 to 6:

Captain must be : C or E  
 Vice captain must be : A or G  
 Other experts : G.K: H or I  
 : M.A: F or J  
 : C.A: B, D or K

From (a) C and G cannot be selected together, thus the possible combinations of captain and vice-captain are

Captain	C	E	E
Vice-Captain	A	A	G

From (a) If H is selected then F in and either D or K are to be selected. But D cannot be selected either with E or A. Thus no team can be selected with D. Thus two possible teams are

- C, A, H, F and K
- E, A, H, F and K
- E, G, H, F and K

If I is selected, J must be selected. The possible combinations are

- C A I J K
- E A I J K
- E G I J K
- C A I J B

The team can be selected in a total of 7 ways.

- If C is selected then the remaining four members can be selected in three ways. Choice (C)

- If G is selected the remaining four can be selected in two ways. Choice (B)

- D cannot be selected into the team. Choice (A)

## PRACTICE EXERCISE – 4

### Solutions for questions 1 to 3:

- First let us take the statements made by Lo and Po. If we assume Lo is a liar, then Po must be a liar. As we know that there is only one liar, Lo and Po can't be the liars.

So, Ho must be the liar and Lo and Po are truth-tellers. Choice (A)

- From the second statement of Johar, we can say that Johar is an alternator and his first and second statements are true and false respectively.

∴ Neither truth-teller nor liar, can say he is a liar.

∴ Karan is the thief.

∴ Karan is a liar and Sharukh is a truth-teller.

Choice (C)

- If Ravi is a Truth Teller, both his statements are to be taken as facts. Then Rajesh will be the liar and Raman is the alternator. But here both the statements of Raman are false. Hence, Ravi cannot be the truth teller. If Rajesh is the truth teller, according to his statements Raman will be the alternator. This implies Ravi should be the liar. By cross checking with their statements we find that there is not going to be any contradiction. Hence, Rajesh can be the truth teller. If we consider Raman to be the truth teller, we notice that all the statements of both Ravi and Rajesh are becoming false. Hence, Raman cannot be the truth teller. Thus, Rajesh is the truth teller. Choice (B)

### Solutions for questions 4 to 6:

Case I: If P is the truth teller, the facts that we get are: P is the doctor and Q is an engineer. This implies R is the teacher. Basing on this, we can say that both the statement of Q are false, i.e., Q is a liar. Hence, R should be the alternator. But going by the facts derived above, the first statements of R is true and the second one is false. Hence P can be the truth teller.

Case II: If Q is the truth teller, the facts that we get are: R is doctor and Q is teacher and hence P is engineer. Going by these facts, both the statements of P become false, hence he is the liar. This implies R should be the alternator. By comparing with the facts derived above, the first statement of Q is false and the second statement is true. Hence, Q can be the truth teller.

Case III: If R is the truth teller, the facts that we derive are: R is teacher and P is liar. Now we should consider the statements of P to be false. It means P is not the doctor and Q is not an engineer. Thus P is the engineer and Q the doctor. Now, Q should be the alternator. Going by the facts derived above Q's first statement is true and the second one is false.

- P cannot be the teacher. Choice (A)
- If P is the engineer, then either R or Q is the truth teller. Choice (D)
- If P is the doctor, then Q is the engineer. Choice (B)

### Solutions for questions 6 to 9:

From the given information and statements we get the following arrangements.

Case I: P likes blue, Q likes green and P is taller between the two.

Name	1 <sup>st</sup>	2 <sup>nd</sup>
P	True	False
Q	False	True

Case II: P likes blue, Q likes green and P is shorter between the two.

Name	1 <sup>st</sup>	2 <sup>nd</sup>
P	True	True
Q	False	False

Case III: P likes green, Q likes blue and P is taller between the two.

Name	1 <sup>st</sup>	2 <sup>nd</sup>
P	False	False
Q	True	True

Case IV: P likes green, Q likes blue and P is shorter between the two.

Name	1 <sup>st</sup>	2 <sup>nd</sup>
P	False	True
Q	True	False

7. Statement (C) is possible. Choice (C)
8. In any case the number of true statements and the number of false statements are equal. Hence, the difference is zero. Choice (D)
9. Both P and Q are alternators. Choice (D)
10. 'Q likes blue' is true. Choice (B)

#### Solutions for questions 11 to 14:

Let's assume Santiago is TT then all his statements would be true.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Santiago	T	T	T

	Santiago	Benjamin	Mateo
Product	DT	Saree	Shawl
Cost	2000		3000
Tax @10%	200		300

So, now Benjamin's statement should be analyzed (D.T stands for Darjeeling tea) using the above table.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Santiago	T	T	T
Benjamin	?	T	F

Since, there is one true and false statement Benjamin is an alternator  $\therefore$  S<sub>1</sub> is false  $\Rightarrow$  Mateo purchased Shawl. Now, the above information is compared with Mateo's statement.

		S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
T.T	Santiago	T	T	T
Alt	Benjamin	F	T	F
Liar	Mateo	F		T

Here,  $\therefore$  S<sub>3</sub> is true. But Mateo must be a liar. We have come across a contradiction. Hence, Santiago cannot be the truth teller.

Let Benjamin be TT.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Benjamin	T	T	T

	Santiago	Benjamin	Mateo
Product	Shawl		
Cost		2000	3000
Tax @10%		200	300

With the above table let us analyse Santiago's statement.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Benjamin	T	T	T
Santiago	?	T	F

So Santiago S<sub>1</sub> = F  
Therefore, Benjamin bought Darjeeling tea.

	Santiago	Benjamin	Mateo
Product	Shawl	D.T	Saree
cost		2000	3000
Tax @10%		200	300

Now, Mateo's statement can be analysed using the above table.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
Benjamin	T	T	T
Santiago	F	T	F
Mateo	F	F	F

So Benjamin = T.T  
Santiago = Alternator  
Mateo = Liar

11. ₹2200 is paid for Darjeeling tea. Ans : 2200
12. 1.5 times. Ans : 1.5
13. ₹1100 is paid by Santiago. Ans : 1100
14. In all ₹6600 is spent Ans : 6600

#### Solutions for questions 15 to 18:

15. According to the given information, the order of their weights is as follows.

1. P 2. R 3. T 4. S 5. Q  
 $\therefore$  R is the second heaviest. Choice (A)

16. There is only one before S. So, S is the 2<sup>nd</sup> dancer. There is only one after T. So, T is the 4<sup>th</sup> dancer. R is neither the 1<sup>st</sup> nor the 5<sup>th</sup>. So, R is the 3<sup>rd</sup> dancer. P dances after Q, so P is the 5<sup>th</sup> and Q is the 1<sup>st</sup> dancer. So P is the last dancer. Choice (C)

17. Given all are of different heights. From the given information we can say that  
F > A > D, E > C > B and B > F  
The final arrangement of their heights will be as follows  
E > C > B > F > A > D  
D is the shortest. Choice (D)

18. Given that no two students got the same rank. From the information we can say that Charan got the third rank and Karan got the fourth rank. It is given that the number of students who got a better rank than Pavan is the same as those who got a worse rank than Lavan, then we can say that if Pavan got first rank and Lavan's rank must be the fifth rank or if Lavan got the first rank, then Pavan's rank must be the fifth rank. Hence, cannot be determined. Choice (D)

#### Solutions for questions 19 to 21:

Let us represent the persons with the First letter of their names.  
From (i), B, C and D got the first ranks.  
From (v), A, C and E got the fifth ranks.  
From (vii) and (viii), C did not get the fifth rank in height and weight.  
 $\therefore$  C got the fifth rank in Age.

And also we get that B did not get the first rank in height and weight.  
 $\therefore$  B got the first rank in Age.  
From (vii), that D did not get the first rank in height.  
 $\therefore$  D got the first rank in weight.  
 $\therefore$  C got the first rank in height.  
Now from (vi), as D got the first rank in weight, he got the third rank in height.

From (iv) and (ii) A got the fifth rank in weight and the third rank in age. E got the fifth rank in weight.

As D got the third rank in height, from (vii) we get that B got the second rank and E got the fourth rank in height.

From (viii), we get that C got the second rank, B got the third rank and A got the fourth rank in weight. Now E and D got the second and the fourth ranks in age respectively.

Rank	Height	Weight	Age
1	C	D	B
2	B	C	E
3	D	B	A
4	E	A	D/C
5	A	E	C/D

19. Ekta is the second eldest person. Choice (A)
20. Ekta is the lightest person. Choice (B)
21. Birendra did not get the fourth rank in any of the categories. Choice (D)

#### Solutions for questions 22 to 25:

Given in (vi) the income and expenditures of Karcha is more than that of Tanqua.

Income :  $K > T$   
Expenditure:  $K > T$

Also, in (iv) the income of Mani is less than the expenditure of Tanqua.

∴ Income :  $K > T > M$ .  
∴ Expenditure :  $K > T > M$ .

From (iii)

The income of Chinta is more than Tanqua and the expenditure of Amdani is more than Karcha.

Income :  $K > T$  and  $C > T > M$ .  
Expenditure :  $A > K > T > M$ .

From (v),

The person with second highest income has the least expenditure.

∴ Chinta has the second highest income.

The highest income has the highest expenditure.

∴ Amdani has the highest income as well as expenditure.

	Income	Expenditure
1	A	A
2	C	K
4	K	T
5	T	M
6	M	C

Here, each alphabet is the first letter of each name and represents that person.

22. Chinta has the least expenditure. Choice (B)
23. Karcha has the third highest income. Choice (C)
24. Karcha has the second highest expenditure. Choice (C)
25. Since the absolute values of the income and the expenditures are not known, the savings cannot be determined. Choice (D)

#### ADDITIONAL SOLUTIONS FOR PRACTICE

##### Solutions for questions 1 to 3:

If C's third statement is false, it implies C is the thief. If B's second and third statements are false, it implies B is a liar which shows A's third statement is false. Hence A's first statement must be true, which is not possible. Hence, C's third statement must be true.

⇒ C's first statement is also true ∴ C is not an alternator which implies C is the truth teller.

According to C's second statement, among the remaining five statements three must be true.

Also, C is not a thief.

If A is the thief, then B's second statement must be false.

∴ B's third statement must be false.

⇒ A's third statement must be false, which violates the second statement of C.

∴ A is not the thief.

∴ A's first and third statements are true.

∴ Only the second statement of B must be true.

(As a total of six statement exist)

∴ The first and third statement of B are false.

Finally, we have,

	I	II	III
A	T	F	T
B	F	T	F
C	T	T	T

1. None of A, B and C is a liar. Choice (D)
2. B is the thief. Choice (A)
3. Together they have given three false statements. Choice (A)

##### Solutions for questions 4 and 5

From the first statement of A, we can say that A is not a liar.

∴ A is either an alternator or a truth-teller.

In both the cases, the second statement of A is true.

∴ B's name is Mahendar is true.

∴ B's first statement is false.

A cannot be an alternator, which violates the second statement of B.

∴ A is a truth-teller.

∴ B's second statement is either true or false.

4. B's father name is Mahendar. Choice (B)
5. Number of true statements is  $2 + 1$  or  $2 + 0$  i.e., 3 or 2. Choice (D)

##### Solutions for questions 6 to 8:

From Akil's second statement, we can say that Akil is an alternator and his second statement is true.

∴ Akil's first and third statements are false.

∴ Chintu is a truth-teller and Bintu is a liar.

From the third statement of Bintu, we can say that, Chintu is sitting in the middle of the row.

From the third statement of Akil and the above, we can say that Bintu is sitting at the extreme left of the row.

∴ Akil is at the extreme right of the row.

6. Chintu is sitting in the middle of the row. Choice (C)
7. Akil is an alternator. Choice (A)
8. Bintu is sitting at the extreme left of the row. Choice (B)

##### Solutions for questions 9 to 11:

From (i),

\_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_ > \_\_\_\_\_ > Mohan > \_\_\_\_\_  
(66)

From (ii) and the above,

\_\_\_\_\_ > \_\_\_\_\_ > Dhavan > Rohan > Mohan > \_\_\_\_\_  
(66)

From (iii) and the above,

Guhan > Sohan > Dhavan > Rohan > Mohan > Bhuvan  
(66)

9. Dhavan can score 69 marks, since Dhavan got more marks than Mohan. Choice (C)
10. Two boys scored less than Sohan and more than Mohan. Choice (C)

# PRACTICE EXERCISE – 5

## Solutions for questions 1 to 4:

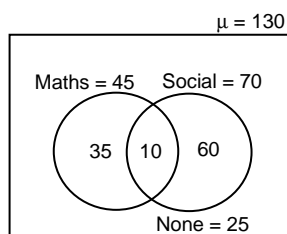
Total students = 130.

85 passed in Maths  $\Rightarrow 130 - 85 = 45$  failed in Maths.

60 passed in Social  $\Rightarrow 130 - 60 = 70$  failed in Social.

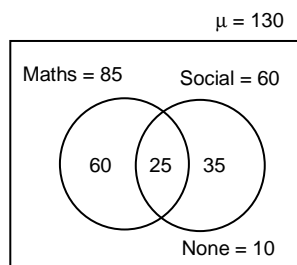
And 10 failed in both the subjects.

Venn – diagram based on the subjects in which students fail, is as follows:



None = 25  $\Rightarrow$  25 students passed in both the subjects.

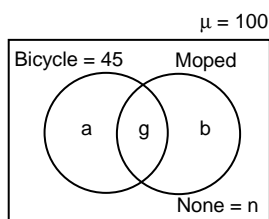
Now, Venn-diagram based on the subjects in which students pass, is as follows.



- 25 students passed in both the subjects. Choice (A)
- Passed only in Social studies = 35 Choice (D)
- Failed in exactly one = 35 + 60 = 95. Choice (C)
- Failed only in social studies = Passed in only Maths = 60  
Failed in Maths = 45  
 $\therefore x\%$  of 60 = 45 (or)  $x = 75\%$  Choice (B)

## Solutions for questions 5 to 7:

Let represent the given information in a venn diagram.



Given,

(i)  $a + g = 45$

(ii)  $25\% (b + g) = n$  (or)  $\frac{1}{4} (b + g) = n$  (or)  $b + g = 4n$  ....(1)

(iii)  $33\frac{1}{3}\% (45) = g$  (or)  $\frac{1}{3} (45) = g$  (or)  $g = 15$  ... (2)

From (1) and (2),

$b + 15 = 4n$  ... (3)

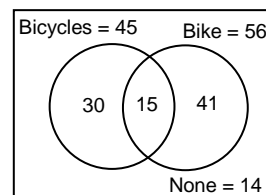
Total = 100  $\Rightarrow a + g + b + n = 100$  but  $a + g = 45$

$\therefore b + n = 55$ .....(4)

From (3) any (4),

$n = 14$  and  $b = 41$

$\therefore$  The final Venn diagram is as follows:



- Mopeds but not bicycles = only bikes =  $b = 41$ . Choice (C)
- Exactly one =  $a + b = 30 + 41 = 71$ . Choice (D)
- Do not have moped =  $100 - 56 = 44$  (or)  $a + n = 30 + 14 = 44$ . Choice (B)

## Solutions for questions 8 to 10:

As total = 160 people

number of males =  $160 - 100 = 60$

From (iv), None = 0

From (iii), 45% of (160) = 72

$\therefore$  72 people like Cameroon's movies.

$\therefore$  The value of total in the column Cameroon is 72 .....(1)

From (ii), Females who like both =  $\frac{1}{2} (60) = 30$

Now, among 100 females, 70 like Spielberg's movies, 30 like both. So,  $100 + 30 - 70 = 60$  females like Cameroon's movies .....(2)

From (1) and (2),  $72 - 60 = 12$  males like Cameroon's movies.

From (i), Males who like both = 12

$\therefore$  Males in Spielberg column =  $60 + 12 - 12 = 60$

$\therefore$  Total in Spielberg column =  $60 + 70 = 130$

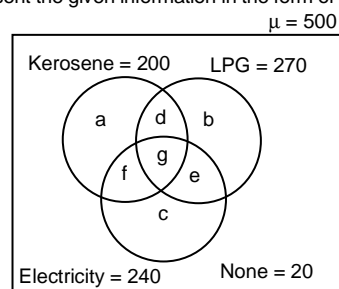
Hence, the complete table is as follows :

	Spielberg	Cameroon	Both	Total
Male	60	12	12	60
Female	70	60	30	100
Total	130	72	42	160

- 130 people like Spielberg's movies. Choice (A)
- $60 - 12 = 48$  males like only Spielberg's movies. Choice (D)
- 42 people like the movies of both the directors. Choice (C)

## Solutions for questions 11 to 15:

Let represent the given information in the form of a venn diagram.



$a + b + c + d + e + f + g + n = 500$  and  $n = 20$

$a + b + c + d + e + f + g = 480$  ..... (1)

72 people use Kerosene and LPG  $\Rightarrow d + g = 72$

$\Rightarrow d = 72 - g$

126 people use LPG and Electricity  $\Rightarrow e + g = 126$

$\Rightarrow e = 126 - g$

62 people use Kerosene and Electricity  $\Rightarrow f + g = 62$

$\Rightarrow f = 62 - g$

Kerosene = 200  $\Rightarrow a + d + f + g = 200$  ....(2)

From (1) and (2),  $b + c + e = 280$  ....(3)

$$\text{LPG} = 270 \Rightarrow b + d + g + e = 270 \quad \dots(4)$$

$$(3) - (4) \Rightarrow c - (d + g) = 10$$

$$\text{but } d + g = 72$$

$$\therefore c = 82$$

$$\text{Also, } c + e + f + g = 240$$

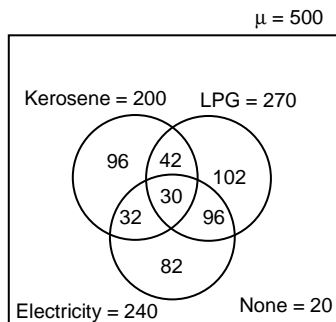
$$\Rightarrow 82 + 126 - g + 62 - g + g = 240$$

$$\Rightarrow 270 - g = 240 \text{ (or) } g = 30$$

$$\therefore d = 42, e = 96 \text{ and } f = 32$$

$$\text{Similarly, we get } a = 96, b = 102 \text{ and } c = 82.$$

$\therefore$  The final Venn diagram is as follows:



11. 30 people use all the three types of fuels.

Choice (D)

12. At most one type of fuel = Exactly one + none.  
=  $280 + 20 = 300$ .

Choice (A)

13. Kerosene or LPG = Total - (Only Electricity + None)  
=  $500 - (82 + 20) = 500 - 102 = 398$ .

Choice (C)

14. At least two types of fuels = Exactly two + Exactly three  
=  $42 + 32 + 96 + 30 = 200$ .

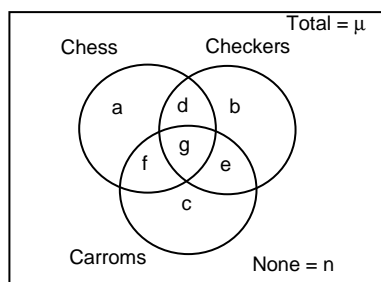
Choice (B)

15. Neither Kerosene nor Electricity = Only LPG + None  
=  $102 + 20 = 122$ .

Choice (D)

#### Solutions for questions 16 to 19:

Let represent the given information in the form of a venn diagram.



Let the number of people who play Checkers =  $21x$

From (iv),  $b + d + g + e = 21x$  and  $g + e = 12x \Rightarrow b + d = 9x$

From (ii),  $g + e = a = 12x$

From (i),  $3g = 21x$  (or)  $g = 7x \Rightarrow e = 5x$

From (vi),  $e : n = 1 : 2 \therefore n = 10x$

From (iii),  $d : n = 3 : 5 \therefore d = 6x \Rightarrow b = 3x$

From (vi),  $d + e + f : e = 4 : 1 \therefore f = 9x$

From (v),  $c : b = 6 : 1$

$\therefore c = 18x$

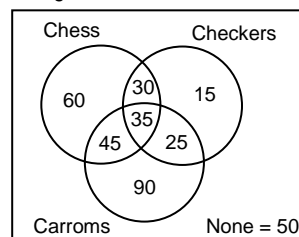
$a + b + c + d + e + f + g + n$

=  $12x + 3x + 18x + 6x + 5x + 9x + 7x + 10x = 70x$

Given that  $70x = 350$

$\Rightarrow x = 5$

$\therefore$  The final Venn diagram is as follows:



16.  $30 + 45 + 25 = 100$  people play exactly two games.

