Solutions

Chapter – 1
(Linear Arrangement)

Exercise – 1(a)

Solutions for questions 1 to 5:

1. Let us analyse all the conditions. The lawyer is at the extreme right end of the row.

_____, _____, _____, ____, lawyer.
1 2 3 4 5

Grocer is to the immediate left of the lawyer

_____, _____, _____, grocer, lawyer.
1 2 3 4 5

The grocer is not next to the barber. So barber cannot be in seat 3.
The barber and the tailor are next to each other.
So the order of seating can be,
barber, tailor, doctor, grocer, lawyer
or
tailor, barber, doctor, grocer, lawyer.
or
doctor, barber, tailor, grocer, lawyer.
The blank is occupied by the doctor. So the doctor or tailor can be in the middle of the row. Choice (D)

2. Let us consider the given data. R is to the immediate right of T, i.e. T → R (TR), whereas P and Q have exactly two persons sitting in between them that can be in four possible ways as shown below.

(i) P – – Q – (ii) – P – – Q

(iii) Q – – P – (iv) – Q – – P

T and R must be between P and Q as they are next to each other.
In any case, S must be at one extreme end either at the left extreme or at the right extreme. Choice (D)

3. File C has as many items to its left as to its right. So it must be in the centre of the row. C is to the immediate left of box R.

So R must be at space 5.

1	2	3	4	5	6	7
			C	R		

The extreme ends must be occupied by only A and B, as no box is at the extreme ends. Box P is to the immediate right of file A. In any case, the third from the right end of the row is R. Choice (C)

4. Parvez sits to the immediate left of Chetan in the same row and opposite to Qadir. Ankit and Parvez have only one person between them. So, the arrangement in that row can be

Ankit – Parvez, Chetan.
Rinku and Bobby have two persons between them. So in their row, it may be Rinku – – Bobby or
Bobby – – Rinku
As Parvez sits opposite to Qadir, the two rows must have people as follows.

Rinku / Bobby	–	Qadir	Rinku/Bobby
Ankit	–	Parvez	Chetan

So, Ankit and Bobby may be diagonally opposite, just as Chetan and Rinku can be. Choice (C)

5. Books on Chemistry and Botany have exactly two books between them just as books on Maths and Physics have. Mathematics book is neither at the top nor at the bottom. So, the arrangement of Chemistry and Botany books may be as follows.

(i) Chemistry – Botany – (or) – Chemistry –- Botany or
(ii) Botany – Chemistry – (or) – Botany –- Chemistry

Maths books are not at any extreme. So, the arrangement may be as follows:
Chemistry Mathematics – Botany Physics or Physics Chemistry – Mathematics Botany or Botany Mathematics – Chemistry Physics or Physics Botany – Mathematics Chemistry.
In any of these possible arrangements, only the Anatomy book can be in the exact middle. Choice (C)

Solutions for questions 6 to 8:

Let us consider the positions as given below.

1	2	3	4	5	6	7	8	9	10

From (iii) G is in position 7.
From (ii) H, D and F are in positions 5, 3 and 1 respectively.
C cannot be in 2 or 4 or 6, because in such case (iv) cannot be fulfilled. Hence C has to be in 8, 9 or 10. If C is in 8 or 9, I, E and B will be in 2, 4 and 6 and then (i) cannot be satisfied. Hence, C is in 10 and J is in 6.
Then I, E and B are in 2, 4 and 8 respectively and A is in 9. Thus we get the following arrangement.

F	I	D	E	H	J	G	B	A	C
1	2	3	4	5	6	7	8	9	10

6. There are six persons sitting between I and A. Choice (B)

7. Only one arrangement is possible. Choice (D)

8. If F and H interchange their positions, then C and H will be at the ends. Choice (C)

Solutions for questions 9 to 12:

Seven persons M, N, O, P, Q, R and S sit in a row for a photo session. First, let us arrange them as per the given data. Here right and left directions will be as follows as they are facing us.