Ans : 100

17. Chess but not Carroms =  $60 + 30 = 90$ .

Ans : 90

18. Do not play Chinese Checkers = Total - Checkers  
=  $350 - (30 + 15 + 35 + 25) = 300 - 105 = 245$ .

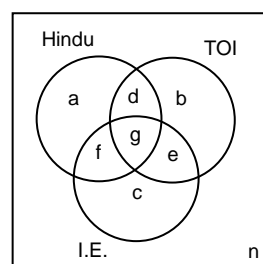
Ans : 245

19. Chess or Carroms = Total - (None + Chinese Checkers only)  
=  $350 - (50 + 15) = 285$ .

Ans : 285

#### Solutions for questions 20 to 22:

Let the venn diagram be as follows:



The Times of India : TOI

Given  $a + b + c + d + e + f + g + n = 300$ .

At least two =  $100 \Rightarrow d + e + f + g = 100 \Rightarrow a + b + c + n = 200$

Exactly one =  $180 \Rightarrow a + b + c = 180 \Rightarrow n = 20$

80 read neither The Hindu nor TOI  $\Rightarrow c + n = 80$

$\Rightarrow c = 60$

230 read either The Hindu or Indian Express

$\Rightarrow a + d + e + g + f + c = 230$

As  $d + e + f + g = 100$ ,  $a + c = 130$  as  $c = 60$ ,  $a = 70$

Also,  $a + b + c = 180 \therefore b = 50$

130 read The Hindu or TOI but not I.E.

$\Rightarrow a + d + b = 130 \Rightarrow d = 10$

20. Here, the required value is  $e + f + g = 90$  ( $\therefore d + e + f + g = 100$  and  $d = 10$ )

Choice (B)

21. The number of persons who like all the three cannot be determined.

Choice (D)

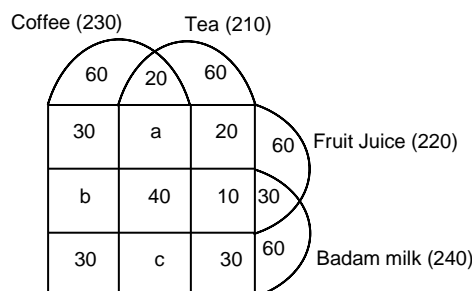
22. The Hindu only =  $a = 70$ .

Choice (C)

#### Solutions for questions 23 to 26:

From the given information, we have the following venn-diagram.

GT = 500



$$a + b = 220 - (60 + 30 + 20 + 10 + 30 + 40) = 30$$



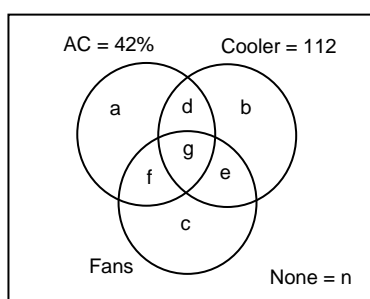
$$\begin{aligned}\therefore c &= 230 - (60 + 20 + 30 + 40 + 30 + a + b) \Rightarrow c = 20 \\ a &= 210 - (20 + 60 + 20 + 40 + 10 + 30 + c) \\ &= 210 - (180 + 20) = 10 \\ \therefore b &= 30 - 10 = 20\end{aligned}$$

23. The required number is  $a + b + c + 10$ .  
 $= 10 + 20 + 20 + 10 = 60$  Choice (D)
24. The required number is  $30 + a + b + 40$ .  
 $= 30 + 30 + 40 = 100$  Choice (D)
25. The required number is  
 $500 - (\text{exactly 3} + \text{exactly 4})$   
 $500 - (60 + 40) = 400$  Choice (B)
26. The required number is  
 $b + 30 = 20 + 30 = 50$  Choice (A)

### ADDITIONAL QUESTIONS FOR PRACTICE

#### Solutions for questions 1 to 4:

Let represent the given information in the form of a Venn diagram.



Given,

- 112 houses have Coolers  $\Rightarrow b + d + e + g = 112$  (i)  
 10 % have Coolers and Fans  $\Rightarrow e + g = 10\%$  (ii)  
 42 % have ACs  $\Rightarrow a + d + g + f = 42\%$  (iii)  
 44 % have Fans  $\Rightarrow c + e + f + g = 44\%$  (iv)  
 20 % have none of the three  $\Rightarrow n = 20\%$  (v)  
 22 % have only Fans  $\Rightarrow c = 22\%$  (vi)  
 12 % have ACs and Coolers  $\Rightarrow d + g = 12\%$  (v)

It is given that those having none of the three is five times of those having all the three. i.e.  $n = 5g$

$$\Rightarrow g = 4\%$$

From (v),  $d = 8\%$  and from (ii)  $e = 6\%$

From (iv), (vi) and the above results  $f = 12\%$

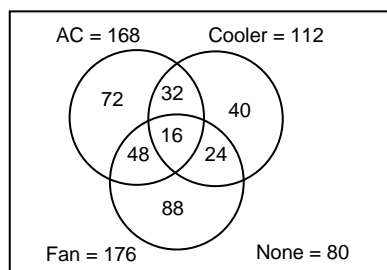
From (iii),  $a = 18\%$

$$\therefore b = 100\% - (42\% + 6\% + 22\% + 20\%) = 10\%$$

$$\text{It is given that } b + d + e + g = 112 \Rightarrow 28\%$$

$$\therefore 1\% \Rightarrow 4$$

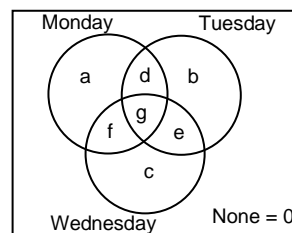
$\therefore$  The final Venn diagram is as follows:



1. 88 houses have Fans only. Choice (D)
2. At most two = Total - g (or)  $400 - 16 = 384$ . Choice (A)
3. Total = 400 Choice (D)
4. No Fans = Total - Fans  $\Rightarrow 400 - 176 = 224$ . Choice (C)

#### Solutions for questions 5 to 9:

5. Let the venn diagram be as follows:



$$\text{Total} = 70$$

Given values are

$$\text{Only Wednesday} \Rightarrow c = 17$$

$$\text{Wednesday but not Tuesday} \Rightarrow c + f = 25 \text{ or } f = 8$$

$$\text{Monday and Wednesday} \Rightarrow f + g = 11 \text{ (or) } g = 3$$

$$\text{Wednesday} = 40 \Rightarrow c + f + g + e = 40 \text{ (or) } 17 + 11 + e = 40$$

$$\Rightarrow e = 12$$

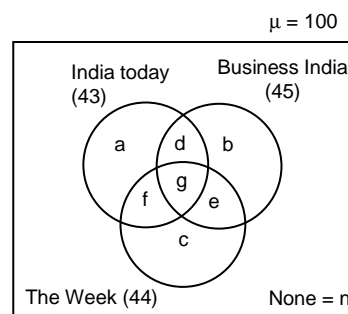
$$\text{Monday} = 36 \Rightarrow a + d + f + g = 36 \text{ (or) } a + d = 25$$

$$\text{Monday and Tuesday} = 13 \Rightarrow d + g = 13 \Rightarrow d = 10 \Rightarrow a = 15$$

$$\text{Exactly two consecutive days} = d + e = 10 + 12 = 22.$$

Choice (D)

6.



$$\text{Given, } d = 9; f = 19; e + g = 18; g = 3 \therefore e = 15$$

$$\text{India Today} + \text{Business India} + \text{The Week}$$

$$= a + b + c + 2(d + e + f) + 3g$$

$$\text{(or) } 43 + 45 + 44 = a + b + c + d + e + f + g + (d + e + f + 2g)$$

$$\text{(or) } 132 = a + b + c + d + e + f + g + (9 + 19 + 15 + 6)$$

$$132 - 49 = a + b + c + d + e + f + g = 83$$

$$\therefore n = \text{Total} - 83 = 17.$$

Choice (C)

7.

Given, at least one = 160

$$\Rightarrow \text{Exactly one} + \text{Exactly two} + \text{Exactly three} = 160 \dots (1)$$

$$\text{At most two} = 175$$

$$\Rightarrow \text{Exactly two} + \text{Exactly One} + \text{None} = 175 \dots (2)$$

$$(2) - (1) = \text{None} - \text{Exactly three} = 15$$

$$\text{As None} = 25$$

$$\therefore \text{Exactly three} = 10$$

$$\text{Mark Twain} + \text{Rudyard Kipling} + \text{Ruskin Bond}$$

$$= 70 + 60 + 90 = 220$$

$$= \text{Exactly one} + 2(\text{Exactly two}) + 3(\text{Exactly three}) = 220 \rightarrow (3)$$

$$(3) - (1) = \text{Exactly two} + 2(\text{Exactly three}) = 60$$

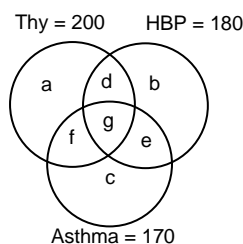
$$\text{(or) Exactly two} + 2(10) = 60 \Rightarrow \text{Exactly two} = 40$$

$$\therefore \text{Exactly one} = 160 - (40 + 10) = 110.$$

Choice (B)

8.

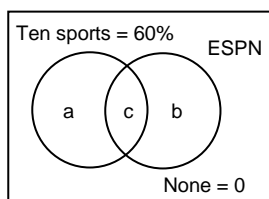
Let us represent the given information in the following diagram.



Patients suffering with Thyroid and HBP =  $d + g = 60$   
 Patients suffering with HBP and Asthma =  $e + g = 50$   
 Patients suffering with Asthma and Thyroid =  $f + g = 60$   
 Dr. Cook's patients =  $a$ , Dr. Watson's patients =  $b$ ,  
 Dr. Doyale's patients =  $c$  and Dr. No's patients =  $d + e + f + g$   
 Given,  $a = 100$   
 $\therefore d + f + g = (\text{Thy} - a) = 200 - 100 = 100$   
 but  $d + g = 60 \therefore f = 40$   
 Given  $f + g = 60 \therefore g = 20$   
 Given  $d + g = 60 \therefore d = 40$   
 Given  $e + g = 50 \therefore e = 30$   
 $b = \text{HBP} - (d + g + e) = 180 - 90 = 90$   
 $c = \text{Asthma} - (e + f + g) = 170 - 90 = 80$   
 $\therefore$  Dr. Cook's patients = 100  
 Dr. Watson's patients = 90  
 Dr. Doyale's patients = 80  
 Dr. No's patients = 130  
 $\therefore$  Dr. No > Dr. Cook > Dr. Watson >  
 Dr. Doyale.

Choice (C)

9. Let the Venn diagram be



$$a + c = 60\% \quad a = 30\% \text{ of } 60\% = 18\% \\ \therefore b + c = 100 - 18 = 82\%.$$

Choice (D)

#### PRACTICE EXERCISE – 6

#### Solutions for questions 1 to 5:

In this set, there is no information about the number of students who do not like any of the games.  
 Let it be  $n$ .

Total member of students who like cricket and both the games is  
 $400 \times \frac{1}{2}, 400 \times \frac{1}{5}$

i.e., 200 and 80 respectively.

The value of  $n$  for total is

$$T(n) = \text{Total} - (T(H) + T(C) - T(H \cap C))$$

$$= 400 - (120 + 200 - 80) = 160$$

The number of boys who like Hockey and both are 120 – 50 and 80 – 30 respectively i.e., 70 and 50 respectively.

The number of girls who like cricket = 200 – 85 = 115.

The total number of boys = 400 – 150 = 250

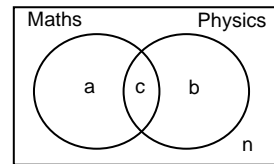
$\therefore$  The final table will be as follows:

	Hockey	Cricket	Both	Total	None
Girls	50	115	30	150	15
Boys	70	85	50	250	145
Total	120	200	80	400	160

- 115 girls like cricket. Choice (D)
- 50 boys like both the games. Choice (D)
- 145 boys like none of the games. Choice (C)
- 160 students like none of the games. Choice (B)
- As  $n = 15$  and Total = 150  
 150 – 15 i.e., 135 girls like at least one of the games.  
 Choice (A)

#### Solutions for questions 6 and 7:

Consider the following venn-diagram:  
 GT = 100



The number inside each circle represents the number of students passed that subject and the remaining students failed in that subject.

Given  $a + b = 65$ ,

Also given 50% of the students who passed Physics failed in Maths, that means

$$\frac{b + c}{2} = b$$

$$\Rightarrow b = c$$

The number of students failed in only Physics is  $a$ .

$\therefore$  The number of students failed in both, i.e.,  $n$  is  $\frac{a}{4}$ .

$$a + b + c + n = 100$$

$$a + b + b + \frac{a}{4} = 100$$

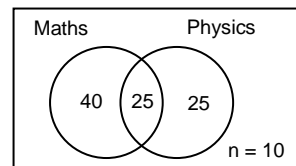
$$a + 65 - a + 65 - a + \frac{a}{4} = 100$$

$$\Rightarrow 30 = \frac{3a}{4} \Rightarrow a = 40$$

$$\therefore b = 25 \text{ and } c = 25$$

Also,  $n = 10$

$\therefore$  The final venn-diagram will be as follows:



6. Given  $n$  is decreased to 6 and the value of  $a + b$  remained the same.

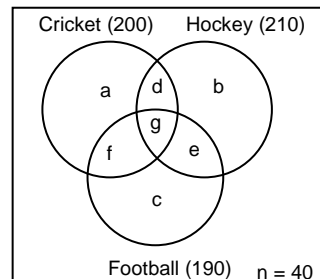
We need to find the maximum possible value of  $a$ .

If 4 students from  $n$  shifted to  $b$  and 4 students from  $a$  shifted to  $c$ , we get the minimum possible value for  $a$  i.e.,  
 $40 - 4 = 36$  Choice (D)

7. If 5 students from  $n$  and all the students who passed only physics (i.e., 25) shift to  $c$ , we get the maximum value for  $a$  i.e.,  
 $40 + 5 + 25 + 25 = 95$ . Choice (D)

#### Solutions for questions 8 to 11:

Consider the following venn-diagram  
 GT = 450



$$a + b + c + d + e + f + g = T - n$$

$$\Rightarrow \text{Ex 1} + \text{Ex 2} + \text{Ex 3} = 450 - 40 = 410$$

$$\Rightarrow \text{Ex 1} + \text{Ex 3} = 410 - 90 = 320 \dots (1)$$

$$\text{Also, Ex 1} + 2(\text{Ex 2}) + 3(\text{Ex 3}) = 200 + 210 + 190$$

$$\Rightarrow \text{Ex 1} + 3(\text{Ex 3}) = 600 - 2(90) = 420 \dots (2)$$

From (1) and (2),  $Ex\ 3 = 50$  and  $Ex\ 1 = 270$   
 $\therefore g = 50$  and  $a + b + c = 270$

8. Given  $a = 90$ ,  
 $d + f = 200 - g - 90$   
 $= 200 - 50 - 90 = 60$ .  
 $Ex\ 2 = d + e + f = 90$ .  
 $\Rightarrow e = 90 - 60 = 30$ . Choice (A)

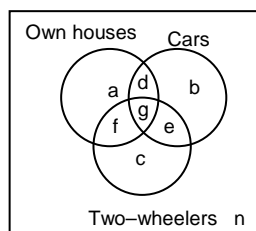
9. Given  $f = 40$   
 $\Rightarrow d + e = 90 - 40 = 50$   
 $b = 210 - d - e - g$   
 $= 210 - 50 - 50 = 110$  Choice (B)

10. Given  $b + d = 100$ , we need to find  $f$ .  
 $e = 210 - b - d - g$   
 $= 210 - 100 - 50 = 60$   
 But as we don't know  $e$  or  $c$ , we cannot find  $f$ .  
 Choice (D)

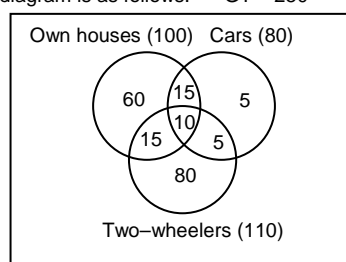
11. Given  $c = 80$ , we need to find  $d + g$ .  
 $e + f = 190 - g - c$   
 $= 190 - 50 - 80 = 60$   
 $d = 90 - e - f = 90 - 60 = 30$   
 $d + g = 30 + 50 = 80$  Choice (D)

#### Solutions for questions 12 to 16:

Consider the following venn-diagram  
 $GT = 250$



- Given,  $d + g = 25 \dots (1)$   
 $e = 5 \dots (2)$   
 $c = 80 \dots (3)$   
 $b + d + e + g = 80 \dots (4)$   
 $a + f = 75 \dots (5)$   
 $g = 10 \dots (6)$   
 $f = 15 \dots (7)$   
 From (3), (4), (5) and  $GT = 250$ ,  
 $n = GT - (a + b + c + d + e + f + g)$   
 $= 250 - (80 + 80 + 75) = 15$ .  
 From (6) and (1),  $d = 15$ .  
 From (2), (1) and (4),  $b = 80 - (d + g + e)$   
 $= 80 - (25 + 5) \Rightarrow b = 50$   
 From (5) and (7),  $a = 60$   
 $\therefore$  The final diagram is as follows:  $GT = 250$



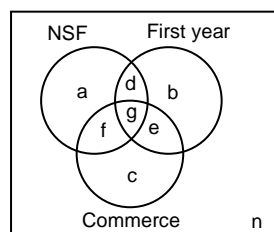
12. Required number is  $b + e$ , i.e.,  $50 + 5 = 55$ . Choice (A)
13. Required number is  $a + b + c + n$ , i.e.,  
 $60 + 50 + 80 + 15 = 205$  Choice (B)
14. The employees who have only a own house will sell it. Now the maximum possible number of employees who have only houses can be those who have none of the three (assuming that they purchased house) those who have only houses and two-wheelers (assuming that they sold their vehicles), those who have only houses and cars (assuming that they sold their vehicles)  $= 15 + 15 + 15 = 45$ . Choice (B)

15. From the given information, it is concluded that  $c$  is added to  $b$  and  $f$  is added to  $d$ .  
 $\therefore$  The required value is  $d + f + g = 15 + 15 + 10 = 40$   
 Choice (C)

16. To get the maximum required value, all the employees under  $e$  should sell their cars.  
 $\therefore$  The required value is  $c + e = 80 + 5 = 85$ . Choice (D)

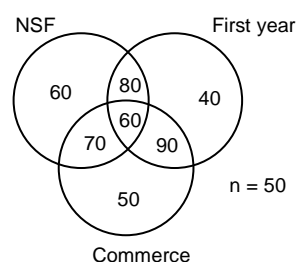
#### Solutions for questions 17 to 21:

Consider the following venn-diagram.  $GT = 500$



- $a + b + c + d + e + f + g + n = 500 \dots (1)$   
 In the above venn-diagram, the number inside each circle is the number of students who belong to that group and the remaining belong to the other group in the category.  
 $Ex$ : Number of NSF members is  $a + d + f + g$ .  
 and number of SFI members is  $b + c + e + n$ .  
 $n$  represents the second year science students who are SFI members. Also, the number of the first year science students who are NSF members is  $d$ .  
 Given  $e = 90 \dots (2)$   
 $a + d + f + g = 270 \dots (3)$   
 $c = 50 \dots (4)$   
 $d + g = 140 \dots (5)$   
 $d + f = 150 \dots (6)$   
 $f + c = 120 \dots (7)$   
 $a + b = 100 \dots (8)$   
 From (4) and (7),  $f = 120 - 50 = 70 \dots (9)$   
 From (9) and (6),  $d = 150 - 70 = 80 \dots (10)$   
 From (10) and (5),  $g = 140 - 80 = 60$   
 $\therefore$  From (3),  $a = 270 - (d + f + g)$   
 $= 270 - (150 + 60) = 60$   
 From (8),  $b = 100 - 60 = 40$   
 From the above results.  
 $n = 500 - (270 + 90 + 40 + 50) = 50$   
 $\therefore$  The final venn-diagram is as follows.

$GT = 500$

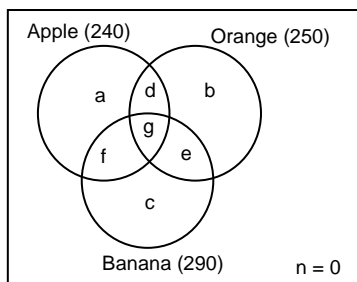


17. The required number is  $n$ , i.e., 50 Ans : 50
18. The required number is  $b$ , i.e., 40 Ans: 40
19. The required number is  $g$ , i.e., 60 Ans: 60
20. The required number is  $c + g$ , i.e.,  $50 + 60 = 110$   
 Ans: 110
21. The required number is  $GT - (b + e)$ ,  
 i.e.,  $500 - 40 - 90 = 370$  Ans: 370

### Solutions for questions 22 to 24:

Consider the following venn-diagram.

Total = 500



We have Total = Ex 1 + Ex 2 + Ex 3 + None

$$\Rightarrow \text{Ex 1} + \text{Ex 2} + \text{Ex 3} = 500 \dots\dots (1)$$

$$\text{Also, } x + y + z = \text{Ex 1} + 2(\text{Ex 2}) + 3(\text{Ex 3})$$

$$\Rightarrow \text{Ex 1} + 2(\text{Ex 2}) + 3(\text{Ex 3}) = 780 \dots\dots (2)$$

$$(2) - (1) \Rightarrow \text{Ex 2} + 2 \text{ Ex 3} = 280$$

$$\text{i.e., } d + e + f + 2g = 280$$

$$22. \text{ Given } f = 60 \Rightarrow d + e + 2g = 220$$

We need to find the maximum possible value of b.

We have  $b + d + e + g = 250$ .

To maximize b,  $d + e + g$  should be minimum.

As  $d + e + 2g = 220$ ,

$d + e + g$  will be minimum when g is maximum.

Take  $d = e = 0$

$$\Rightarrow g = 110$$

$$\therefore b = 250 - 110 = 140$$

Choice (C)

$$23. \text{ Given } a = 120,$$

we need to find the maximum value of e.

$$\text{As } a = 120, d + f + g = 120$$

$$d + e + f + 2g = 280$$

$$\Rightarrow e + g = 160$$

e can be maximized by minimizing g. i.e., by taking  $g = 0$

$$\therefore e = 160$$

Choice (B)

$$24. d + e + f + 2g = 280$$

g will be maximum

$$\text{If } d = e = f = 0$$

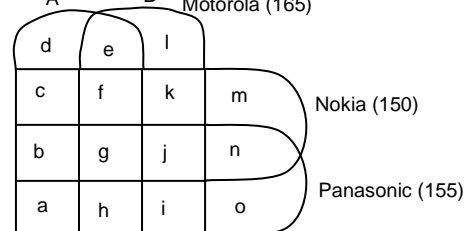
$$\therefore g = 140$$

Choice (A)

### Solutions for questions 25 to 28:

Sony Ericsson (175)

Motorola (165)



It is given that Sony Ericsson and Motorola = 75

$$\Rightarrow e + f + g + h = 75 \rightarrow (1)$$

$$\text{Also Nokia and Panasonic} = 75 \Rightarrow b + g + j + n = 75 \rightarrow (2)$$

$$(1) + (2) = e + b + f + j + h + n + 2g = 150$$

Given that exactly three = 75

$$\therefore f + b + j + h = 75 \Rightarrow e + n + 2g = 75$$

Also, given that sum of the number of families using Sony Ericsson and Motorola only and the number of families using Nokia and Panasonic only is 25.

$$\Rightarrow e + n = 25 \therefore g = 25$$

$$25. \text{ All the four} = g = 25$$

Ans : 25

$$26. \text{ Exactly one} + \text{Exactly two} + \text{Exactly three} + \text{Exactly Four} = 280.$$

$$\text{Given Exactly two} = \text{Exactly one} + 100$$

$$\text{As Exactly four} = 25 \text{ and Exactly three} = 75. \text{ Exactly two} = 140.$$

$$\therefore \text{Exactly two} + \text{Exactly three} = 215.$$

Ans: 215

$$27. \text{ Exactly two} + \text{Exactly three} = 215 \text{ and Exactly four} = 25$$

$$\therefore \text{Exactly one} = (\text{Exactly one} + 100) = 280 - (75 + 25)$$

$$\Rightarrow \text{Exactly one} = 40$$

Ans: 40

$$28. \text{ Given, } f + h = 35$$

$$\text{We have, } e + f + g + h = 75 \Rightarrow e + g = 75 - 35 = 40$$

$$\text{Also, } g = 25 \Rightarrow e = 15$$

$$\text{Also, we know that } e + n = 25 \Rightarrow n = 10$$

$$\text{Sony Ericsson} + \text{Motorola} = 175 + 165 = 340$$

$$\therefore a + b + c + d + i + j + k + l + 2(e + f + g + h) = 340$$

$$a + b + c + d + e + f + g + h + i + j + k + l = 340 - 75 = 265 \dots\dots(1)$$

$$\text{Total} - (1) = m + n + o = 280 - 265 = 15$$

$$\text{We have } n = 10,$$

$$\therefore m + o = 5$$

The required value is 5.

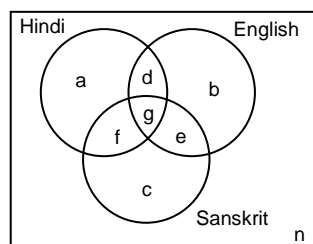
Ans : 5

### ADDITIONAL QUESTIONS FOR PRACTICE

#### Solutions for questions 1 to 4:

Consider the following venn-diagram

GT = 100%



$$\text{Given } n = g \quad (1)$$

$$d = e = \frac{f + g}{2} \quad (2)$$

$$f = c = 2n \dots\dots (3)$$

$$b = 4c \dots\dots (4)$$

From (1), (3) and (2) we get

$$d = e = \frac{3n}{2}$$

$$\text{Also given, } a + d + g + f = 2(f + g) \Rightarrow a = f + g - d$$

$$= 2n + n - \frac{3n}{2} = \frac{3n}{2}$$

$$\text{From (3) and (4), } b = 8n$$

$$\therefore a : b : c : d : e : f : g : n$$

$$= 3 : 16 : 4 : 3 : 3 : 4 : 2 : 2$$

1. The required percentage is

$$\frac{f}{d + e + f} \times 100 = \frac{4}{10} \times 100 = 40\%.$$

Choice (C)

$$2. a : b = 3 : 16$$

$$\text{Given } b = 320$$

$$\therefore a = 60$$

Choice (B)

$$3. \text{ Let total} = 37x$$

$$\text{Given } g = 100 = 2x$$

$$\therefore \text{Total} = 1850$$

Choice (A)

$$4. \text{ If } c = 4x, \text{ then } n(H) = 12x \text{ and total} = 37x$$

$$\Rightarrow \text{The number of people who don't speak Hindi} = 25x$$

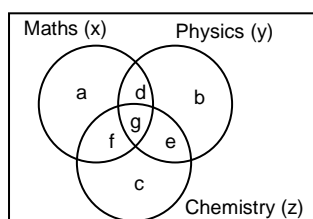
$$\text{Given } c = 80 = 4x \Rightarrow x = 20$$

$$\therefore \text{The required number is } 25x = 500.$$

Choice (D)

### Solutions for questions 5 to 7:

Consider the following Venn-diagram.



Exactly 1 =  $a + b + c$

Exactly 2 =  $d + e + f$

Exactly 3 =  $g$

$x + y + z = \text{Ex } 1 + 2(\text{Ex } 2) + 3(\text{Ex } 3)$

Given,  $x = 150$ ,  $y = 160$  and  $z = 200$

$d = 40$ ,  $e + f = 140$

$\therefore \text{Ex } 2 = d + e + f = 40 + 140 = 180$

Also,  $e + f + g + c = z = 200$

$\Rightarrow 140 + g + c = 200 \Rightarrow g + c = 60$

5. Given  $g = 10$

We have

$150 + 160 + 200 = \text{Ex } 1 + 2(\text{Ex } 2) + 3(\text{Ex } 3)$

$\Rightarrow 510 = \text{Ex } 1 + 2(180) + 3(10)$

$\Rightarrow \text{Ex } 1 = 510 - 360 - 30 = 120$

Choice (B)

6. Given  $c = 50$

$\Rightarrow g = 60 - 50 = 10$

If we consider Maths and physics, we have

$x + y = (a + f) + (b + e) + 2(d + g)$

$150 + 160 = (a + b) + (f + e) + 2(40 + 10)$

$\Rightarrow a + b = 310 - 100 - 140 = 70$

Choice (A)

7. Given  $a + b = 80$

We have

$2(d + g) = x + y - (a + f) - (b + e)$

$= 150 + 160 - (a + b) - (f + e)$

$= 310 - 80 - 140 = 90$

$\Rightarrow d + g = 45$

$\Rightarrow g = 45 - 40 = 5$

Choice (D)

### PRACTICE EXERCISE - 7

#### Solutions for questions 1 to 4:

1.  $15^{+2}$ ,  $17^{+3}$ ,  $20^{+5}$ ,  $25^{+7}$ ,  $32^{+11}$ , 43 Choice (B)

2.  $5^{+2+3}$ ,  $13^{+3+2}$ ,  $37^{+2+3}$ ,  $77^{+3+2}$ ,  $229^{+2+3}$ , 461 Choice (D)

3. The given numbers can be expressed as follows  
 $2^2+1$ ,  $3^2+1$ ,  $5^2+1$ ,  $7^2+1$ ,  $11^2+1$ ,  $13^2+1$ ,  $17^2+1 = 290$   
 Choice (A)

4. The pattern for the first letter:  $B^{+1}$ ,  $C^{+1}$ ,  $D^{+1}$ ,  $E^{+1}$  F  
 The pattern for the second letter:  $T^{-2}$ ,  $R^{-2}$ ,  $P^{-2}$ ,  $N^{-2}$ , L  
 The pattern for the third letter:  $P^{+3}$ ,  $S^{+3}$ ,  $V^{+3}$ ,  $Y^{+3}$ , B  
 The pattern for the fourth letter:  $S^{-4}$ ,  $O^{-4}$ ,  $K^{-4}$ ,  $G^{-4}$ , C  
 $\therefore$  F L B C is the next group. Choice (D)

#### Solutions for questions 5 to 11:

5. The given analogy is as follows.  
 Prime number: Square of the next prime number.  
 Hence  $17^2=289$  is the required number Choice (B)

6.  $8:8 \times 8 : 10 : \underline{10 \times 8=80}$  Choice (C)

7.  $2^3 : 3^2 \Rightarrow x^y : y^x$   
 $\therefore 2^4 : \underline{4^2=16}$  Choice (B)

8. First letter In the English alphabet: first letter in reverse order  
 English letter: English letter in the reverse order  
 $\therefore$  S is the required letter Choice (A)

9. First group: P Z M G K  
 Logic :  $+1 +2 +3 +4 +5$   
 Second group: Q B P K P

Similarly, for M D T P Q, the next term is  
 N F W T V Choice (C)

10. Bravery attracts, rewarded while crime attracts punishment.  
 Choice (A)

11. Kitten is the young one of cat, while calf is the young one of the cow.  
 Choice (D)

#### Solutions for questions 12 to 18:

12. Except 33, the rest are prime numbers. Choice (B)

13. Except 27, the rest are perfect squares. Choice (C)

14. Except 225, the rest are squares of prime numbers.  
 Choice (C)

15. Except BCD, the rest of the groups have one vowel and two consonant.  
 Choice (B)

16.  $M^{+3} P^{+4} T$ ,  $J^{+2} L^{+3} O$ ,  $R^{+3} U^{+4}$ ,  $C^{+3} X^{+4} J$   
 Except J L O, the rest follows the same pattern.  
 Choice (B)

17. Except ship, the rest are territorial transport.  
 Choice (C)

18. Except Goa, the rest are union territories. Choice (B)

#### Solutions for the questions 19 to 21:

19. Word : P E R F O R M  
 Logic1:  $+1 +2 +3 +4 +5 +6 +7$   
 Code : Q G U J T X T  
 Logic2: Reverse order  
 Code : T X T J U G Q  
 Hence the code for CONDUCT is A F Z H Q Q D  
 Choice (D)

20. The object refracted to 'telephone', which is called 'radio' in that language.  
 Choice (B)

21. The object refracted to is 'flower', According that language 'fruit' means 'flower'.  
 Choice (B)

#### Solutions for questions 22 to 24:

By comparing code (1) and (2), we can say that, the code for "North" is "rit".

By comparing (1) and (4), we can say that, the code for "persons" is "bit".

By comparing (1) and (3) we can say that, the code for "faces" is "sit".

By comparing (2) and (3) we can say that, the code for "East" is "lit".

$\therefore$  The code for "five" is "kit".

$\therefore$  The code for "four" is "nit".

By comparing (2), (4) and (5), we can say that, the code for "directions" is "pit".

By comparing (2) and (5) the code for "are" is "mit".

By comparing (2) and (4) the code for "and" is "fit".

$\therefore$  The code for "different" is "git" and the code for "there" is "dit".

22. The code for different is "git". Choice (C)

23. "There" is coded as "dit". Choice (A)

24. Choice (A) is correct. Choice (A)

#### Solutions for questions 25 to 27:

25. By combining the given statements, we get

(1)  $L \geq M = P \leq N = O$

(2)  $R > M = P \geq Q$

(3)  $A > M = P$

ConclusionI, does not follow,

From (2), conclusionII, follows.

$\therefore$  Only conclusion II follows. Choice (B)

26. By combining the given statements, we get  
 (1)  $C < G < A > B \geq C$   
 (2)  $D = E \geq F < G < A$   
 From (1), conclusion I, does not follow.  
 From (2), conclusion II, follows. Choice (B)

27. By combining the given statements, we get  
 (1)  $P < Q \leq R < S < T = V$   
 (2)  $V = T > S > U$ .  
 From (2), conclusion I follows.  
 From (2), conclusion II, does not follow.  
 $\therefore$  Only conclusion I follows. Choice (A)

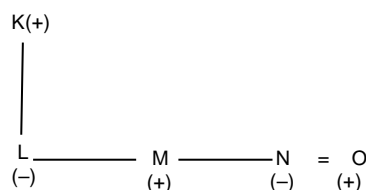
#### Solutions for questions 28 and 29:

28. 'B  $\geq$  E' is definitely true in the expression  
 $A < B \geq C = D \geq E$ . Choice (A)
29. 'W < X' and 'Z < X' are definitely true in the expression  
 $Y > W < Z < V \leq X$ . Choice (D)

#### Solutions for questions 30 and 31:

30. Sarala's sister's mother's father's only son is Sarala's uncle.  
 Sarala's uncle's daughter is Sarala's cousin. Sarala's cousin is cousin of Sarala's brother. Choice (C)

31. The given expression is  
 $K + L - M \times N ? O$   
 In the above expression  
 '+' means 'father'  
 '-' means 'sister'  
 ' $\times$ ' means 'brother'  
 '?' means 'wife'



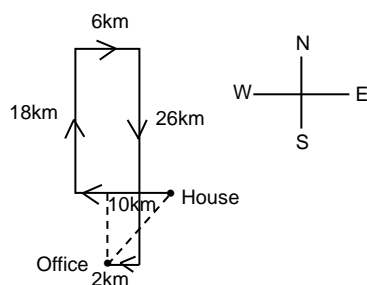
From the above diagram it is understood K is the father of L, M and N. O is the husband of N. Hence K is the father-in-law of N.

$\therefore$  '?' comes in the place of question mark.

Choice (A)

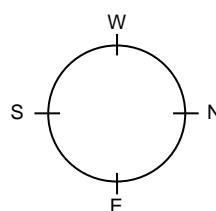
#### Solutions for the questions 32 and 33:

32. The path travelled by Ravi will be as follows.  
 Horizontal distance =  $10 - 6 + 2 = 6$  km  
 Vertical distance =  $26 - 18 = 8$  km  
 Distance =  $\sqrt{6^2 + 8^2} = 10$  km  
 Direction = North-east  
 $\therefore$  10 km North-east.

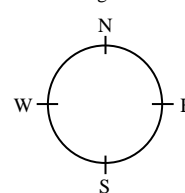


Choice (A)

33. The given directions are,  
 Damaged compass:



Original:



$\therefore$  If the person is going towards East, then he was actually going towards South. Choice (B)

#### Solution for question 34:

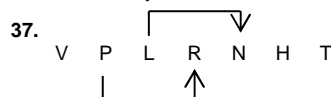
34. The given sequence is,  
 3 6 4 4 2 3 8 4 4 2 3 9 4 6 8 3 2 1 5 2 8 4 6 5 3 2 8 3 6 4  
 $\therefore$  Eight digits are immediately followed by an odd digit and preceded by an even digit. Choice (B)

#### Solutions for questions 35 to 38:

The given sequence is,

\$ 3 \* V P L R N H T ! # @ & 9 < \theta \uparrow \pi 4 ? 5 B 8 \odot

35. The ninth element from the right end is  $\theta$ , the sixteenth element to the left of  $\theta$  is \$. Choice (D)
36. There are eight symbols (i.e., \$, !, #, @, &, \theta, \uparrow and \pi) which are neither immediately preceded by a digit nor followed by a letter. Choice (B)



There are two such pairs i.e., PR and LN. Choice (D)

38. The given logic is as follows.  
 $8^{-7}, \theta^{-6}, !^{-5}, L^{-4}, 3$   
 $\therefore$  The next term in the series is 3. Choice (A)

#### Solutions for the questions 39 and 40:

39. \_\_\_\_\_ Ravi \_\_\_\_\_ Rajesh \_\_\_\_\_  
 (19) (17) (13)  
 $\therefore$  total number of persons standing in the row  
 $= 19 + 1 + 17 + 1 + 13 = 51$  Choice (C)

40. Roshni entered before Lakshmi. Then number of people = 9  
 $+ (1) \text{ Roshni} + 10 + 1 \text{ (Lakshmi)} + 19$   
 $= 40$  Choice (A)

#### PRACTICE EXERCISE - 8

#### Solutions for questions 1 to 7:

- As it is not known, whether the year referred to in the question is a leap year or not, the question cannot be answered. Choice (D)
- The total number of days from 12<sup>th</sup> to 28<sup>th</sup> of April (excluding 12<sup>th</sup>) is 16, i.e. two odd days. Hence, 28<sup>th</sup> April is Friday + 2 = Sunday. Choice (A)
- Among the given years only 1496 and 1200 are leap years. Choice (C)
- Let us first calculate the number of odd days from 5<sup>th</sup> February of 1756 to 5<sup>th</sup> February of 1763.  
 $1756 - 57 - 58 - 59 - 60 - 61 - 62 - 63$   
 $2 \quad 1 \quad 1 \quad 1 \quad 2 \quad 1 \quad 1$   
 In all nine odd days, i.e. effectively two odd days.

The number of odd days for the months February to July in 1763 are:

February (23), March (31), April (30), May (31), June (30), July (12)  
2        3        2        3        2        5

In all 17 odd days, i.e. effectively three odd days.

Year-wise two odd days and for the months three odd days.  
In all five odd days.

Hence, 12<sup>th</sup> July 1763 will be Wednesday + 5 = Monday.  
Choice (D)

5. Century-wise odd days for the first 1800 years:  $1600 + 200 \Rightarrow 0 + 3 = 3$  odd days

Year-wise odd days for 42 years :  $32 \times 1 + 10 \times 2 = 52 \Rightarrow 3$  odd days

In 1843 :

January (31) – February (28) – March (31) – April (30) – May (17)  
3        0        3        2        3

$\Rightarrow 4$  odd days

The total number of odd days  $3 + 3 + 4 = 10 \Rightarrow 3$  odd days.

Thus 17<sup>th</sup> May 1843 was Sunday + 3 = Wednesday

Choice (B)

6. The year 1877 is in leap + 1 form. Hence, 1883 i.e.  $1877 + 6$ ) will have the same calendar as that of 1877.  
Choice (D)

7. The given days can be represented as follows:

Notification 7 days Today 6 days Submission 4 days Last date

Hence, the last day = Thursday + 5 = Tuesday.

Choice (D)

#### Solutions for questions 8 to 11:

From the output we can observe that words are arranged in the alphabetical order and then numbers are arranged in the ascending order.

In each step, one word and one number is arranged. The word, which comes first in the alphabetical order is arranged first. The least number is shifted to the right end and so on.

Input: try 95 67 solve 43 16 power car 39 plan 88 nice

Step I: car try 95 67 solve 43 power 39 plan 88 nice 16

Step II: car nice try 95 67 solve 43 power plan 88 16 39

Step III: car nice plan try 95 67 solve power 88 16 39 43

Step IV: car nice plan power try 95 solve 88 16 39 43 67

Step V: car nice plan power solve try 95 16 39 43 67 88

Step VI: car nice plan power solve try 16 39 43 67 88 95

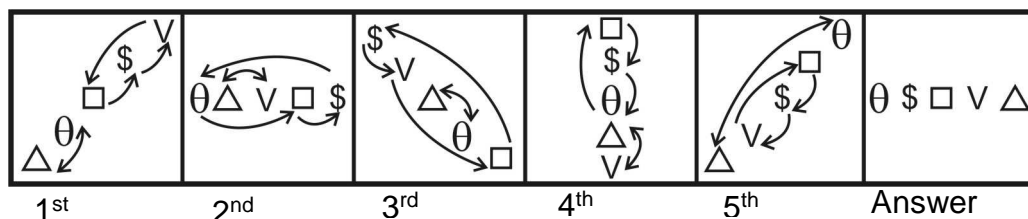
Step VI is the last step.

8. 6 steps are required to get the output. Choice (D)

9. Option (C) is step III. Choice (C)

#### Solutions for questions 16 to 18:

16. From one figure to the next figure the string of element is rotated by 45° in the CW direction, and the elements are arranged as shown below.



$\therefore$  The approximate answer figure is 2.