Right ← _ _ _ _ _ _ _ → Left
1 2 3 4 5 6 7

O is to the immediate left of S i.e, SO. S → O
R is to the immediate right of P i.e, RP. R ← P
N has equal number of persons on either side of him, so he must be in the exact middle of the row i.e. N is in the 4th place. M is to the immediate left of N, i.e., N → M. There are exactly 3 persons between S and M
i.e, S _ _ _ M or M _ _ _ S.

So, S and M can occupy the positions as follows:

Possibilities	1	2	3	4	5	6	7
I	S				M		
II	M				S		
III		S				M	
IV		M				S	
V			S				M
VI			M				S

Possibility V is not possible as O is to the left of S. Possibility II is ruled out as M is to the immediate left of N. Now as N has equal number on his either side he must be in position 4 and hence M must be in position 5. So all the possibilities, except I, are ruled out.
P must be at the right extreme only and Q must be the only person between O and N. Now as per all the above conditions, the order must be as follows:
S O Q N M R P

9. As per the seating arrangement from the data, N is to the immediate left of Q and O is to the immediate right of Q. Choice (A)

10. If Q sits to the immediate left of N, then the order will be as follows:
S O M N Q R P
Hence, he exchanges his seat with M. Choice (D)

11. The seating order is as follows.
S O Q N M R P
There are 2 persons between R and Q and they are M and N. Choice (A)

12. When P and Q exchange their places, the order is as follows.

S O P N M R Q

where Q sits to the left of N.
Hence, choice (A) is true.
M and O have 2 persons between them, hence choice (B) is true.
P and R sit together is not true, hence choice (C) is not true. S is at one extreme end is also true, hence choice (D) is true. Choice (C)

Solutions for questions 13 to 16:

Nine persons A, B, C, D, E, F, G, H and I sit in a row. As it is given that C, F and I sit together, the order may be one out of CFI, FIC, ICF, CIF, FCI and IFC.

E is to the immediate right of H, i.e. HE in this order.

B sits in the 4th seat from the left end and D is in the 3rd seat from the right end. Let us number the seats and then see.

1	2	3	4	5	6	7	8	9
			B			D		

H and E are not between B and D. So they must be in the two seats at the right extreme as C, F, I are next to one another. Hence, they sit in the 3 left extreme seats together. A and G sit as A, G or G, A, and they must be between B and D as no other space is left out, so the order is as follows.

In any order						
1	2	3	4	5	6	7	8	9
C	F	I	B	A	G	D	H	E

13. If G is to the immediate left of D, then the order will be as follows.

In any order						
1	2	3	4	5	6	7	8	9
C	F	I	B	A	G	D	H	E

The exact middle seat number 5 is occupied by A.
Choice (B)

14. If F sits between C and I, the arrangement can be any one of the following:

(i) C F I B A G D H E (ii) I F C B A G D H E
(iii) C F I B G A D H E (iv) I F C B G A D H E

Altogether 4 different seating arrangements are possible.
Choice (D)

15. The order from the data given in the directions is (C, F, I) B (AG) DHE, whereas CFI can be in any order and similarly A and G can be in any order. E is definitely at the extreme end of the row, whereas C or F or I may be at the other extreme end. Choice (C)

16. If I sits at one extreme end and F sits to the immediate left of B, then the seating arrangement is as follows.
ICFBAGDHE (OR) ICFBGADHE.
Thus, there are 2 possible arrangements. Choice (B)

Solutions for questions 17 to 20:

A, B, C, D, E, F and G are seven persons who parked their cars in a row. E's car and F's car should be next to each other, i.e. EF or FE. Similarly the cars of D and G should be next to each other, i.e. DG or GD. A's car and B's car should not be next to each other, whereas the cars of B and D are parked next to each other, i.e. BD or DB. C's car is parked to the immediate right of G's, i.e. G $\rightarrow$ C. Hence, they can be parked in the following order.