Choice (B)

10. 95 is the 6<sup>th</sup> number from right end in step V. Choice (D)

11. Option (B) is the correct output. Choice (B)

#### Solutions for questions 12 to 15:

From the sample arrangement we can deduce the following algorithm:

Step I: Number of letters in each word +

Step II: Step I  $\times 2$

Step III: Adding 1, 2, 3, 4, 5 to corresponding numbers.

Step IV: Squaring each number.

Step V: Arrange next in descending order.

Step VI: Subtract 1, 2, 3, 4, 5 from the corresponding numbers.

Step VII: Replacing the number with the source word.

12. Given input,

That lady on road screamed

Step I: 5        5        3        5        9

Step II: 10        10        6        10        18

Step III: 11        12        9        14        23

Step IV: 121        144        81        196        529

Step V: 529        196        144        121        81

Step VI: 528        194        141        117        76

Step VII: Screamed road lady that on

That output is step VII. Choice (B)

13. Given    step IV    169    324    441    784    729  
Then    step III    13    18    21    28    27  
          step II    12    16    18    24    22  
          step I    6    8    9    12    11

The above is step I of an input. Choice (B)

14. Given input: "Samsung is a decent cell".

Step I: 8        3        2        7        5

Step II: 16        6        4        14        10

Step III: 17        8        7        18        15

Step IV: 289        64        49        324        225

Step V: 324        289        225        64        49

Step VI: 323        287        222        60        44

required o/p

Step VII: decent Samsung cell is a. Choice (D)

15. I/P score hundred geography in exam

Step I: 6        8        10        3        5

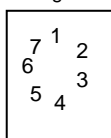
Step II: 12        16        20        6        10

Step III: 13        18        23        10        15

Step IV: 169    324    529    100    225 required step

Choice (B)

17. Let the elements in each figure be,

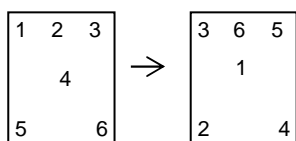


From one figure to the next figure, the elements are inverted as shown below:

1 <sup>st</sup> to 2 <sup>nd</sup>	2 <sup>nd</sup> to 3 <sup>rd</sup>	3 <sup>rd</sup> to 4 <sup>th</sup>	4 <sup>th</sup> to 5 <sup>th</sup>	5 <sup>th</sup> to 6 <sup>th</sup>
1, 2	3	4, 5	6	7, 1

∴ The appropriate answer figure is (D). Choice (D)

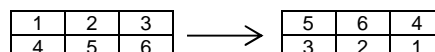
18. From one figure to the next figure, the elements are rearranged as follows:



∴ The appropriate answer figure is (D). Choice (D)

### Solutions for questions 19 and 20:

19. From the first figure to the second figure the given relationship is as follows:



Similar relationship is continued from the third figure to the fourth answer figure. Choice (D)

20. From the second figure to the first figure the given relationship is as follows:  
 '—○' is rotated by 45° in ACW, '→' by 90° in CW and '—▷' by 90° in ACW.  
 Similar relationship is continued from the fourth figure to the first answer figure. Choice (A)

### Solutions for questions 21 to 25:

S.No.	Name	(i) B.E(mech) ≥ 70%	(ii) Similar Exp ≥ 10 years	(iii) Exp in DG Sets ≥ 4 years	(iv) Exp in Europe ≥ 3	(v) French / German	(a) MBA(Maintenance) + 8 years of Exp	(b) Exp in Europe ≥ 5	(c) Spanish
21.	Subrato	✓	✓	✓	✓	✓			
22.	Manish	✓	×	✓	✓	✓	×		
23.	Sumit	×	✓	✓	✓	✓			
24.	Rajesh	✓	✓	✓	✓	×			✓
25.	Satish	✓	×	✓	✓	✓	✓		

In the above table,

(✓) implies the condition is satisfied

(×) implies the condition is not satisfied

(—) implies the condition is unknown

From the above table, if there are (✓) marks they are for conditions

(i) + (ii) + (iii) + (iv) + (v) → The person is selected → Choice (A)

(i) + (iii) + (iv) + (v) + a → The person is selected → Choice (A)

(i) + (ii) + (iv) + (v) + b → The person is referred to the Manager (Maintenance) → Choice (B)

(i) + (ii) + (iii) + (iv) + c → The person is referred to the Manager(HR) → Choice (B)

21. He fulfils all the conditions. Choice (A)

22. (ii) is not satisfied and its alternative condition is also not satisfied. Hence, he is rejected. Choice (D)

23. As (i) is not satisfied, he is rejected. Choice (D)

24. (v) is not satisfied, but (c) is satisfied.  
 ∴ He is referred to the Manager (HR). Choice (B)

25. (ii) is not satisfied, but (a) is satisfied. Choice (A)

### Solutions for questions 26 to 30:

Q. No.	Number	(i) 6 ≥ number ≥ 12 of digits	(ii) 2 <sup>nd</sup> & 4 <sup>th</sup> digits are composite	(iii) At least 1 digit is repeated [a] 3 <sup>rd</sup> digit is a multiple of the other	(iv) Exactly three odd digits [b] at least two odd digits
26.	7466315	(i) ✓	(ii) ✓	(iii) ✓	(iv) × [b] ✓
27.	1968342	(i) ✓	(ii) ✓	(iii) × [a] ✓	(iv) ✓
28.	8847325	(i) ✓	(ii) ×	(iii) ✓	(iv) ✓
29.	1792883	(i) ✓	(ii) ×	(iii) ✓	(iv) × [b] ✓
30.	14273322	(i) ✓	(ii) ×	(iii) ✓	(iv) × [b] ✓

26. Condition (iv) is not satisfied but [c] is satisfied. Hence, it is a melody number. Choice (C)

27. Condition (iii) is not satisfied but [b] is satisfied. Hence, it is a melange number. Choice (B)

28. Condition (ii) is not satisfied. As the number does not come under any category, it is a morose number. Choice (D)

29. Basic conditions (ii) and (iv) are not satisfied, Hence, it is a morose number. Choice (D)



30. Both the conditions (ii) and (iv) are not satisfied. Hence, the number does not come under any category and is a morose number. Choice (D)

### PRACTICE EXERCISE – 9

#### Solutions for questions 1 to 15:

- In the two premises together there are four terms. Hence, there can be no conclusion.
- Both the given premises are particular. Hence, there can be no conclusion.
- Both premises are particular. Hence, there can be no conclusion.
- Both the given premises are negative. Hence, there can be no conclusion.
- Both the premises are negative. Hence, there can be no conclusion.
- The middle term Q is not distributed. Hence, there can be no conclusion.
- The middle term P is not distributed. Hence, there can be no conclusion.
- The premises satisfy all rules. The conclusions are 'All men are sincere', 'some men are sincere' and 'some sincere are men'.
- The premises satisfy all the rules. The conclusions are, 'No actor is a singer', 'No singer is an actor', 'Some actors are not singers' and 'Some singers are not actors'.
- The premises satisfy all the rules. The conclusions are, 'Some R's are M's and Some M's are R's'.
- The premises satisfy all the rules. The conclusion is 'Some snakes are not dangerous'.
- The premises satisfy all the rules. The conclusion is 'Some books are not readable.'
- The premises satisfy all the rules. The conclusion is 'Some buyers are not sellers'.
- Readers are not creative.  $\Rightarrow$  No reader is creative. The premises satisfy all the rules. The conclusion is 'Some painters are not readers'.
- The premises satisfy all the rules. The conclusions are, 'Some K's are P's' and 'Some P's are K's'.

#### Solutions for questions 16 to 19:

- Does not violate any rule.
  - Both the premises are affirmative, while the conclusion is negative.
  - The middle term 'xenophobia' is not distributed.
  - Does not violate any rule. Choice (D)
- The middle term 'pleasant' is not distributed.
  - and (D) One of the premises is negative. Hence, the conclusion cannot be affirmative.
  - There are four terms. Choice (D)
- The middle term 'cactus' is not distributed.
  - The term 'rodents' is not distributed in the statements but it is distributed in the conclusion.
  - The term 'emperor' is not distributed in the statements but it is distributed in the conclusion.
  - No rule is violated. Choice (D)
- No rule is violated.
  - No rule is violated.
  - No rule is violated.
  - The middle term is not distributed. Choice (C)

#### Solutions for questions 20 to 22:

- bce: The middle term is not distributed.
  - adb: The middle term is not distributed.
  - bad: No rule is violated.
  - aec: There are four terms. Choice (C)
- abd: The middle term is not distributed.
  - adc: The term 'bulletins' is not distributed in the premise but in the conclusion it is distributed.
  - ace: There are four terms.
  - dba: No rule is violated. Choice (D)
- abe: No rule is violated.
  - ced: One of the premises is negative but the conclusion is not negative.
  - bde: There are four terms.
  - aeb: The term 'working day' is not distributed in the premise, but is distributed in the conclusion. Choice (A)

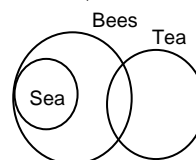
#### Solutions for questions 23 to 25:

- eac: All the three statements are particular. Hence, they are not logically related.
  - fda: The term 'sellers' is there in all the three statements.
  - dfb: In any combination the term that is not distributed in the premise is distributed in the conclusion.
  - acd: No rule is violated and the correct order is dca. Choice (D)
- ade: The term 'rational' is there in all the three statements.
  - acd: No rule is violated and the correct order is cda.
  - dbf: The term 'rational' is there in all the three statements.
  - cdb: There are four terms. Choice (B)
- bea: All the three statements are particular.
  - eda: Only one of the statements is negative, which does not give any logical relation.
  - aec: The only possible order is eca, but in this case also the term 'cricketers' is not distributed in the premise but is distributed in the conclusion.
  - fdb: No rule is violated and the correct order is bdf. Choice (D)

### PRACTICE EXERCISE – 10

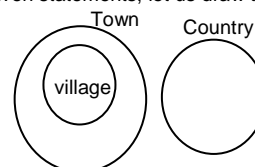
#### Solutions for questions 1 to 5:

- For the given statements, let us draw the basic diagram.

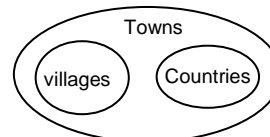


From the above diagram, both conclusions I and II, which are affirmative and do not follow. Choice (4)

- For the given statements, let us draw the basic diagram.

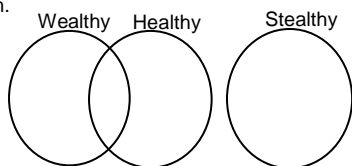


From the above diagram, both negative conclusions follow. Let us try to negate the given conclusions, with an alternate diagram.

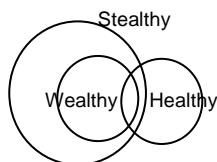


From the above diagram, neither of the conclusions follow. Choice (4)

3. From the given statements, we get the following basic diagram.



From the above diagram, the positive conclusion I is not true but negative conclusion II is true. Let us try to negate II, with the help of an alternate diagram.



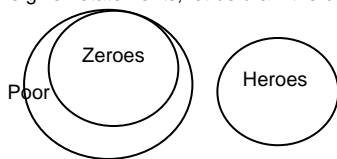
From the above diagram, II does not follow but I follows. Either I or II follows. Choice (3)

4. From the given statements, we get the following basic diagram.



From the above diagram, the affirmative conclusion I follows but not the negative conclusion II. Hence, only I follows. Choice (1)

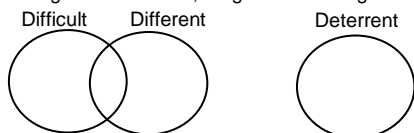
5. From the given statements, let us draw the basic diagram.



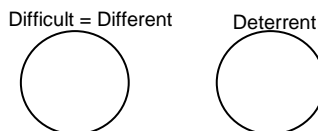
From the above diagram, the affirmative conclusion I does not follow and the negative conclusion II follows. We cannot negate conclusion II. Hence, only II follows. Choice (2)

#### Solutions for questions 6 to 10:

6. From the given statements, we get the following basic diagram.

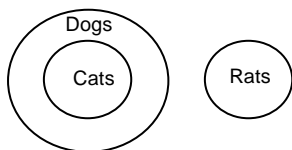


From the above diagram, I, the affirmative conclusion does not follow and the negative conclusions II, III and IV follow. Let us look at the alternate diagram,



From the above, II does not follow. But III and IV follow. We cannot negate III and IV. They always follow. Choice (3)

7. From the given statements, we get the following basic diagram.

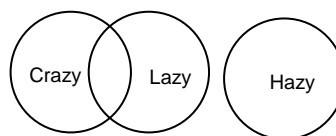


From the above diagram, the affirmative conclusion I and the negative conclusions II and III follow but IV does not follow. In this case, the alternate diagram cannot negate any of the given conclusions.

Hence, I, II and III follow.

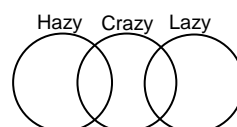
Choice (2)

8. From the given statements, we get the following basic diagram.



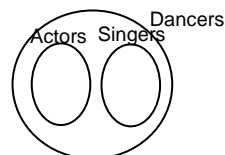
From the above diagram, the affirmative conclusions, I, II and IV do not follow but, the negative conclusion, III follows.

Let us draw the alternate diagram.



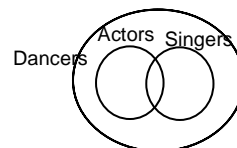
From the above diagram, II follows but III does not follow. Hence, either II or III follows. Choice (4)

9. From the given statements, we get the following basic diagram.



From the above diagram, only IV, the negative conclusion, follows.

Let us try to negate conclusion IV by drawing an alternate diagram as follows.

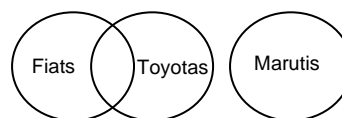


From the above diagram, IV is false but I follows.

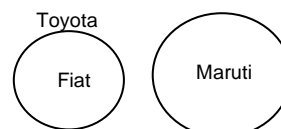
Hence, either I or IV follows.

Choice (4)

10. From the given statements, we get the following basic diagram.



From the above diagram, the negative conclusions I, II and IV follow, while the positive conclusion III does not follow. Let us negate the conclusions by drawing the alternate diagram.



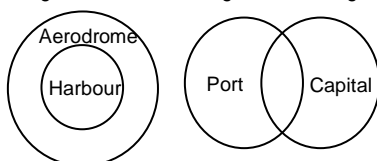
In the alternate diagram, I does not follow but III follows. II does not follow.

Hence, either I or III and IV follow.

Choice (3)

### Solutions for questions 11 to 15:

11. From the given statements, we get the following basic diagram.



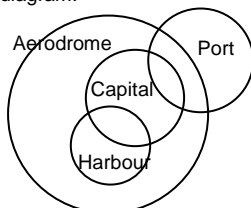
From the above diagram, all the given conclusions are negative and follow.

Let us try to negate the conclusions by drawing the alternate diagram as shown below.

Negation of (I) is "All aerodromes are ports" and negation of (IV) is "All capitals are harbours".

No diagram can be drawn to prove I or IV. Hence, they can't be negated.

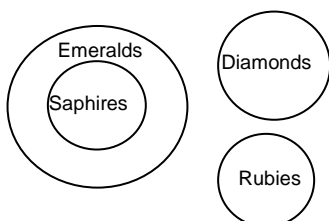
Negation of (II) is "some ports are aerodromes" negation of (III) is "some harbours are capitals" is possible from the alternate diagram.



Hence I and IV follow.

Choice (1)

12. From the given statements, we get the following basic diagram.



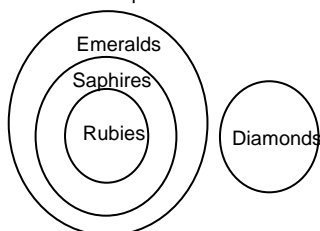
From the above diagram, all the given conclusions are negative and follow.

Let us negate the conclusions by drawing alternate diagrams. Negation of

- I. All rubies are sapphires.
- II. All rubies are emeralds.
- III. Some diamonds are sapphires.
- IV. All sapphires are diamonds.

No diagram can be drawn to prove III or IV.

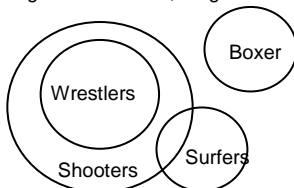
But negation of I and II is possible from this alternate diagram.



Hence III and IV follow.

Choice (3)

13. From the given statements, we get the following basic diagram.



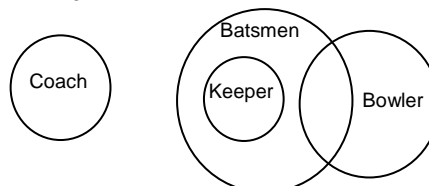
From the above diagram, all the given conclusions are negative and follow.

Let us negate the conclusions by drawing an alternate diagram as shown below.

- I. Some boxers are wrestlers.
- II. All boxers are wrestlers.
- III. All surfers are boxers.
- IV. All wrestlers are boxers.

No diagram can be drawn to prove any of the four. Hence, all of the given four conclusions follow. Choice (5)

14. The given statements can be represented in the following basic diagram.



In the above basic diagram, conclusion:

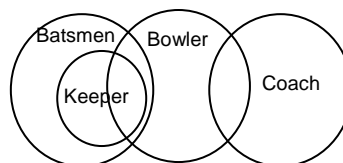
I is negative and follows.

II is negative and follows.

III is affirmative and does not follow.

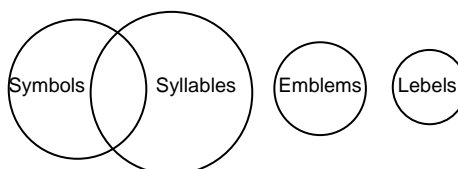
IV is affirmative and does not follow.

I and II are true but negative, let us try to negate them. The statement we have to prove true are "some coaches are bowlers" and "some keepers are bowlers" which can be proved true in the following diagram.



Thus, conclusion I is negated, does not follow. But conclusion I and III are contradictory to each other. Hence, either I or III follows. Choice (5)

15. The given statements can be represented in the following basic diagram.



In the above diagram, conclusion:

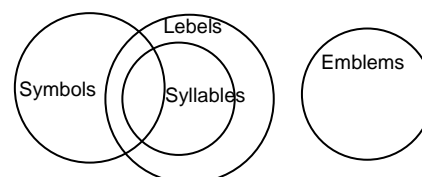
I is negative and follow.

II is affirmative and does not follow.

III is affirmative and does not follow.

IV is affirmative and does not follow.

Let us try to prove conclusion I false, so we have to prove "All syllables are lebel" and that is represented in the following diagram.

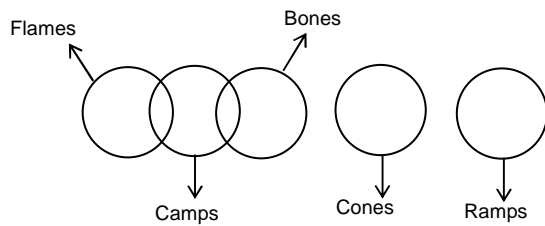


∴ None follows.

Choice (5)

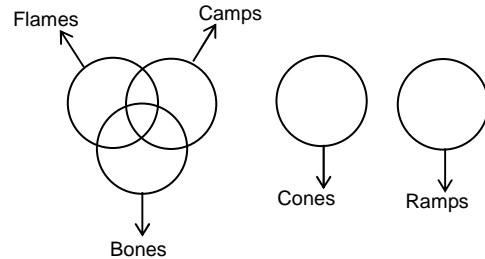
**Solutions for questions 11 to 15:**

16. The basic diagram for the given statements is,



The possible diagram for conclusion II cannot be drawn since it is given that "No camp is a ramp".  
 $\therefore$  Conclusion II does not follow.

The possible diagram for conclusion IV is shown below.



$\therefore$  Conclusion IV follows.

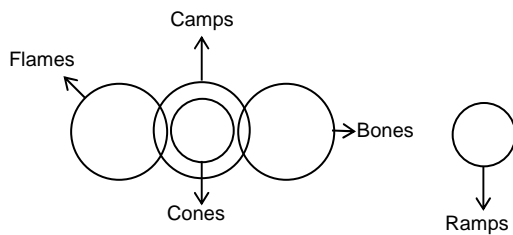
From the above basic diagram,

Conclusion I, negative, follows.

Conclusion III, affirmative, does not follow.

As the negative conclusion follows, let us try to negate it by drawing an alternative diagram.

The negation of conclusion I is 'All cones are camps'.

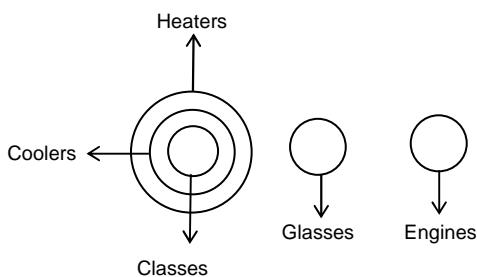


Conclusion I is negated, hence does not follow.

But conclusion III, which did not follow earlier follows now.

$\therefore$  Only IV and either I or III follow. Choice (4)

17. The basic diagram for the given statements is,



From the above basic diagram,  
 Conclusion I, affirmative, follows.

Conclusion IV, affirmative, does not follow.

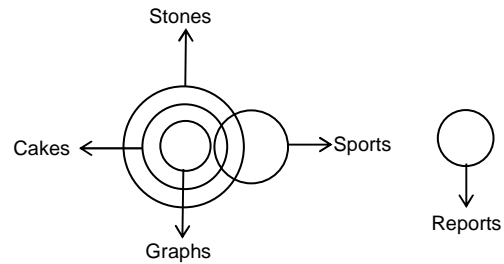
The possible diagram for "Some classes being engines is a possibility" cannot be drawn since it is given that "No heater is an engine".

$\therefore$  Conclusion II, "Some classes being engines is not a possibility", follows.

Conclusion III, a possibility, follows from the basic diagram.

$\therefore$  Only I, II and III follow. Choice (2)

18. The basic diagram for the given statements is,



From the above basic diagram,  
 Conclusion I, affirmative, does not follow.

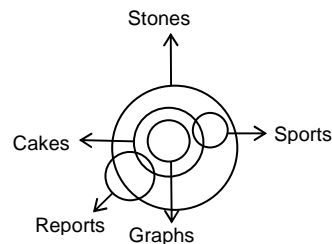
Conclusion II, affirmative, follows.

Conclusion III, negative, follows.

Conclusion IV, negative, follows.

As the negative conclusions III and IV follow, let us try to negate them by drawing an alternative diagram.

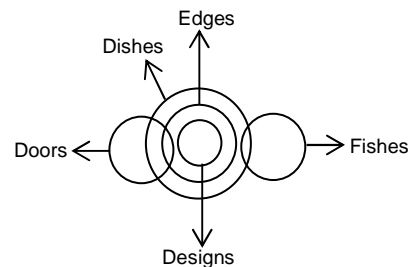
The negation of conclusion III is 'Some reports are cakes' and conclusion IV is 'All sports are stones'.



Conclusions III and IV are negated, hence do not follow.

$\therefore$  Only II follows. Choice (1)

19. The basic diagram for the given statements is,



From the above basic diagram,  
 Conclusion I, affirmative, follows.

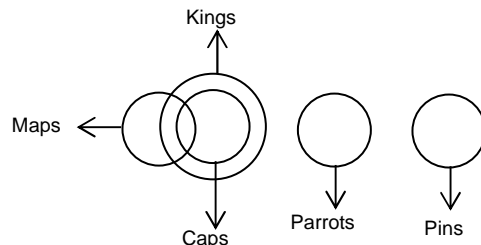
Conclusion II, affirmative, does not follow.

Conclusion III, affirmative, does not follow.

Conclusion IV, affirmative, follows.

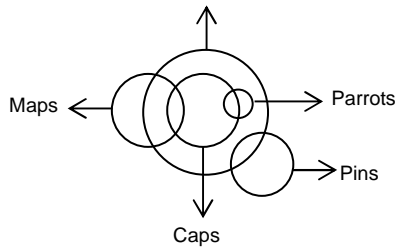
$\therefore$  Only I and IV follow. Choice (3)

20. The basic diagram for the given statements is,



From the above basic diagram,  
 Conclusion III, affirmative, follows.

The possible diagram for conclusions I, II and IV is an shown below.



∴ All follow . Choice (1)

### PRACTICE EXERCISE – 11

#### Solutions for question 1 to 5:

1. If  $\boxed{\text{Sania wins}}$  , then her  $\boxed{\text{rank improve.}}$
- The statement is of the form 'If p, then q'. The implications are (i)  $p \Rightarrow q$  and (ii)  $\neg q \Rightarrow \neg p$ .  
Choice (C) is according to (ii). Choice (C)

2. Whenever  $\boxed{\text{my parents are away}}$  ,  $\boxed{\text{I have fun.}}$
- The statement is of the form 'whenever p, then q'. The implications are, (i)  $p \Rightarrow q$  and (ii)  $\neg q \Rightarrow \neg p$ .  
Choice (B) is according to (i). Choice (B)

3. Only if  $\boxed{\text{the aesthetic sense prevails}}$  , t then  $\boxed{\text{corruption vanishes.}}$
- The statement is of the form, 'only if p, then q'. The implications are, (i)  $\neg p \Rightarrow \neg q$  and (ii)  $q \Rightarrow p$ .  
Choice (D) is according to (ii). Choice (D)

4. Unless  $\boxed{\text{the apple cart is full,}}$   $\boxed{\text{there will be no balance.}}$
- The statement is of the form, 'unless p, q'. The implications are, (i)  $\neg p \Rightarrow q$  and (ii)  $\neg q \Rightarrow p$ .  
Choice (B) is according to (ii) and Choice (C) is according to (i). Choice (D)

5. Either  $\boxed{\text{the king is efficient}}$  or  $\boxed{\text{the subjects are disciplined.}}$
- The statement is of the form, "either p or q". The implications are, (i)  $\neg p \Rightarrow q$  and (ii)  $\neg q \Rightarrow p$ .  
Choice (B) is according to (i). Choice (B)

#### Solutions for questions 6 to 11:

6. If  $\boxed{\text{you attend the party}}$  , then  $\boxed{\text{I will introduce you to them.}}$
- The statement is of the form, 'if p, then q'. The implications are, (i)  $p \Rightarrow q$  and (ii)  $\neg q \Rightarrow \neg p$ .  
 $A \Rightarrow p$ ,  $B \Rightarrow \neg p$   $C \Rightarrow q$   $D \Rightarrow \neg q$   
AC and DB are proper pairs. Choice (D)

7. Either  $\boxed{\text{Ram}}$  or  $\boxed{\text{Laxman}}$  will deliver the book.
- The statement is of the form, 'either p or q'. The implications are, (i)  $\neg p \Rightarrow q$  and (ii)  $\neg q \Rightarrow p$ .  
 $A \Rightarrow p$ ,  $B \Rightarrow q$   $C \Rightarrow \neg p$   $D \Rightarrow \neg q$   
CB and DA are proper pairs. Choice (B)

8. Unless  $\boxed{\text{your will is strong ,}}$   $\boxed{\text{you will not fulfill your dream.}}$
- The statement is of the form, 'unless p, then q'. The implications are, (i)  $\neg p \Rightarrow q$  and (ii)  $\neg q \Rightarrow p$ .  
 $A \Rightarrow \neg p$ ,  $B \Rightarrow q$   $C \Rightarrow p$   $D \Rightarrow \neg q$   
AB and DC are the proper pairs. Choice (A)

9.  $\boxed{\text{The government will be in place}}$  , only if  $\boxed{\text{there is a fair poll.}}$
- The statement is of the form, 'only if p, then q'. The implications are, (i)  $\neg p \Rightarrow \neg q$  and (ii)  $q \Rightarrow p$ .  
 $A \Rightarrow \neg q$ ,  $B \Rightarrow p$   $C \Rightarrow q$   $D \Rightarrow \neg p$   
DA and CB are the proper pairs. Choice (D)

10. whenever  $\boxed{\text{Rohit creates history}}$   $\boxed{\text{he is in form.}}$
- The statement is of the form, 'whenever p, then q'. The implications are, (i)  $p \Rightarrow q$  and (ii)  $\neg q \Rightarrow \neg p$ .  
 $A \Rightarrow \neg p$ ,  $B \Rightarrow \neg q$   $C \Rightarrow q$   $D \Rightarrow p$   
DC and BA are the proper pairs. Choice (D)

11.  $\boxed{\text{The face of the world would be different ,}}$  only if  $\boxed{\text{Cleo's nose is shorter.}}$
- The statement is of the form, 'only if p, then q'. The implications are, (i)  $\neg p \Rightarrow \neg q$  and (ii)  $q \Rightarrow p$ .  
 $A \Rightarrow \neg p$ ,  $B \Rightarrow p$   $C \Rightarrow q$   $D \Rightarrow \neg q$   
AD and CB are the proper pairs. Choice (A)

#### Solutions for questions 12 to 17:

12. The given statement is of the form, 'if p, then q' the negation of the statement is p and  $\neg q$ . Choice (D)
13. The given statement is of the form, 'p, only if q'. The negation of the statement is  $\neg q$  and p. Choice (B)
14. The given statement is of the form, 'either p or q', the negation of the statement is  $\neg p$  and  $\neg q$ . Choice (A)
15. The statement is of the form, q unless p, the negation of which is  $\neg p$  and  $\neg q$ . Choice (D)
16. The given statement is of the form, 'p and q', the negation of which is  $\neg p$  or  $\neg q$ . Choice (A)
17. The statement is of the form, 'p or q,' the negation of which is  $\neg p$  and  $\neg q$ . Choice (B)

#### Solutions for questions 18 to 25:

18. If  $\boxed{\text{he gets a gift}}$  , then it is  $\boxed{\text{a pen}}$  or  $\boxed{\text{a pencil}}$
- The statement is of the form, 'if p, then q or r'. The implications are,  
(i)  $p \Rightarrow q$  or  $r$   
(ii)  $p$  and  $\neg q \Rightarrow r$   
(iii)  $p$  and  $\neg r \Rightarrow q$

(iv)  $\neg q$  and  $\neg r \Rightarrow \neg p$

Choice (A) is according to (i).

Choice (B) is according to (iv).

Choice (C) is according to (ii).

Choice (D)

19. If you  $\boxed{\text{help}}$  and  $\boxed{\text{forget}}$ , then

$\boxed{\text{you will go to heaven.}}$

The statement is of the form, 'if p and q, then r'.

The implications are,

(i)  $p$  and  $q \Rightarrow r$

(ii)  $\neg r \Rightarrow \neg p$  or  $\neg q$

(iii)  $\neg r$  and  $p \Rightarrow \neg q$

(iv)  $\neg r$  and  $q \Rightarrow \neg p$

Choice (A) is according to (i).

Choice (A)

20. If  $\boxed{\text{you want to succeed}}$ , then  $\boxed{\text{you must read}}$  and  $\boxed{\text{practice}}$ .

The statement is of the form, 'if p, then q and r'.

The implications are,

(i)  $p \Rightarrow q$  and  $r$

(ii)  $\neg q$  or  $\neg r \Rightarrow \neg p$

(iii)  $\neg q \Rightarrow \neg p$ ,

(iv)  $\neg r \Rightarrow \neg p$

(v)  $\neg q$  and  $\neg r \Rightarrow \neg p$

Choice (A) is according to (i).

Choice (B) is according to (iv).

Choice (C) is according to (ii).

Choice (D)

21. If  $\boxed{\text{push}}$  or  $\boxed{\text{pull}}$ , then  $\boxed{\text{It gets damaged}}$

The statement is of the form, 'if p or q, then r'.

The implications are,

(i)  $p$  or  $q \Rightarrow r$

(ii)  $p \Rightarrow r$

(iii)  $q \Rightarrow r$

(iv)  $p$  and  $q \Rightarrow r$

(v)  $\neg r \Rightarrow \neg p$  and  $\neg q$

Choice (B) is according to (iii).

Choice (C) is according to (v).

Choice (D)

22. Only if  $\boxed{\text{you play}}$  your  $\boxed{\text{reflexes}}$  and  $\boxed{\text{flexibility}}$  improve.

The statement is of the form, 'only if p, then q and r'.

The implications are,

(i)  $q$  and  $r \Rightarrow p$

(ii)  $\neg p \Rightarrow \neg q$  or  $\neg r$

(iii)  $\neg p$  and  $q \Rightarrow \neg r$

(iv)  $\neg p$  and  $r \Rightarrow \neg q$

Choice (B) is according to (iii).

Choice (B)

23.  $\boxed{\text{the exam will be cancelled}}$ , only if  $\boxed{\text{the paper is leaked}}$  and  $\boxed{\text{it is known to all}}$ .

The statement is of the form, 'only if p and q, then r'.

The implications are,

(i)  $\neg p$  or  $\neg q \Rightarrow \neg r$

(ii)  $\neg p \Rightarrow \neg r$

(iii)  $\neg q \Rightarrow \neg r$

(iv)  $\neg p$  and  $\neg q \Rightarrow \neg r$

(v)  $r \Rightarrow p$  and  $q$

Choice (A) is according to (ii).

Choice (A)

24. Unless  $\boxed{\text{you go to school}}$ ,  $\boxed{\text{you will not pass}}$  or  $\boxed{\text{you will not have friends.}}$

The statement is of the form, 'unless p, q or r'.

The implications are,

(i)  $\neg p \Rightarrow q$  or  $r$

(ii)  $\neg p$  and  $\neg q \Rightarrow r$

(iii)  $\neg p$  and  $\neg r \Rightarrow q$

(iv)  $\neg q$  and  $\neg r \Rightarrow p$

Choice (A) is according to (iv).

Choice (B) is according to (iii).

Choice (C) is according to (ii).

Choice (D)

25. I will  $\boxed{\text{not go to a movie}}$ , unless  $\boxed{\text{I am bored}}$  or  $\boxed{\text{have no work}}$ .

The statement is of the form, 'unless p or q, r'.

The implications are,

(i)  $\neg p$  and  $\neg q \Rightarrow r$

(ii)  $\neg r \Rightarrow p$  or  $q$

(iii)  $\neg r$  and  $\neg p \Rightarrow q$

(iv)  $\neg r$  and  $\neg q \Rightarrow p$

Choice (A) is according to (i).

Choice (B) is according to (iv).

Choice (C) is according to (iii).

Choice (D)

## PRACTICE EXERCISE – 12

### Solutions for questions 1 and 2:

1. In these questions, the number of cuts is given, but not the direction in which they are applied, i.e. in one direction or different directions. Let us consider the following cases.

(i) All Cuts made in only one direction :

6 cuts in one direction, give  $6 + 1 = 7$  pieces.

(ii) Cuts made in two directions :

Distribution	No. of pieces
1, 5	$2 \times 6 = 12$
2, 4	$3 \times 5 = 15$
3, 3	$4 \times 4 = 16$

(iii) Cuts made in three directions :

Distribution	No. of pieces
4, 1, 1	$5 \times 2 \times 2 = 20$
3, 1, 2	$4 \times 2 \times 3 = 24$
2, 1, 3	$3 \times 2 \times 4 = 24$
2, 2, 2	$3 \times 3 \times 3 = 27$

From the above, it is clear that if the direction of cuts is not mentioned, we cannot get a unique value for the number of pieces obtained and also, the cube is cut into minimum number of pieces, i.e. 7, when all the cuts are applied in the same direction. The cube is cut into a maximum number of pieces, i.e. 27, when the cuts are distributed equally in all the three directions.

Hence, to cut the cube into maximum number of pieces the given number of cuts is to be distributed equally in the three directions.

But equal distribution is possible only when the given number of cuts is an exact multiple of three. The situation, when the given number of cuts is not a multiple of three is explained in the next solution.

2. Distribution
- | Distribution | No. of pieces                |
|--------------|------------------------------|
| 16, 0, 0     | $17 \times 1 \times 1 = 17$  |
| 14, 1, 1     | $15 \times 2 \times 2 = 60$  |
| 12, 2, 2     | $13 \times 3 \times 3 = 117$ |
| 10, 3, 3     | $11 \times 4 \times 4 = 176$ |
| 8, 4, 4      | $9 \times 5 \times 5 = 225$  |

6, 5, 5

$$7 \times 6 \times 6 = 252$$

- (i) From the above it is clear that when the given number of cuts is distributed as evenly as possible in the three directions i.e. 6, 5, 5 the number of pieces obtained is the maximum i.e. 252.

In the above questions the procedure followed is as follows.

- Distribution of the given number of cuts.
- Adding one to each of those distributed values.
- Multiplication of the resulting values.

The same can be applied for questions (ii) to (v).

Solutions for questions (ii) to (v):

	No. of cuts	Distribution	Max. No. of pieces
(ii)	11	4, 4, 3	$5 \times 5 \times 4 = 100$
(iii)	15	5, 5, 5	$6 \times 6 \times 6 = 216$
(iv)	19	7, 6, 6	$8 \times 7 \times 7 = 392$
(v)	20	7, 7, 6	$8 \times 8 \times 7 = 448$

### Solutions for questions 3 to 5:

These questions deal with the situation, where the number of pieces into which a cube is to be cut is given and the minimum number of cuts required is to be calculated.

- (i)  $512 = 512 \times 1 \times 1$   
 $\Rightarrow$  The number of cuts required is  $511 + 0 + 0 = 511$ .

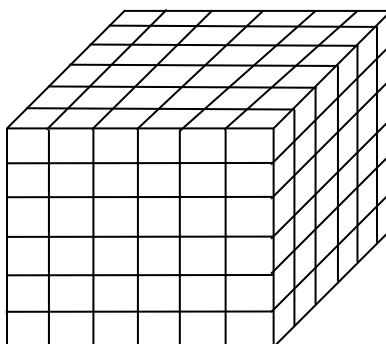
(ii)  $512 = 64 \times 8 \times 1$   
 $\Rightarrow$  The number of cuts required is  $63 + 7 + 0 = 70$ .

(iii)  $512 = 8 \times 8 \times 8$   
 $\Rightarrow$  The number of cuts required is  $7 + 7 + 7 = 21$ .

### Solutions for questions 6 to 9:

A cube's outer surface is painted and then it is cut into smaller pieces. Now the smaller pieces obtained have paint on some surfaces and the surfaces generated after the cut do not have any paint on them.

When a cube is cut into 216 smaller pieces by applying minimum number of cuts, it appears as follows



	The given cube $6 \times 6 \times 6 = 216$	No. of smaller pieces which have	Generalisation $n \times n \times n$
6.	8 corner pieces	(i) exactly three painted surfaces	8 corner pieces
7.	4 pieces at each edge i.e. $(6 - 2) \times 12$ edges = 48	(ii) exactly two painted surfaces	$(n - 2) \times 12$
8.	16 pieces at the middle of each surface i.e. $(6 - 2)^2 \times 6$ surfaces = 96	(iii) exactly one painted surface	$(n - 2)^2 \times 6$
9.	$4 \times 4 \times 4$ i.e. $(6 - 2)^3 = 64$	(iv) no painted surface	$(n - 2)^3$

### Solutions for questions 10 to 13:

Here the cube is cut into 216 pieces. The number of pieces into which each of the four edges of one direction are cut is 5, each of those in another direction into 6 and each of those in the third direction into 7 i.e., the cube appear in  $5 \times 6 \times 7$  format as shown below.

From the above it is clear that we cannot find a unique value for the number of cuts and also 21 is the minimum possible number of cuts required.

To find the minimum possible number of cuts required the given number of pieces should be factorised in a such a way that we get three equal factors. This is possible only when the given number of pieces is a perfect cube.

Calculating the minimum number of cuts required, when the number of pieces into which a cube is to be cut is not a perfect cube is explained in the next question.

- Here, to find the minimum number of cuts we factorise the given number of pieces in such a way that the factors are as equal as possible.

$$180 = 36 \times 5$$

$$(i) \quad 36 \times 1 \times 5 \Rightarrow 35 + 0 + 4 = 39$$

$$(ii) \quad 6 \times 6 \times 5 \Rightarrow 5 + 5 + 4 = 14 = \text{Minimum number of cuts.}$$

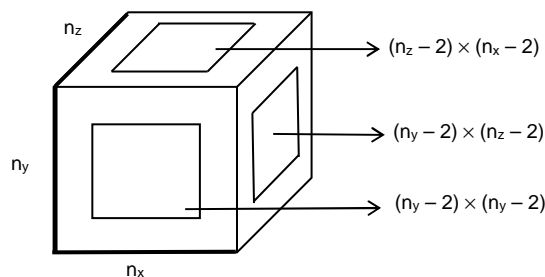
In the above question, the procedure followed is as follows:

- Factorisation of the given number.
- Subtracting one from each of the values.
- Adding the resulting values to get the total number of cuts.

The same can be applied for questions (i) to (v) given below.

5.

	No. of pieces	Factors	Min. No. of cuts
(i)	48	$4 \times 4 \times 3$	$3 + 3 + 2 = 8$
(ii)	150	$5 \times 5 \times 6$	$4 + 4 + 5 = 13$
(iii)	210	$5 \times 6 \times 7$	$4 + 5 + 6 = 15$
(iv)	294	$7 \times 7 \times 6$	$6 + 6 + 5 = 17$
(v)	343	$7 \times 7 \times 7$	$6 + 6 + 6 = 18$



i.e., Each of the horizontal edges have  $n_x$  number of pieces, each of the vertical edges have  $n_y$  number of pieces and each of the edges which are along the depth have  $n_z$  number of pieces.