(i) E F or F E
(ii) D G or G D
(iii) B D G
(iv) B D G C

As A and B are not parked together, the arrangement can be as follows,

(i) A - - B D G C
(ii) - A - B D G C
(iii) - - B D G C A
(iv) - B D G C A -
(v) - B D G C - A
(vi) B D G C A - -
(vii) B D G C - A -
(viii) B D G C - - A

But as E and F must be together, the arrangement can be as follows. AFEBDGC or AEFBDGC
FEBDGCA (or) EFBDGCA
BDGCA (EF or FE) or BDGC (EF or FE) A

17. If A is not next to C, then the arrangement is A (EF or FE) BDGC or BDGC (EF or FE) A. Now A is 7th or 1st from the right end of the row. Choice (D)

18. If F does not park his car next to A's, then A's car is at the left extreme, and the parking arrangement is as follows.
A E F B D G C. The cars between E's car and G's car belong to F, B and D. Choice (D)

19. The different ways of parking are as follows.

A E F B D G C ; A F E B D G C;
E F B D G C A ; F E B D G C A ;
B D G C A E F ; B D G C A F E ;
B D G C E F A ; B D G C F E A;

There are 8 ways of parking the cars as per the given data.
Choice (B)

20. If A parks to the immediate right of C, then the parking arrangement is as follows : (EF or FE) BDGCA or BDGCA (FE or EF). So the left extreme end may be occupied by the cars of E or F or B. Choice (D)

Solutions for questions 21 to 24:

In point (2), it is given that X sits at the left end and Y sits second to the right of X. From (1), the person working in Hutch must be sitting at the right end and R is to the immediate left of him. From (3), W sits to the immediate right of Y who works in Hutch and sits opposite T. Since, from (4) T does not sit at the ends.
From the above points we get the arrangement as follows

Hutch					
	R		T		Row I
X		Y	W		Row II
		Hutch			

From (4), the person working in Mahindra does not sit at the ends. Hence, from (5) Q must be sitting to the immediate left of R and W works in Sonata. From (6), P and V sits opposite each other and P works in Sonata, Since persons working in the same company do not sit in the same row. From (8), neither V nor R works in Samsung. Hence, R must be working in Nokia and T works in Samsung. So, X also must be working in Samsung. Hence, V works in Nokia and U works in Mahindra.

The final arrangement is as follows.

Hutch	Nokia	Mahendra	Samsung	Sonata	
S	R	Q	T	P	Row I
X	U	Y	W	V	Row II
Samsung	Mahendra	Hutch	Sonata	Nokia	

21. U, who works in Mahindra sits opposite R. Choice (D)

22. None of the given options are true. Choice (D)

23. Except option (C), in all the other options given person sits opposite the person who is to the immediate left of given person's profession. Choice (C)

24. T and the person working in Nokia, i.e. R, are neighbours of Q. Choice (A)

Solutions for questions 25 to 27:

Given, J sits third to the right of Y, who is second to the right of M, Y faces north, M sits at an end and J and M face different directions. Hence, we can say that M faces north, J faces south and sits second from the right end.

Also given that, neither K nor L sits at an end and N is second to the right of J, hence N is to the immediate right of Y and Z sits at the right end. Given, K is second to the right of N, so K sits between M and Y and N faces south. AS, L is to the left of Z, Z is facing north. Given, no three persons, who sit in consecutive positions face the same direction, we get the following arrangement.

↑	↓	↑	↓	↑	↓	↑
M	K	Y	N	L	J	Z

25. Two persons sit between K and L Choice (B)

26. N sits second to the left of K. Choice (C)

27. 4 : 3 Choice (B)

Solutions for questions 28 to 30:

It is given that P does not sit at any end and P and R are not adjacent to each other. Hence, we get following possibilities.

(i) R _ P _
_ _ _ _

(ii) _ P _ R
_ _ _ _

It is given that A sits opposite neither P nor R and Q sits opposite the persons who sits second to the left of B

(i) R Q P _
_ A _ B

(ii) Q P _ R
A _ B _

S does not sit adjacent to R and C does not sit between A and B. Hence the final arrangement is as follows.

(i) R Q P S
C A D B

28. B sits opposite S. Choice (B)

29. S and B sit at the ends. Choice (B)

30. Except QD, in all other pairs, both persons sit opposite each other. Choice (A)

Exercise – 1(b)

Solutions for questions 1 to 3:

From (i), we can say that Harsha stopped working in the year 1996.
From (ii), we can say that Aksha stopped working in the year 1997.