The number of pieces having exactly two painted surfaces

$$= (n-2) \times 12$$

$$= (n-2) \times 4 \quad + \quad (n-2) \times 4 \quad + \quad (n-2) \times 4$$

(Horizontal)                      (Vertical)                      (into the depth)

$\therefore$  For a cube of  $n_x \times n_y \times n_z$  it is expressed as

$$(n_x - 2) \times 4 + (n_y - 2) \times 4 + (n_z - 2) \times 4$$

The number of pieces having exactly one painted surface

$$= (n-2)^2 \times 6$$

$$= (n-2)^2 \times 2 \quad + \quad (n-2)^2 \times 2 \quad + \quad (n-2)^2 \times 2$$

$$\left[ \begin{array}{c} \text{front and back} \\ \text{surfaces} \end{array} \right] \quad \left[ \begin{array}{c} \text{top and bottom} \\ \text{surfaces} \end{array} \right] \quad \left[ \begin{array}{c} \text{left and right} \\ \text{surfaces} \end{array} \right]$$

$\therefore$  For a cube of  $n_x \times n_y \times n_z$  it is expressed as  $(n_x - 2)$

$$(n_y - 2) \times 2 + (n_y - 2) (n_z - 2) \times 2 + (n_z - 2) (n_x - 2) \times 2$$

The number of pieces with no painted surface

$$= (n-2)^3$$

$$= (n-2) \times (n-2) \times (n-2)$$

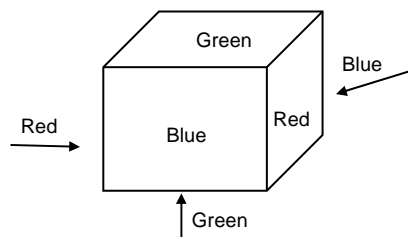
For a cube of  $n_x \times n_y \times n_z$  it is expressed as

$$(n_x - 2) \times (n_y - 2) \times (n_z - 2)$$

Q.No.	Formula for a $n_x \times n_y \times n_z$ cube	Answer for the given $5 \times 6 \times 7$ cube.
10.	Corner pieces	8
11.	$(n_x - 2) \times 4 + (n_y - 2) \times 4 + (n_z - 2) \times 4$	$(5 - 2) \times 4 + (6 - 2) \times 4 + (7 - 2) \times 4 = 48$
12.	$(n_x - 2) (n_y - 2) \times 2 + (n_y - 2) (n_z - 2) \times 2 + (n_z - 2) (n_x - 2) \times 2$	$(5 - 2) (6 - 2) \times 2 + (6 - 2) (7 - 2) \times 2 + (7 - 2) (5 - 2) \times 2 = 94$
13.	$(n_x - 2) (n_y - 2) (n_z - 2)$	$(5 - 2) (6 - 2) (7 - 2) = 60$

#### Solutions for questions 14 to 19:

The cube, after cutting, has  $6 \times 6 \times 6 = 216$  pieces. The pattern of painting is as follows.



14. Since no two adjacent surfaces have the same colour, each corner piece has three painted faces and each face has a different colour. Hence, the number of smaller cubes with all three colours on them is 8.

15. We find the smaller cubes with only red and green colours on them at the edges which are common for red and green surfaces. The number of small pieces with only red and green on them is

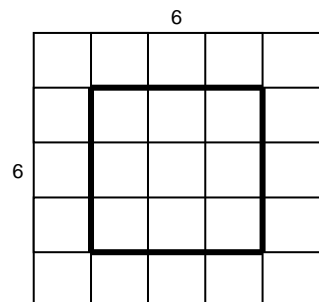
$4(\text{red - green edges}) \times 4 \text{ (at each edge)} = 16 \text{ pieces.}$

Similarly, the number of small pieces with only red and blue colours on them and those with only blue and green are 16+ each.

16. The number of small pieces with exactly two colours is  $(16 + 16 + 16) = 48$

This can also be obtained by applying the formula  $(n-2) \times 12$  i.e.  $4 \times 12 = 48$ .

17. We find the smaller pieces with only red colour on them, are at the middle of the surfaces painted red.



i.e.  $4 \times 4 = 16$  pieces on one red surface  $\times 2 = 32$  pieces.

Similarly, the number of small pieces with only blue colour and those with only green colour are 32 each.

18. The number of small pieces with exactly one colour is  $(32 + 32 + 32 = 96)$ .

This can also be obtained by applying the formula  $(n-2)^2 \times 6$ .

19. The number of small pieces with no colour on them is  $(n-2)^3$  i.e.  $(6-2)^3 = 64$ .

#### Solutions for questions 20 to 27:

20. Out of eight corner cubes, one has only red on it and two have all the three colours and the remaining five have two colours on them. Two cubes have all the three colours on them.

21. Among the corner cubes there is only one cube which has only green and red on it. Among the edges there are only two edges which have green and red on them, along each edge there are four cubes. Hence, there are 9 cubes which have only green and red.

22. There are 8 edges, which are common to two faces with different colours.

The number of cubes on these edges  $= 8 \times 4 = 32$

Out of the eight corner cubes. One has only red on it and two have all the three colours on them. Hence, five cubes have two colours on them.

$\therefore$  Total cubes  $= 32 + 5 = 37$ .

23. There are eight edges, which are common to two faces with different colours on them.

$\therefore$  The number of cubes on these edges (excluding those of corners)  $= 8 \times 4 = 32$

24. The number of cubes having only one colour along the

$$(i) \text{ faces} = 6 \times 4^2 = 96$$

$$(ii) \text{ edges} = 4 \times 4 = 16$$

$$(iii) \text{ corners} = 1 \times 1 = 1$$

$$\therefore \text{Total} = 113.$$

25. The number of cubes having exactly one painted surface in exactly one colour i.e., along the faces.

$$6 \times 4^2 = 96$$



26. The number of cubes having red colour along the, faces =  $3 \times 4^2 = 48$   
edges =  $9 \times 4 = 36$   
corners =  $7 \times 1 = 7$   
 $\therefore$  Total cubes with red colour on them = 91.  
 $\therefore$  cubes without red on them =  $216 - 91 = 125$ .
27. Out of the total cubes 64 cubes do not have any colour on them.  
Out of the remaining cubes = 152 there are 91 cubes with red on them  
Hence,  $152 - 91 = 61$  cubes have only blue or green but not red.

#### Solutions for questions from 28 to 31:

	61	62	63	64
	57	58	59	60
	53	54	55	56
49	50	51	52	48
33	34	35	36	44
17	18	19	20	40
1	2	3	4	24
				8
				12
				16

28. The numbers on the referred cubes are 1, 2, 3 and 4, whose sum is 10.  
Ans: 10
29. The required numbers are 1, 17, 33 and 49. These are in AP with a common difference of 16, whose sum is 100.  
Ans: 100
30. The required numbers are 13, 29, 45 and 61. These numbers are in AP with a common difference of 16, whose sum is 148.

#### Alternate Solution:

This scenarios can be viewed in relation to that in previous question. Each required cube, now, is 12 cubes away from each required cube of previous questions (from bottom to top).

Therefore, sum =  $100 + 12 \times 4 = 148$ .  
Ans: 148

31. The required numbers are 53, 54, 55 and 56, whose sum is 218.  
Ans: 218

#### Solutions for questions from 32 to 35:

	121	122	123	124	125
	116	117	118	119	120
	111	112	113	114	115
	106	107	108	109	110
101	102	103	104	105	100
76	77	78	79	80	95
51	52	53	54	55	75
26	27	28	29	30	90
1	2	3	4	5	85
					65
					60
					45
					40
					25
					20
					15
					10

32. The required numbers are 7, 32, 57, 82 and 107. These numbers are in AP with a common difference of 25, whose sum is 285.  
Ans: 285
33. The required numbers are 101, 107, 113, 119 and 125. These numbers are in AP with a common difference of 6, whose sum is 565.  
Ans: 565
34. The required numbers are 1, 32, 63, 94 and 125. These numbers are in AP with a common difference of 31, whose sum is 315.  
Ans: 315
35. The required numbers are 5, 34, 63, 92 and 121. These numbers are in AP with a common difference of 29, whose sum is 315.  
Ans: 315

#### PRACTICE EXERCISE – 13

#### Solutions for questions 1 to 4:

The given information

Annual returns in ₹	Rate of interest	Amount invested in ₹	Remarks
7,200	6%	1.2 lakhs	From (v) it is clear that the person with highest annual returns didn't invest in higher interest rate so person with highest annual rate didn't invest in company which offers 8%
3,600	4%	90,000	
4,000	5%	80,000	
4,800	8%	60,000	
3,000	3%	1 lakh	

From (ii) and (iii) B invests an amount of ₹90,000 and C invests an amount of ₹80,000. From (i) D received the highest annual returns. From (iv), E and A invested ₹1lakh and ₹60,000 respectively.

So the final distribution table is

Employee	Invested amount in ₹	Annual rate of interest	Annual returns received in ₹
A	60,000	8%	4,800
B	90,000	4%	3,600
C	80,000	5%	4,000
D	1.2lakh	6%	7,200
E	1lakh	3%	3,000

- The amount invested by employee A was ₹60,000.  
Choice (A)
- The annual returns received by employee E were ₹3,000.  
Choice (A)
- That B invested an amount of ₹90,000 is true.  
Choice (C)
- Both the statements that, A invests an amount of ₹80,000 and E invests an amount of 1.2 lakhs are false.  
Choice (D)

#### Solutions for questions 5 to 7:

From the given information the amount that remained with each person after the completion of round 3 is ₹640 In round 3, R lost the game so he pays the amount to P and Q, such that their amounts get doubled.

So by the above logic the amount with each of P and Q before round 3 is  $\frac{640}{2} = ₹320$  and the amount that remained with R is  $(640 + 320 + 320) = ₹1,280$ . Similarly, the amounts with P, Q, and R can be calculated before round 2 and round 1.

	Amount with P in ₹	Amount with Q in ₹	Amount with R in ₹
After round 3	640	640	640
After round 2 (or) Before round 3	320	320	1,280
After round 1 (or) before round 2	160	1,120	640
Before round1 (or) initial funds	1,040	560	320

5. The initial amount with person P before round1 is ₹1,040.  
Choice (B)
6. The amount that remained with person Q after the completion of round1 is ₹1,120.  
Choice (D)
7. The total amount that remained with three persons after the completion of round 2 is  $320 + 320 + 1280 = ₹1920$ . This will be the total amount with the three persons together at any point of time.  
Choice (C)

#### Solutions to questions 8 to 12:

The table in the given data can be filled in completely, By filling in the data year wise using the given conditions.

From (i)  $N = 50$  for Grade I across all years 2012 to 2016.

From (ii), for any grade either  $P = N + R$  or,  $N = 0$ , if  $R > P$ , thus for all grades except grade I,  $N = 0$  if  $P = 0$  or  $P = 10$ ; R is always a multiple of 10.

From (ix), all students of only Grade V of 2014 are promoted, therefore  $R \neq 0$  except for Grade V in 2015.

Therefore, from (iv), value of R for all five grades in a year will be five different values among 10, 20, 30, 40 and 50. Thus the total number of students retained in any year will be  $10 + 20 + 30 + 40 + 50 = 150$  except for the year 2015, where grade V has  $R = 0$  and from (v), lowest number of students retained in a year is 140. Thus in the year 2015, values of R are five different values among 0, 20, 30, 40 and 50.

Further, from (vii), for any grade across each of the years 2013, 2014, 2015 and 2016, the value of R will be four different values among 10, 20, 30, 40 and 50.

Across all years promotees in Grade I, i.e. 'P' will be zero, i.e. for Grade I,  $P = 0$ ;

Enrollments in 2013;

	'12	2013				
	T	N	R	P	T	
I	50	50	50	0	100	$N$ is 50; $\Rightarrow R = 100 - 50 = 50$ ;
II	50	0	40	0	40	$P = 50 - 50 = 0$ ; $\Rightarrow R > P \Rightarrow N = 0$ ;
III	50	0	20	10	30	$P = 50 - 40 = 10 \Rightarrow N = 0$ ; $R = 20$ as 30 from previous year are promoted
IV	50	20	10	30	60	$R = 10$ (only possibility), $N = 30 - 10$ ;
V	50	10	30	40	80	$P = 50 - 10 = 40$ ; $N = 40 - 30 = 10$ ; $T = 80$

Enrollments in 2014;

	'13	2014				
	T	N	R	P	T	
I	100	50	40	0	90	$N$ is 50; $\Rightarrow T = 50 + 40 = 90$ ;
II	40	50	10	60	120	$P = 100 - 40 = 60$ ; $\Rightarrow R$ cannot be 30(III), 40(I), 20(2015) or 50(2016); so $R = 10 \Rightarrow N = 50$ ; $T = 120$
III	30	0	30	30	60	$P = 40 - 10 = 30 \Rightarrow N = 30 - 30 = 0$ ; $T = 30 + 30 = 60$
IV	60	0	50	0	50	$P = 30 - 30 = 0 \Rightarrow N = 0$ ; 10 promoted $\Rightarrow R = 50 \Rightarrow T = 50$ ;
V	80	0	20	10	30	$R = 20$ (only possibility). $R > P \Rightarrow N = 0$ ; $T = 20 + 10 = 30$

Enrollments in 2015;

	'14	2015				
	T	N	R	P	T	
I	90	50	30	0	80	$N$ is 50; $\Rightarrow T = 50 + 30 = 80$ ;
II	120	40	20	60	120	$P = 90 - 30 = 60$ ; $\Rightarrow N = 60 - 20 = 40$ ;
III	60	50	50	100	200	$R = 50$ (only possibility); $\Rightarrow N = 100 - 50 = 50$ and $T = 200$
IV	50	0	40	10	50	$R$ cannot be 10(2013) or 50(2014); $R = 40$ ; $P = 60 - 50 = 10$ ; $R > P \Rightarrow N = 0$ ; $T = 50$
V	30	10	0	10	20	$R = 0$ in 2015 (given); $P = 50 - 40 = 10$ ; $\Rightarrow N = 20 - 10 = 10$ ;

Enrollments in 2016;

	'14	2015				
	T	N	R	P	T	
I	80	50	20	0	70	$N$ is 50; $\Rightarrow R = 70 - 50 = 20$ ;
II	120	10	50	60	120	$P = 80 - 20 = 60$ ; $N = 60 - 50 = 10$ ; $T = 10 + 50 + 60 = 120$ ;
III	200	30	40	70	140	$R = 40$ (only possibility). $P = 120 - 50 = 70$ ; $N = 70 - 40 = 30$ ; $T = 140$
IV	50	130	30	160	320	$R = 30$ (only possibility). $P = 200 - 40 = 160$ ; $N = 160 - 30 = 130 \Rightarrow T = 320$ ;
V	20	10	10	20	40	$P = 50 - 30 = 20$ ; $N = 20 - 10 = 10$ ;

Thus the complete data will be

	2012	2013				2014				2015				2016			
Grade	T	N	R	P	T	N	R	P	T	N	R	P	T	N	R	P	T
I	50	50	50	0	100	50	40	0	90	50	30	0	80	50	20	0	70
II	50	0	40	0	40	50	10	60	120	40	20	60	120	10	50	60	120
III	50	0	20	10	30	0	30	30	60	50	50	100	200	30	40	70	140
IV	50	20	10	30	60	0	50	0	50	0	40	10	50	130	30	160	320
V	50	10	30	40	80	0	20	10	30	10	0	10	20	10	10	20	40
Certifications				20				60				30				10	

8. Total Grade V certifications issued = the total number completed grade V.  
 $= (50 - 30) + (80 - 20) + (30 - 0) + (20 - 10) = 20 + 60 + 30 + 10 = 120$ .  
 Ans: (120)

9. 130 enrollments for Grade IV in 2016 is the highest.  
 Ans: (130)

10. In all total 100 new enrolments made in 2014.

Ans: (100)

11. The total strength of students in the year 2015 =  $80 + 120 + 200 + 50 + 20 = 470$ .  
 Ans: (470)

12. From the above total it can be seen that the highest 'new enrolment KBC Ltd had seen is in 2012. Ans: (2012)

### Solutions for question 13 to 16:

From (i) and (v) it is clear that P and S pick up 5 and 1 coins respectively.  
 From (v) and (vi) it is clear that Q has picked all the coins which have multiples of 3 on them.  
 From (iii), S has picked up a single coin, which has number 26 printed on it.  
 Finally, from (v) the distribution is as follows:

Name of persons	P	Q	R	S
Number of coins picked up	5	4	2	1
Numbers on the coins picked up	22, 28, 29, 23, 31	21, 24, 27, 30	20, 25	26

13. Four coins were picked up by person Q. Choice (C)  
 14. Of all the coins picked up by P, 22 is the least number. Choice (D)  
 15. The sum of the numbers on the coins picked up by Q is  $21 + 24 + 27 + 30 = 102$ . Choice (C)  
 16. (20, 25) are picked up by R. Choice (D)

From (iii), B is not the person who answered all questions correctly.

Case (3)

Let us assume that C is the person who answered all the questions correctly.

	Questions no. 1	Questions no. 2	Questions no. 3	Questions no. 4	Questions no. 5
A	x	✓	x	✓	✓
B	x	x	✓	x	x
D	x	✓	x	x	x
E	x	x	x	✓	x

From (iii) C also cannot be the person who answered all questions correctly.

Case (4)

Let D be the person who answered all questions correctly. Then the answers of the remaining persons would be

	Questions no. 1	Questions no. 2	Questions no. 3	Questions no. 4	Questions no. 5
A	✓	✓	✓	x	✓
B	✓	x	x	✓	✓
C	x	✓	x	x	x
E	✓	x	✓	x	✓

from (ii) and (iii) D is the person who has got all the questions correct in the examination.

17. D is the person who has got all the questions correct. Choice (C)  
 18. The right choice for question 2 is 'c'. Choice (B)  
 19. B answered 3 questions correctly. Choice (D)  
 20. D - 5 is the correct combination. Choice (B)

### Solutions for questions 17 to 20:

From the following given information.

Case (1)

Let us assume that A is the person who answered all the questions correctly.

Then the answers of the remaining person would be

	Questions no. 1	Questions no. 2	Questions no. 3	Questions no. 4	Questions no. 5
B	✓	x	x	x	✓
C	x	✓	x	✓	x
D	✓	✓	✓	x	✓
E	✓	x	✓	✓	✓

From (iii), A is not the person who answered all questions correctly.

Case (2)

Let us assume that B is the person who answered all the questions correctly.

	Questions no. 1	Questions no. 2	Questions no. 3	Questions no. 4	Questions no. 5
A	✓	x	x	x	✓
C	x	x	✓	x	x
D	✓	x	x	✓	✓
E	✓	x	x	x	✓

**Solutions for questions 21 to 23:**

21. When  $n = 10$ , we have to take one ball from the first box, two from the second and so on.  
If the total weight is 1 kg more, then the required box is the first. If it is 2 kg more, then it is the second box and so on.  
 $\therefore$  Only one weighing is required. Choice (A)
22. Take one ball each from the first five boxes and two balls each from the remaining. If the weight is 1 kg more, then the required box is in the first five. If it is 2 kg more, then it is in remaining five. Now, number these boxes from 1 to 5. Take one ball each from first two and two balls each from the next two. If the weight is same, then the required box is the fifth one. If it is 1 kg more, then it is between the first two. If it is 2 kg more, then it is between the next two. Now, one more weighing is required to find the required box.  
 $\therefore$  A total of 3 weighing are required. Choice (B)
23. Take one ball each from the first three, two balls each from the next three and three balls each from the next three. If the weight is same, then the 10<sup>th</sup> box is the required one. If it is 1 kg more, then it is between the first three. Similarly, we can find for the other groups.  
Now, number these three boxes and one more weighing is required (similarly as described earlier).  
 $\therefore$  Two weighings are sufficient. Choice (A)

**Solutions for questions 24 and 25:**

24.  $(G + C + E) + (A + D + G) + (F + B + D) = 15 + 15 + 15$   
 $\Rightarrow (A + B + C + D + E + F + G) + (D + G) = 45$   
 $\Rightarrow (2 + 3 + 4 + 5 + 6 + 7 + 8) + (D + G) = 45$   
 $\Rightarrow D + G = 10$   
 But  $A + D + G = 15 \Rightarrow A = 5$ . Choice (A)
25. From the choices,  
 Choice (A): If the second player draws all the coins of the pile containing 4 coins, then the first person is left with 2 piles of 2 coins each, in which case he loses.  
 Choice (B): If the second person takes one coin from the pile of 2, the first takes all the coins of the pile of 4. Similarly if the second one takes all coins from the pile of 2, then the first and second persons take alternate coins from the pile of 4. Similar is the case for other possibilities.  
 Hence in any case, the first person wins. Choice (B)

**PRACTICE EXERCISE – 14****Solutions for questions 1 to 3:**

As it is a knock out tournament for eliminating any single player, one match is needed. Now only one of the 64 players is to be the winner, hence remaining 63 players are to be eliminated. Hence, 63 matches are required.

1. If each match is an upset, we will get a maximum of 63 upsets. Choice (B)
2. As there are no upsets, all the top 8 players will reach quarter finals. In the quarterfinals, seed 1 plays seed 8, seed 2 plays seed 7, seed 3 plays seed 6, seed 4 plays seed 5. Choice (A)
3. In the first round, seed 43 plays seed 22. In the second round, seed 43 plays with winner of the match between seed 11 and seed 54. In the third round, seed 43 and the winner, of the matches between 59<sup>th</sup> and 6<sup>th</sup> seeded players or the winner of 27<sup>th</sup> and 38<sup>th</sup> seeded players are played.  
 $\therefore$  43<sup>rd</sup> seeded player would have played with 6<sup>th</sup> or 27<sup>th</sup> or 38<sup>th</sup>, or 59<sup>th</sup> seeded player in the third round.  
 Choice (D)

**Solutions for questions 4 to 6:**

The following table shows the changes in the pocket money, expenditure and savings of each boy in this month.  
 "+" indicates increase. "-" indicates decrease.

Name of the boy	Pocket money P	Expenditure Q	Savings P – Q
A	+10	+5	+5
B	-5	-5	0
C Note (a)	+25	+35	-10
D Note (b)	+5	0	+5
E Note (c)	-20	0	-20

Note (a): A's saving is ₹5 more than the normal saving [say  $z + 5$ ; where  $z$  = normal saving]. C's saving is ₹15 less than A's savings.

$$\Rightarrow z + 5 - 15 = z - 10$$

$\Rightarrow$  ₹10 less than the normal saving.

$$\text{Now } P = 25; P - Q = -10$$

$$\Rightarrow Q = 35$$

Note (b): B's pocket money =  $x - 5$  [where  $x$  = normal pocket money]

$$\Rightarrow D's = x - 5 + 10 = x + 5$$

$$P = +5 \text{ and } P - Q = +5 \Rightarrow Q = 0$$

Note (c):  $C = x + 25$

$$E = x + 25 - 45 = x - 20$$

E's expenditure did not change  $\Rightarrow Q = 0$

$$P = -20; Q = 0$$

$$\Rightarrow P - Q = -20$$

$\Rightarrow$  Saving is reduced by ₹20.

It is given that E could not save any money.

$$\Rightarrow z - 20 = 0 \text{ [where } z \text{ is the normal saving.]}$$

$$\Rightarrow z = 20.$$

4. From the table, it can be observed that C's expenditure is the maximum, i.e. ₹35 more than the normal expenditure. Choice (C)
5. ₹20 is the normal saving. Choice (C)
6. C received ₹25 more than the normal pocket money, which is the maximum. Choice (C)

**Solutions for questions 7 to 10:**

It is given that

- (a) Kamal's tokens are perfect squares [any of 1, 4 and 9].  
 (b) Manish's tokens are multiples of 3 [any of 3, 6 and 9].  
 (c) Nihar's tokens are even numbers, one of which is a multiple of 3 [6 and any even number].  
 (d) Lohit gets exactly one token [assume that the number of this token is A].

Also assume that the number on second token of Nihar is B.

$$\text{Then } A = 6 + B$$

$$\Rightarrow 8 \leq A \leq 10$$

$$\Rightarrow A = 8 \text{ or } 10$$

[since sum of two even numbers is an even number.]

$$\Rightarrow B = 2 \text{ or } 4$$

Let us assume that

$$B = 4$$

Then,

$$\text{Kamal's tokens} = 1 \text{ and } 9$$

$$\text{Manish's tokens} = \text{only } 3$$

Because 9 is Kamal's token and 6 is Nihar's token.

But it is given that Lohit is the only person to get exactly one token.

$$\Rightarrow B \neq 4$$

$$\Rightarrow B = 2$$

$$\Rightarrow A = 8$$

$$\Rightarrow \text{Manish's tokens} = 3 \text{ and } 9$$

$$\Rightarrow \text{Kamal's tokens} = 1 \text{ and } 4$$

The following table shows the numbers of tokens:

Name of the boy	Tokens
Jayaraj	5, 7 and 10
Kamal	1 and 4
Lohit	8
Manish	3 and 9
Nihar	6 and 2

7.  $5 + 7 + 10$  is the required sum = 22. Choice (A)
8. 8 is Lohit's token. Choice (B)
9. 1 and 4 are the numbers on Kamal's tokens. Choice (C)
10. 3 and 9 are the numbers on Manish's tokens. Choice (B)

#### Solutions for questions 11 to 15:

From the information, the maximum number of persons travelling by any car is three, in each car there are at least one male and one female. We can say that the ratio of the persons travelling by all cars is 2 : 3 : 3.

From the information only G and F's sister are travelling to Bangalore, we can say that G is a male and F is not travelling to Bangalore and only two persons are travelling to Bangalore. From the above information, B and E are travelling by the same car, but it is not a Wagon R, we can say that B and E are not travelling to Bangalore i.e., either they are travelling to Chennai or Hyderabad.

From the information, C who is a female, and A are travelling to the same place but not to Hyderabad, and A is a female. We can say that they must be travelling to Chennai.

Hence B and E are travelling to Hyderabad.

From the information, A and A's brother H are travelling by two different cars, we can say that H is travelling to Hyderabad since H is a male.

Hence D is travelling to Bangalore and F is travelling to Chennai. From the information, two females are travelling by Honda city and D is not travelling by Wagon R, we can say that the persons travelling to Bangalore are not travelling by Wagon R and Honda city.

Hence D and G are travelling by Swift.

From the information B and E are not travelling by Wagon R, we can say that they are travelling by Honda City.

∴ B, E and H are travelling by Honda City.

Thus A, C and F are in Wagon R

Since two females are there in Honda City, B and E must be females.

Since at least one male is in each car, we can say that F is a male.

Name of the person	CAR	CITY	Gender
A	Wagon R	Chennai	Female
B	Honda City	Hyderabad	Female
C	Wagon R	Chennai	Female
D	Swift	Bangalore	Female
E	Honda City	Hyderabad	Female
F	Wagon R	Chennai	Male
G	Swift	Bangalore	Male
H	Honda City	Hyderabad	Male

11. There are 5 females. Choice (C)
12. A, C and F are travelling in Wagon R. Choice (C)
13. F is travelling to Chennai. Choice (B)
14. Except 'F', all are females. Choice (D)
15. Choice (C) is true. Choice (C)

#### Solutions for questions 16 to 18:

From (i) we can say that B is at the extreme end and C is at the second position from left.

From (iv) we can say that A is at the extreme left of the row and P is opposite to B. ∴ D is to the immediate left of B.

From (ii), we can say that C is wearing a yellow coloured shirt and the person who is opposite A is wearing a black coloured shirt.

Now, we get the following arrangement

Black			
			P
A	C	D	B
yellow			

From (v) we can say that M is opposite to C and P is wearing a white shirt.

From (iii) we get the position of Q and N.

From (vi) we can say that A is wearing a blue shirt and D is wearing a magenta coloured shirt. Thus, B is wearing a grey shirt. The complete arrangement is as follows.

Black	Red	Green	white
N	M	Q	P
A	C	D	B
Blue	Yellow	Magenta	Grey

16. B is wearing a grey shirt. Choice (C)
17. D – Magenta is the correct combination. Choice (B)
18. Except green, all the others are the shirt colours of persons in the same row. Choice (B)

#### Solutions for questions 19 to 21:

First, let us observe the second statements made by Madhuri and Mithu. Clearly, both of them cannot be true simultaneously. First, let us assume the second statement made by Madhuri is true, so the second statement of Mithu is false, which implies the first statement of Mithu is true.

∴ The second statement of Mamta is true.

∴ We get

Case (1):

Name	I	II	Belongs to	Working in
Mamta	F	T	Hyderabad	Delhi
Madhuri	F	T	Delhi	Mumbai
Mithu	T	F	Mumbai	Hyderabad

Now, let us assume the second statement of Madhuri is false, so, her first statement is true.

∴ The second statement of Mamta is true and also, the first statement of Mithu is true. So, we get,

Case (2):

Name	I	II	Belongs to	Working in
Mamta	F	T	Hyderabad	Mumbai
Madhuri	T	F	Mumbai	Delhi
Mithu	T	F	Delhi	Hyderabad

19. In case (1), Mithu belongs to Mumbai. Choice (C)
20. In case (2), the first statement of the person from Delhi is true. So, Mamta works in Mumbai. Choice (A)

21. Mamta belongs to Hyderabad. Choice (B)

**Solutions for questions 22 to 25:**

22. Condition given in this question is "Siddhu is two places away from Shastri". This implies that there is exactly one person between Siddhu and Shastri. Therefore,

In Case I : Siddhu must be in chair – 1.

In Case II: Siddhu must be in chair – 10.

In Case I : Agarkar must be in chair – 10 (between Kumble and Srinath).

In Case II: Agarkar must be in chair – 2 (between Kumble and Srinath).

Therefore, in either case, Agarkar must be exactly between Kumble and Srinath. Choice (C)

23. Condition given in the question is, "Agarkar is to the immediate left of Shastri".

Agarkar can be to the immediate left of Shastri in case I only, because in case II, Raju is to the immediate left of Shastri. Therefore, Case II cannot be considered.

Case I:

Agarkar is to the left of Shastri. This implies that Agarkar is in chair – 5. In this case, Siddhu must be in chair – 7, to the immediate left of Raman. Choice (D)

24. Let us start with assigning different possible chairs to Tendulkar.

If Tendulkar is given chair – 2, Gavaskar must be given chair – 10. Agarkar and Siddhu can be arranged in chair – 7 and 5 in two ways. (That is, Agarkar in chair – 7, Siddhu in chair 5, and vice versa).

That is, if Tendulkar is given chair – 2, there are two possible ways of arrangement. In the similar way, if we assign chair – 10 to Tendulkar, there will be another two possible ways of arrangement. Each of the assignment "chair – 7 to Tendulkar" and "chair – 5 to Tendulkar" will also give rise to two different ways. Thus, there are totally 8 different ways of assignment in one case. We have two possible cases (Case I and Case II). Therefore, there will be 16  $[8 \times 2]$  possible arrangements. Choice (A)

25. Condition given in this question is "Agarkar is to the right of Raju". This is possible only in case I but not in case II. (As there is Shastri to the right of Raju). That means Agarkar is in chair – 2. This implies that Siddhu is in chair – 10 (exactly between Kumble and Srinath). Choice (C)

**Solutions for questions 26 to 30:**

26. If a student enrolls for Forensic Medicine, he must enrol for Physiology and Pathology. Pathology enrolled  $\Rightarrow$  No Anatomy and hence, no Pharmacology.

Since Physiology & Cardiology are taken  $\Rightarrow$  cannot enrol for Ophthalmology.

Hence, choices (B), (C) and (D) are eliminated Choice (A) does not violate any condition. Choice (A)

27. If a student takes up Microbiology, then he must also take Pathology and Biochemistry. This implies Anatomy cannot be chosen. Since Anatomy cannot be chosen, even Pharmacology cannot be selected. Choice (D)

28. Since Pathology and Anatomy cannot be selected together, those courses, requiring these two as prerequisites, cannot be selected together. Hence, Microbiology or Forensic Medicine cannot be taken with Pharmacology. Choice (A)

29. If a student enrolls for Microbiology and Forensic Medicine, then he must also enrol for Biochemistry, Physiology and Pathology.

Since Pathology is taken, Anatomy, and hence Pharmacology, cannot be taken.

Since he has to take Physiology, he cannot take both Ophthalmology and Cardiology but only one of these two. Choice (D)

30. If D chooses Ophthalmology and Cardiology, then he cannot choose Physiology.

$\Rightarrow$  he cannot choose Pharmacology or Forensic Medicine. He cannot enrol for 3 courses. Also, out of Anatomy and Pathology, he can enrol only for one course. Hence, he cannot enrol totally for 4 courses.

$\Rightarrow$  he can take up a maximum of 5 courses. Choice (B)

**PRACTICE EXERCISE – 15**

**Solutions for questions 1 to 3:**

It is given that Qureshi made only one true statement. It implies that he made two false statements.

$\Rightarrow$  Qureshi's third statement is true and the other two are false.

$\Rightarrow$  Pranav's first statement is true. (From Qureshi's first statement) i.e. Pranav is not the top ranker.

$\Rightarrow$  Raja's first statement is false and the other two are true.

$\Rightarrow$  Raja is the second ranker and Qureshi is not the second ranker.

As Pranav is not the first ranker, Qureshi is the first ranker and Pranav is the third ranker.

$\Rightarrow$  Pranav's second statement is true and the third one is false.

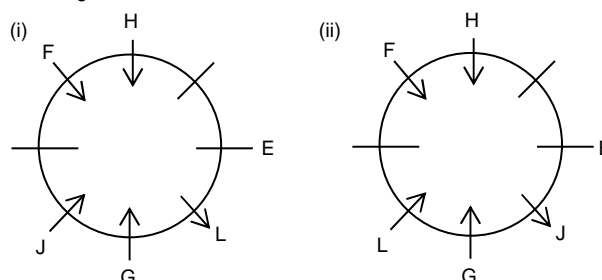
1. Qureshi is the first ranker. Choice (B)

2. Raja's statements are in the order false, true and true. Choice (C)

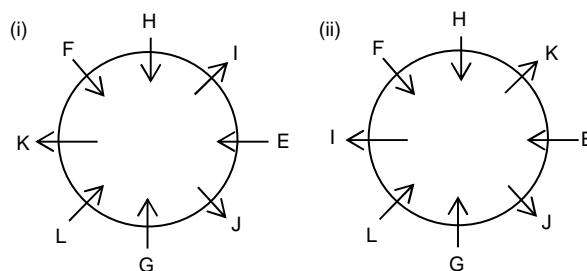
3. Pranav is the third ranker. Choice (A)

**Solutions for questions 4 to 7:**

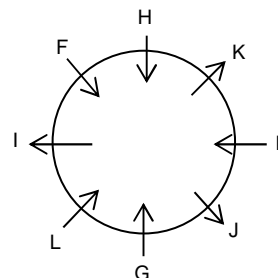
It is given that only G and H are facing each other. G sits to the immediate right of J and L. Also given that E sits third to the left of F, who sits to the immediate right of H. Then we get the following cases.



Also given that E and F face the same direction, E does not sit in the opposite place of J and L. Since I does not sit adjacent to J, case(i) is eliminated. Then we get the following possible cases.



Since E does not sit in the opposite place of K, case(i) is eliminated. Therefore, the final circular arrangement is as follows.



4. K sits second to the left of F. Choice (B)  
 5. E sits to the immediate right of K. Choice (A)  
 6. Four persons sit between J and H when counted to the right of J. Choice (D)  
 7. 'L sits to the immediate right of I' is definitely false. Choice (C)

#### Solutions for questions 8 to 11:

Statement I:

Costlier of watch and ring is the lightest.  
 Let us assume that ring is the lightest.

Statement II:

Heavier of necklace and ring is the cheapest.

Statement III:

Heavier of necklace and brooch is the costliest.

Statement IV:

Cheaper of ring and brooch is the heaviest.

If ring is the lightest, it cannot be the heaviest.

⇒ Brooch is the heaviest [statement IV].

⇒ Brooch is the costliest [statement III].

⇒ Necklace is the cheapest [statement II].

But brooch is the heaviest.

⇒ Brooch is heavier than ring.

⇒ Brooch is cheaper than ring [statement IV].

"Brooch is the costliest"; and "Brooch is cheaper than ring" are contradicting each other. Hence, our assumption is wrong.

⇒ Ring is not the lightest.

⇒ Watch is the lightest.

Statement V:

If brooch is costlier than necklace, then it is lighter than watch.

But we know that watch is the lightest.

⇒ Necklace is not lighter than watch.

⇒ Brooch is not costlier than necklace.

⇒ Necklace is costlier than brooch.

⇒ Necklace is the costliest [statement III].

⇒ Necklace is heavier than brooch.

⇒ Brooch is not the heaviest.

⇒ Ring is the heaviest [statement IV].

⇒ Ring is the cheapest [statement II].

Let us now rank the pieces of jewellery and show them in the following table.

Rank	Cost	Weight
1	Necklace	Ring
2	Brooch (or) Watch	Necklace
3	Brooch (or) Watch	Brooch
4	Ring	Watch

In the above table, 1<sup>st</sup> rank represents the costliest or the heaviest as the case may be.

Observation:

We do not know the rank of brooch and watch in terms of cost.

8. The logician's wife is talking about Brooch and Watch. Choice (B)

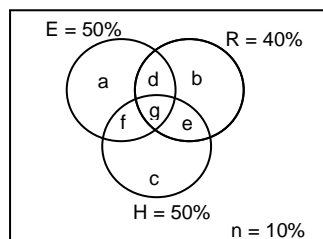
9. If we know the comparison between brooch and watch in terms of cost, we can determine the ranks list in both the comparisons. Choice (D)

10. Necklace is the costliest. Choice (A)

11. Watch is the lightest. Choice (B)

#### Solutions for questions 12 to 14:

Total = 100%



$$\begin{aligned}
 a + b + c + d + e + f + g + n &= 100\% \\
 \Rightarrow a + b + c + d + e + f + g &= 90\% \\
 50 + 40 + 50 - (e + d + f) - 2g &= 90\% \\
 \Rightarrow e + d + f + 2g &= 50\%
 \end{aligned}$$

12. Given  $e + d + f = 30\%$   $\therefore 2g = 20\%$   
 $\therefore g = 100 = 10\%$   
 $\therefore e + d + f = 3 \times 100 = 300$  Choice (A)

13. Given  $a + c + b = 60\%$   
 $\Rightarrow e + d + f + g = 90 - 60$   
 $\Rightarrow e + d + f + g = 30\% \text{ — (1)}$   
 But  $e + d + f + 2g = 50\% \text{ — (2)}$   
 $(2) - (1) \Rightarrow g = 20\%$   
 $a + c + b = 60\%$   
 $\Rightarrow a + c + b = 3e$   
 $\Rightarrow a + c + b = 3 \times 100 = 300$  Choice (C)

14. Given that g has the maximum value  
 $e + d + f + 2g = 50\%$   
 g has the maximum value when  $e + d + f = 0$   
 $\therefore 2g = 50\%$   
 $\Rightarrow g = 25\%$   
 But  $a + b + c + d + e + f + g = 90\%$   
 $\Rightarrow a + c + b + 25\% = 90\%$   
 $\Rightarrow a + c + b = 65\%$  Choice (C)

#### Solutions for questions 15 to 17:

The following are the possible combinations.

- I. Team  
 A: T, R, S and (V or W)  
 B: U, P, Q and (V or W)

- II. Team  
 A: T, R, S and (P or Q)  
 B: U, V, W and (P or Q)

- III. Team  
 A: T, P, Q and (V or W)  
 B: U, R, S and (V or W)

15. Possibility I gives two different combinations of teams. Possibilities II and III also give two different combinations each. Total number of ways is 6. Choice (D)

16. With this condition, possibilities I and III change as shown below.

- I: A: T, R, S and V  
 B: U, P, Q and W  
 III: A: T, P, Q and W  
 B: U, R, S and V

This means that there are only two ways under these possibilities. Possibility II will still give two ways of combination. Therefore, there are 4 ways. Choice (C)

17. By observation, we can say that the combinations given in choices (A), (C) and (D) are not possible. Compare with possibilities I, II and III given above, only (B) is possible and hence is the answer. Choice (B)

#### Solutions for questions 18 to 22:

From the given information.

I round scores – 2, 3, 4, 5, 6, 7

II round scores – 1, 3, 4, 5, 6, 8.

From (5), if Delhi scored 4 goals in each round, then the team which scored one goal in II round can never score more goals than Delhi, which contradicts (5).

$\therefore$  Delhi score of 3 goals in each of the first two rounds.

From (4), the only possibility of getting 10 goals in a match is 6 and 4 in II round. Now, as total number of goals of Maharashtra is not 10, in the first match the number of goals scored must be 7 and the number of goals conceded must be 3.  $\therefore$  3 goals are scored by Delhi is known for us.

∴ In the first round, Delhi and Maharashtra played and Maharashtra won.  
 ∴ Delhi won in the second round.  
 ∴ It must have conceded 1 goal in the second round.  
 ∴ In the second round, as the total number of goals scored is 10 in the match which Maharashtra played, Maharashtra loses it by scoring 4 goals and conceding 6 goals.

From (3) and the above results, As Maharashtra conceded 6 goals in the second round; Karnataka cannot concede 6 goals each in the first two rounds. If Karnataka conceded 5 goals each in the first two matches, then in the first match it have scored either  $5 + 2$  or  $5 - 2$  goals i.e., either 7 or 3 goals, which is not possible as Maharashtra and Delhi scored 7 and 3 goals respectively in the first round matches.