From (ii) and (iii), we can say that Bindu has 7 years of experience. Since each person has different number of years of experience and Bindu started working in 1988 and stopped in 1995. From (iv) and (v), we can say that, Chandana and Lasya stopped working in the years 1989 and 1991 or 1990 and 1992 or 1991 and 1993 or 1992 and 1994 or 1993 and 1995 or 1998 and 2000 respectively.

Chandana did not stop working in 1994 or 1995, since no two persons stopped working in the same year. (From (vii))
From (v), and above we can say that Deeksha started working in 1989 or 1990 or 1991 or 1992 or 1993 or 1998.
From (vii), we can say that Chandana did not have one year experience. Hence we can say that Chandana did not stop working in 1989. Since she started working in 1988 (from (iv)).

If Chandana stopped working in 1991 (i.e., 3 years of experience) then Deeksha has 2 years of experience. i.e., Deeksha stopped working in 1993, which is not possible since Lasya stopped working in 1993. Similarly, Chandana did not stop working in 1992 or 1993 or 1997.
Hence Chandana stopped working in 1990, and Lasya stopped working in 1992 and hence Deeksha stopped working in 1991.

∴The arrangement is as shown below.
Let us represent the names with their starting letters.

Year	1988	89	90	91	92	93	94	95	96	97	98	99	2000
Started working	H, C, B	L	D	A									
Stopped working			C	D	L			B	H	A			

1. (Chandana, Deeksha), (Deeksha, Lasya), (Bindu, Harsha) and (Harsha, Aksha) stopped working in the consecutive years. Choice (B)

2. More than three persons started working in none of the years. Choice (D)

3. Lasya's work experience is 3 years. Choice (C)

Solutions for questions 4 to 6:

From the given information it is clear that Asha and Madhu are sitting adjacent to each other and Mahima is to the left of Asha and at least there is one person sitting between them. Kavita is to the left of Mahima. As, it is given that Lata is two places away to the left of Sandhya, there is one person between Lata and Sandhya and the person can be Kavita or Mahima. As Mahesh is not sitting adjacent to Kavita.

If they are sitting adjacent to Kavita, then the possible case is
I. Lata Kavita Sandhya Mahima Mahesh Asha Madhu

If they are sitting adjacent to Mahima, then the possible cases are
II. Kavita Lata Mahima Sandhya Asha Madhu Mahesh.
III. Kavita Lata Mahima Sandhya Mahesh Asha Madhu.

If they are sitting adjacent to Mahesh, then the possible case is
IV. Kavita Mahima Lata Mahesh Sandhya Asha Madhu.

4. There are 3 people between Mahesh and Mahima, if Madhu is not sitting at any end (i.e., II). Choice (D)

5. Kavita can sit to the left of Lata (i.e., II, III and IV). Choice (A)

6. Kavita is sitting at the extreme left end, if Sandhya is at the middle of the row (II and III). Choice (C)

Solutions for questions 7 to 9:

Males: - Aravind, Bharat, Chandrapaul and Daniel
Females: - Preeti, Revati, Sravani and Vanita
Cities: - Mumbai, Chennai, Kolkata and Hyderabad

With reference to the couples, the wife always sits to the immediate right of her husband.
From (i), Bharat is not the husband of Preeti.
From (ii), Daniel is from Hyderabad.
From (iii), Revati is not from Chennai.

From (iv), Chandrapaul is not from Kolkata and he is not the husband of Sravani.

From (v), Aravind is not married to Revati and Revati is not from Mumbai.