For the same reason as above, it cannot concede 3 goals each in the first two matches.

∴ Karnataka conceded 4 goals each in the first two matches.  
 ∴ It scored one of  $(4 + 2)$  and  $(4 - 2)$  are the number of goals in the first round and in the second round.

In the second round, no team scored 2 goals.

∴ Karnataka scored 2 goals in the first round and 6 goals in the second round.

From (1) and the above results, as West Bengal scored a total of 9 goals, It must have scored 4 and 5 goals in the first two matches [∴ It cannot scored 6 and 3 goals as Delhi scored 3 goals in each. of the first two rounds]. In the second round as Maharashtra scored 4 goals, West Bengal have scored 4 goals and 5 goals in the first and the second rounds respectively. As Karnataka conceded 4 goals in the first round, it played against West Bengal in the first round.

As West Bengal won in the first round, it should lose in the second round.

∴ It should concede 8 goals in the second round.

From (2) and the above results, Tamilnadu cannot score 6 goals in the first round, if so it has to concede 6 goals in the second round, which is not possible as Maharashtra conceded 6 goals in the second round.

∴ Tamilnadu must have scored 5 goals in the first round and conceded 5 goals in the second round.

∴ It had scored 8 goals in the second round. (West Bengal scored 5 goals and conceded 8 goals in the second round)

∴ Tamil Nadu has to lose in the first round. So, it must have conceded 6 goals in the second round.

∴ AP scored 6 goals and Tamilnadu conceded 6 goals in the first round and Andhra Pradesh scored 1 goal and conceded 3 goals in the second round.

∴ The final table for I round will be as follows:

(1) AP - Tamilnadu  
6 5

(2) West Bengal – Karnataka  
4 2

(3) Delhi – Maharashtra  
3 7

II round

(1) AP - Delhi  
1 3

(2) Karnataka - Maharashtra  
6 4

(3) West Bengal - Tamilnadu  
5 8

18. Maximum number of goals scored in any match is  $5 + 8 = 13$ .  
Choice (D)

19. Andhra Pradesh scored the least number of goals (1) in the second round match.  
Choice (C)

20. Tamilnadu scored  $5 + 8 = 13$  goals in the first two rounds, which is the maximum.  
Choice (B)

21. Against Andhra Pradesh, Delhi won the match in the first two rounds.  
Choice (D)

22. Maharashtra scored 7 goals in the match it won.  
Choice (C)

### Solutions for questions 23 to 26:

We can get the following table from the given information.

	Sing	Dance	Play Music
Delhi	Divya	Harish	Seema
Mumbai			Rohini
Kolkatta	~ Harish	Dilip	
Chennai	Harish	~ Divya	
Bangalore	Mahesh		
Hyderabad	Rohini ~ Mahesh		

In Delhi, as Harish is not performing with Divya or Seema they are not his partners. In Chennai as Dilip is not performing with Harish, they are not partners.

If Rohini is Harish's partner then Harish can sing in Chennai and Hyderabad only, but Harish has to sing in three cities. So, Mahesh is Harish's partner and they will be singing in Chennai, Bangalore and Mumbai.

Now, Divya and Rohini or Divya and Dilip can be partners.

If Divya and Rohini are partners, then they will play music in at least three cities (Chennai, Bangalore, Mumbai). As Divya plays music in only two cities, Divya and Dilip have to be partners.

So, Seema and Rohini are partners.

We will get the final performances as below.

	Sing	Dance	Play Music
Delhi	D, D	H, M	R, S
Mumbai	H, M	D, D	R, S
Kolkatta	D, D / R, S	H, M / D, D / R, S	H, M / D, D / R, S
Chennai	H, M	D, D	R, S
Bangalore	H, M	R, S	D, D
Hyderabad	R, S	D, D / H, M	D, D / H, M

D, D → Dileep and Divya.

H, M → Harish and Mahesh

R, S → Rohini and Seema

23. Dilip and Divya dance in Mumbai.  
Choice (B)

24. Dilip and Divya play music in Bangalore is true.  
Choice (C)

25. If Harish and Mahesh play music in Kolkatta and since Divya plays music in two cities, then Dilip and Divya will play music in Hyderabad.  
Choice (B)

26. If Rohini and Seema dance in Kolkatta then Dilip and Divya will Sing in Kolkatta. So, Harish and Mahesh will play music in Kolkatta. As Divya plays music in at least two cities she has to play music in Hyderabad. So Rohini and Seema will dance in Kolkatta. This statement is sufficient to know the complete schedule.  
Choice (C)



### Solutions for questions 27 to 30:

From (1), we can say that U lives either on the second floor or on the fourth floor. Suppose, U lives on the second floor, the person working in Google lives on the fourth floor.

From (3), T has to live on the sixth floor as T lives on the even-numbered floor and works in Cognizant.

From (4), the person working in Infotech has to live on the third floor, the person working in Infosys has to live on the fifth floor and the person working in Virtusa has to live on the ground floor. From (5), S must be living on the fourth floor and below Q. Since, either U or S works in Infotech, this case is eliminated as it is not possible.

Hence, U lives on the fourth floor, the person working in Google lives on the sixth floor.

T lives on the second floor and works in Cognizant. From (4), U must be working in Infotech and the person working in Infosys must be living on the seventh floor and the person working in Virtusa must be living on the ground floor.

From (5), S must be working in Google and Q must be working in Infosys.

From (2), the person working in Samsung must be living on the third floor.

From (6), P must be working in Samsung, R must be working in Virtusa and V works in Microsoft.

Hence, the final arrangement is as follows.

Floor	Person	Company
7	Q	Infosys
6	S	Google
5	V	Microsoft
4	U	Infotech
3	P	Samsung
2	T	Cognizant
1	R	Virtusa

27. R works in Virtusa. Choice (D)

28. V who works in Microsoft and lives on the fifth floor. Choice (B)

29. P lives on the immediate floor of T. Choice (A)

30. Three persons live between S and the person working in Cognizant. Choice (C)

### Solutions for questions 31 to 35:

From the given information, the number of people surveyed in five cities are as follows:

Bengaluru - 600

Hyderabad - 600

Kolkata - 400

Delhi - 200

Mumbai - 1000

The given information can be tabulated as follows:

	Vegetarians	Non-vegetarians	Males	Females
Delhi	80	120	150	50
Mumbai	380	620	450	550
Bengaluru	336	264	360	240
Kolkata	180	220	136	264
Hyderabad	144	456	444	156
Total	1120	1680	1540	1260

31. Minimum possible number of females who are non-vegetarians in Delhi =  $120 - 150 = -30$   
 $\Rightarrow$  No female is a non-vegetarian.  
 Minimum possible number of females who are non-vegetarians in Mumbai =  $620 - 450 = 170$ .

Similarly,

Minimum possible number of females who are non-vegetarians in Bengaluru, Kolkata and Hyderabad are 0, 84 and 12 respectively.

$\therefore$  Minimum possible number of females who are non-vegetarians in these cities =  $170 + 84 + 12 = 266$ .

Choice (C)

32. As we require the maximum number of females who are vegetarians  $\Rightarrow$  we take the minimum number of males who are vegetarians which is given as 30% at least in each city.  
 Maximum possible number of females who are vegetarians in Delhi =  $80 - 45$  (30% of 150) = 35  
 Maximum possible number of females who are vegetarians in Hyderabad =  $144 - 134$  ( $\approx$ 30% of 444) = 10  
 Maximum possible number of females who are vegetarians in Kolkata =  $180 - 41$  ( $\approx$ 30% of 136) = 139  
 Maximum possible number of females who are vegetarians in Bengaluru =  $336 - 108$  (30% of 360) = 228  
 $\therefore$  The required number is least in Hyderabad.

Choice (B)

33. Given 50% of females in Hyderabad = 78 are vegetarians  
 $\Rightarrow$  78 are non-vegetarians.  
 Hence the number of males who are non-vegetarians is  $456 - 78 = 378$ .

Choice (D)

34. It cannot be determined. Choice (D)

35. As per the condition range of number of female non-vegetarian from Bengaluru are 0 - 136 [as maximum male vegetarians from Kolkata is 136]  
 $\Rightarrow$  Range of male non vegetarians from Bengaluru (128, 264)  
 $\Rightarrow$  Male vegetarians will be of range from Bengaluru (96 - 232)  
 $\therefore$  The number of males who are vegetarians in Bengaluru cannot be 78. Choice (D)

### PRACTICE EXERCISE - 16

#### Solutions for questions 1 to 3:

From the given information, only one person is heavier than W but is not a doctor. Hence W is the second heaviest and is either an actor or an engineer.

Given, X is heavier than S and V but lighter than T  $\Rightarrow T > X > S, V$ .  
 Given, Y who is neither a doctor nor an actor is heavier than S but lighter than V  $\Rightarrow T > X > V > Y > S$  and Y is an engineer.  
 Given, Z is not the heaviest. Three persons are heavier than T, hence T is the fourth heaviest. Hence the persons in descending order of their weights are,

$\frac{U}{x \text{ doctor}} > \frac{W}{x \text{ doctor}} > \frac{Z}{x \text{ actor}} > \frac{T}{x \text{ actor}} > \frac{X}{x \text{ doctor}} > \frac{V}{x \text{ doctor}} > \frac{Y}{x \text{ doctor}} > \frac{S}{x \text{ doctor}}$   
 and the distribution is as shown below.

Actors	Doctors	Engineers
W	T	U
S	V	Z
	X	Y

1. U and Z, who are engineers, are heavier than X. Choice (C)

2. Nine teams that can be selected are,  
 (1) UWZT (4) UWTX (7) WZTX  
 (2) UWZX (5) UWTV (8) WZTV  
 (3) UWZV (6) UWXV (9) WZXV  
 Choice (A)

3. Six teams that can be selected are,  
 (1) WZT (4) WTY  
 (2) WZX (5) WXY  
 (3) WZV (6) WVY  
 Choice (D)

### Solutions for questions 4 to 6:

The given data can be tabulated as shown below:

Names	A	B	C	D	E
Amount got		B <sub>1</sub>		B <sub>1</sub> + 20	
No. of books bought	2	1	1	2 or 1	3 or 4
Amount left		B <sub>2</sub>		$\frac{B_2}{2}$	

Given that, the amount left with D is half of the amount left with B, hence the number of books bought by D is 2 and hence E bought 3 books. Since the amount left with D is less than the amount left with B.

Let the amount left with B = B<sub>2</sub> and the cost of a book = x.

Then B<sub>2</sub> = x(∵ Amount left with D =  $\frac{x}{2}$ )

As B bought one book, the amount received by B = x + x = 2x.

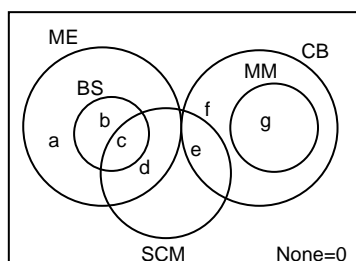
Given, D = 2x +  $\frac{x}{2}$ , D = B + 20 ⇒ 5x/2 = 2x + 20 ⇒ x = 40

(∴ Price of a book = 40).

4. Cost of a book is ₹40. Choice (B)
5. Amount received by D is ₹100. Choice (A)
6. E bought 3 books. Choice (A)

### Solutions for questions 7 to 11:

From (1), (2) and (4), the information can be represented as follows:



From

(3), the number of students who failed in four subjects is equal to the number of student who passed in only one subject = a + f.

### Solutions for questions 14 to 17:

Let us draw tables and fill the cells of the table with two signs "✓" and "×" using the information given. ✓ "implies "Yes" and "x" implies "No".

Name of the breed	Mark of Identification				
	Brown Scar	Long ears	Dot on ear	Single eyed	Cut tail
German Shepherd		×			
Labrador					×
Spaniel					
Great Dane					×
Alsatian	✓				

Owner of the dog	Mark of Identification				
	Brown Scar	Long ears	Dot on ear	Single eyed	Cut tail
Jane					
Jack					
Joel					✓
Johnny			×		
Jimmy		✓			

The number of students who failed in Microeconomics = e + f + g

a + f = e + f + g - 7 ⇒ a + 7 = e + g ----- (1)

From (4), c = 18 ----- (2)

From (6), c + d + e = 46

⇒ d + e = 28 ----- (3)

From (5), a = 17 and g = 13, f = 10

a = 17, g = 13

⇒ e = 11 (from (1)) ⇒ d = 17 (from (3))

As a + b + c + d + e + f + g = 108 ⇒ b = 22

7. The number of students who passed in exactly two subjects = b + d + e + g = 22 + 17 + 11 + 13 = 63. Choice (D)
8. The required number of students = b + c = 22 + 18 = 40. Choice (B)
9. No student passed in all the subjects except ME and MM. Choice (D)
10. The required number of students = d + e = 17 + 11 = 28. Choice (B)
11. (I) b + d + e + g + c = 22 + 17 + 11 + 13 + 18 = 81, true  
(II) d = 17, true  
∴ Both (I) and (II) are true. Choice (C)

### Solutions for questions 12 and 13:

From the information, V is adjacent to U and, Y and X are equidistant from U, we can say that Y and X are at ends and U is in the centre of the row. Now, Q is opposite U and R is to the immediate right of Q. Now, as R is not facing W, we can say that R is facing V, and W is to the immediate right of U. Thus, we get the following arrangement.

	R	Q		
X/Y	V	U	W	Y/X

Now from the information, S is not adjacent to P, who is not adjacent to T, so we can say that P is sitting at the right end in his row. Thus, S is at the left end and facing X. T is to the immediate right of S and facing W. Thus, Y is at the left end in his row. So, we get the following arrangement.

P	R	Q	T	S
Y	V	U	W	X

12. W is second to the right of V. Choice (B)
13. S, X is the pair of persons facing each other but in all the remaining pairs the second person faces a neighbour of the first person. Choice (D)

Name of the breed	Name of the owner				
	Jane	Jack	Joel	Johnny	Jimmy
German Shepherd	×				
Labrador		×		×	×
Spaniel					
Great Dane	×	×			×
Alsatian				×	

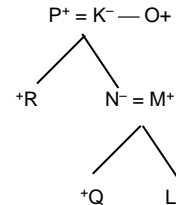
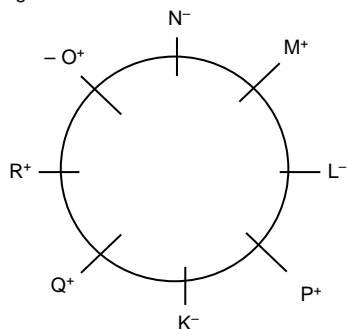
Alsatian is not owned by Jimmy because it has brown scar.  
 Jimmy's dog has long ears.  
 ⇒ Jimmy's dog is not German Shepherd.  
 ⇒ Jimmy's dog is Spaniel.  
 ⇒ Spaniel has long ears.  
 ⇒ German Shepherd has a cut tail because no other dog has this characteristic.  
 ⇒ Joel's dog is German Shepherd.  
 ⇒ Great Dane is Johnny's dog and Alsatian is Jack's dog, as they do not own any other dog.  
 ⇒ Labrador is Jane's dog.  
 ⇒ Jack's dog has brown scar.  
 ⇒ Jane's dog has dot on ear.  
 ⇒ Johnny's dog has single eye.  
 Great Dane belongs to Johnny and Johnny's dog has single eye.  
 ⇒ Great Dane is single eyed.  
 ⇒ Labrador has a dot on its ear.  
 This information is shown in the following table.

Name of the owner	Name of the breed	Mark
Johnny	Great Dane	Single eyed
Jane	Labrador	Dot on ear
Jimmy	Spaniel	Long ears
Joel	German Shepherd	Cut tail
Jack	Alsatian	Brown Scar

14. From the above table, it can be observed that only Choice (C) is true and is the answer. Choice (C)
15. The Spaniel has long ears. Choice (A)
16. Joel owns the German Shepherd. Choice (A)
17. Johnny's dog is single eyed. Choice (C)

#### Solutions for questions 18 to 21:

It is given that N's father sits second to the right of his grandson who is three places away from his sister. N's husband sits opposite Q who is the only son of N. Thus, we come to know that N has one daughter and one son.  
 From (3) and (4), N sits to the immediate right of her husband and K sits to the immediate left of N's father. N's brother has to sit to the immediate left of Q and N's maternal uncle sits to the immediate right of N. Since O is the brother – in – law of P, P is the husband of K.  
 As L is the niece of R, L must be the daughter of N and R must be the brother of N. M must be the husband of N. Hence, the final arrangement is as follows.



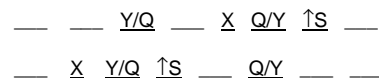
18. KP represents a couple. Choice (B)
19. N's brother sits second to the left of N's mother. Choice (B)
20. K sits to the immediate left of N's father. Choice (A)
21. P is the father of R. Choice (A)

#### Solutions for questions 22 and 23:

22. Molly is in waiting list in C<sub>3</sub> and C<sub>4</sub>.  
 ∴ Molly cannot be in waiting list further.  
 ∴ Molly must be rejected in C<sub>5</sub>.  
 ∴ Mahesh must be in waiting list in C<sub>5</sub>. Choice (D)
23. Let us assume Mridu is rejected in one college.  
 As Mahesh is rejected in four colleges. Among those four colleges, where Mahesh is rejected, in 3 colleges Mridu must be selected. So, in those three colleges, Molly must be in waiting list, which violates the given condition.  
 ∴ Mridu cannot be in the rejected list. Choice (D)

#### Solutions for questions 24 to 27:

It is given that two people sit between Q and Y who face different directions but neither B nor Y is the fourth one to sit from either end of the row. R faces south and sits adjacent to neither P nor Q. X sits second to the left of S. R and S face different directions. As R faces south S faces north and X sits second to the left of S. It can be represented as follows.



W sits between Q and Y but sits adjacent to neither X nor Y. P sits third to the left of W. Y and W face the same direction. X and Q face same direction. P and S face the same direction. P and Z face different directions. Hence the final seating arrangement is as follows.



24. R and P sit at the ends of the row. Choice (D)
25. Four people face south. Choice (B)
26. W sits second to the right of Z. Choice (A)
27. Except X, all the remaining face the north, whereas X faces south. Choice (C)

### Solutions for questions 28 to 31:

It is given that at least two students study each subject and play each game. No two students who study the same subject do not play the same game. Either H or M studies physics but neither of them plays tennis. J plays either cricket or hockey but do not study chemistry. Neither G nor K studies mathematics and plays cricket. J and K study the same subject. Hence both J and K study physics. K has to play either hockey or tennis. If K plays hockey either H or M has to play tennis. Hence, K plays tennis. G plays either mathematics or chemistry. But G does not study mathematics hence G studies chemistry. It can be represented as follows.

Person	Subject	Game
G	Chemistry	
H		
I		
J	Physics	
K	Physics	Tennis
L		
M		

One among H and M studies mathematics and the other studies physics. As M and I study the same subject, M and I study mathematics and H studies physics. L studies chemistry. L plays either tennis or hockey but not the same game which K plays. Hence, L plays hockey. Neither M nor H plays cricket. Hence, both play hockey. J and I play cricket.

Person	Subject	Game
G	Chemistry	Tennis
H	Physics	Hockey
I	Mathematics	Cricket
J	Physics	Cricket
K	Physics	Tennis
L	Chemistry	Hockey
M	Mathematics	Hockey

28. G studies chemistry. Choice (B)
29. M studies mathematics. Choice (A)
30. 'I – mathematics – cricket' is true. Choice (C)
31. Except 'L – mathematics', in all other options the person and their respective subject or game is given. Choice (D)

### Solution for questions 32 to 35:

32. From the choices,  
 (A) ACD is not a valid set as it consist only one negative premise.  
 (B) BCE is not a valid set as all the three premises are negative.  
 (C) AEF is not a valid set as it consist only one negative premise. Choice (D)
33. From the choices,  
 (A) In BCD, As B is particular negative and no other is particular, the only chance of combining C and D exist. As the term door is not distributed in C it should not get distributed in B, but it contradicts this rule. Hence BCD cannot be a valid set.  
 (B) AEF is a valid set as A can be concluded from E and F.  
 (C) DEB is not a valid set as it consists our terms among them.  
 (D) BDF is not a valid set as all the three premises are negative. Choice (B)
34. From the choices,  
 (A) In ADE, as D is particular, the only chance is to combine A and E but in both the premises, the term "cries" is not distributed. Hence, it is not a logically related.  
 (B) FEC is a valid set as F can be concluded from E and C  
 (C) In ABF, as B is particular, the only chance is to combine A and F but in both the premises, the term "cries" is not distributed. Hence it is not logically related.  
 (D) BDF is not a valid set as it consists four terms among them. Choice (B)
35. From the choices,  
 (A) ABC is not a valid set, as there exists only one negative statement.  
 (B) BDF is a valid set, as D can be concluded from B and F.  
 (C) CDE is also valid set as D can be concluded from C and E. Choice (D)