Let us represent the persons with the first letter in their names.
From (iv),

$$[\underline{\text{Husband} - \text{S}}]\ [\underline{\text{C} - \text{Wife}}]\ \left[\frac{\text{Husband} - \text{Wife}}{\text{Kolkata}}\right]$$

From (iii) and (v),

$$\left[\frac{\text{Husband} - \text{Wife}}{\text{Chennai}}\right]\ \left[\frac{\text{Husband} - \text{R}}{\text{Not Mumbai}}\right]\ [\underline{\text{A} - \text{Wife}}]$$

By combining the above two arrangements, we obtain the following arrangement.

$$[\underline{\text{Husband} - \text{S}}]\ \left[\frac{\text{C} - \text{Wife}}{\text{Chennai}}\right]\ \left[\frac{\text{Husband} - \text{R}}{\text{Kolkata}}\right]\ [\underline{\text{A} - \text{Wife}}]$$

From (ii), we know that Daniel is from Hyderabad. Hence, he cannot be Revati's husband.
$\Rightarrow$ He is the husband of Sravani.
From (i), we know that Bharat is to the immediate right of Preeti.
$\Rightarrow$ Preeti is the wife of Chandrapaul and Bharat is the husband of Revati.
$\Rightarrow$ Vanita is the wife of Aravind. Thus, we obtain the following arrangement.

$$\left[\frac{\text{D} - \text{S}}{\text{Hyderabad}}\right]\ \left[\frac{\text{C} - \text{P}}{\text{Chennai}}\right]\ \left[\frac{\text{B} - \text{R}}{\text{Kolkata}}\right]\ \left[\frac{\text{A} - \text{V}}{\text{Mumbai}}\right]$$

7. Daniel is married to Sravani. Choice (A)

8. Chandrapaul and Preeti are from Chennai. Choice (C)

9. Chandrapaul and his wife are seated second in the row. Choice (C)

Solutions for questions 10 to12:

From (2), (5) and (6), we get

____	G	____	__	_____	____	____
blue	violet			green	pink	yellow

From (7), we have F E C

From (3), C must be wearing green coloured shirt.
$\therefore$ From (2), A is to the immediate right of C.
From (1), B is wearing blue coloured shirt and A and D are sitting adjacent to each other.

The final distribution is as follows:

B	G	F	E	C	A	D
blue	violet	white	red	green	pink	yellow

10. C is wearing green colour shirt. Choice (B)

11. A is wearing pink colour shirt. Choice (D)

12. D is sitting at extreme right. Choice (A)

Solutions for questions 13 to 16:

The Blue box and the Indigo box have 4 boxes between them. The Yellow box is to the immediate left of the Indigo box. So, the possible arrangement may be

Yellow, Indigo, _ _ _ _ Blue.
(OR)
Blue, _, _, Yellow Indigo, White
(OR)
White, Blue, _ _ _ , Yellow, Indigo.

But the White box is not between the Blue and Indigo boxes. So, the arrangement can be as follows:

Blue, _, _, _,Yellow, Indigo, White
(OR)
White, Blue, _, _, _ , Yellow, Indigo.

13. If the White and Red boxes have two boxes between them, then the arrangement must be as follows:
White Blue – Red – Yellow Indigo.
The Red box must be in the middle of the row.
Choice (B)

14. If the white box is at the left extreme end, the green box is placed to the immediate left of the violet box and next to the blue box, then the order of colours is White, Blue, Green, Violet, Red, Yellow, Indigo. The fourth box from the right end is the violet box. Choice (D)

15. Three boxes are in between blue and yellow coloured boxes. Choice (C)

16. The arrangement can be as follows.

Blue, –, –, –, Yellow, Indigo, White
(or)
White, Blue, –, –, –, Yellow, Indigo.

Now, the violet box may or may not be in the middle of the row. Choice (A) is ruled out.
The Yellow box can be the 3rd from the right end. Choice (C) is ruled out.
White and Indigo boxes can be at the extreme ends. Choice (D) is ruled out. But the White box must be at one of the extreme ends.
So, choice (B) is definitely false. Choice (B)

Solutions for questions 17 to 20:

Let us analyse all the given conditions. M, N, P, Q, R, S, T, U, V and W are the ten persons sitting in a row. O is the eleventh person who makes them sit. It is also given that P and R sit together, whereas V and W sit together. There are exactly 4 seats between the two pairs P, R and V, W. Q, S and T, U sit in pairs together with T to the immediate right of S. Q, S, T, U must be the order of their sitting. M and N sit in that order only at one extreme end. No one sits to the left of P. So P must be at the left extreme end.

P - - - - - - - M N
P R - - - - - - M N
P, R and V, W have exactly 4 seats between them.
P R - - - - V W M N
P R - - - - W V M N

The four spaces should be occupied by Q, S, T, U in that order only. So, the seating arrangement is, P, R, Q, S, T, U [V, W or W, V] M, N.

17. The order is as follows.
P R Q S T U V W M N or P R Q S T U W V M N
N is exactly fourth place to the right of U. Choice (A)

18. The order of seating is as follows.
P R Q S T U [V W or W V] M N
Between S and N there are 5 people and they are (T, U, V, W, M) Choice (C)

19. The possible arrangements of seating are as follows.
(i) P R Q S T U V W M N
or
(ii) P R Q S T U W V M N

Two possible arrangements can be made. Choice (A)

20. If P, R and V, W exchange their seats, then the order would be as follows.

(i) V W Q S T U P R M N
or
(ii) W V Q S T U P R M N

Then there would be many persons to the left of P. So the condition that there is no one to the left of P would be violated. Choice (A) and (B) and (C) are not violated, because
(i) V and W sit together;
(ii) Q and S sit together;
(iii) M and N are at one extreme end in this order only.
Choice (D)

Solutions for questions 21 to 23:

It is given that no two adjacent persons face the same direction that means alternate persons face the same direction. Two persons sit in between D and E and E sits at one of the ends. G is two places away to the right of E. We get the following cases.

Case (i)

E↑ ↓ G↑ D↓ ↑ ↓ ↑

Case (ii)

↓ ↑ ↓ D↑ ↓ ↑ E↓

Given B faces the same direction as C faces and is adjacent to both D and F.
Then the possibilities are as follows.

Case (i):

E↑ A↓ G↑ D↓ B↑ F↓ C↑

Case (ii):

C↓ F↑ B↓ D↑ G↓ A↑ E↓

Since G faces North, case (ii) is eliminated and the final row arrangement is shown below.

E↑ A↓ G↑ D↓ B↑ F↓ C↑

21. 'D' is to the immediate right of 'G'. Choice (A)

22. Except AB, in the remaining options both are facing the same direction. Choice (D)

23. A sits adjacent to G and B is second to the left of C are definitely true.
Therefore, more than one are true. Choice (D)

Solutions for questions 24 to 26:

It is given that T and R are not sitting at any end and T is not adjacent to both S and R. Hence we have the following possible seating arrangement.

	T/R		R/T	

S is sitting opposite the person who is not a neighbour of both A and C. And only one person is sitting between A and C and neither of them is sitting at the left end. Hence the arrangement is as follows.

S	R		T	
		A/C		C/A

A is not sitting opposite to the person who sits at the left end and at least one person is sitting to the left of Q. Neither B nor E is sitting opposite T, hence D has to sit opposite T. E is not sitting opposite S and C is not sitting opposite S. Hence, the final seating arrangement is as follows.

S	R	Q	T	P	↓ Row-II
B	E	A	D	C	↑ Row-I

24. C is sitting opposite P, who is not a neighbour of both S and Q. Choice (B)

25. If R and T interchange their positions E will sit opposite T. Choice (A)

26. Both (A) and (C) are true. Choice (D)

Solutions for questions 27 to 30:

From (iv) and (vii) P is a scientist and he is sitting opposite the teacher at an end.
L is the singer and sitting to the immediate left of 'P'.
From (i) and (vi) Q is a politician and sits adjacent to the architect. From (v) neither Q nor O sits at ends.
Hence, the arrangement is as follows:

Teacher

	Q	L	P
Architect	Politician	Singer	Scientist

From (viii) K is the principal and sitting opposite the architect,
From (iii) either R or K is the doctor. Hence R is the doctor.
From (ii) neither M nor O is the teacher and from (v) neither Q nor O sits at ends.
From (i) the doctor is sitting opposite the person who is to the immediate right of Q.
Hence R is the doctor and he must be sitting opposite L.
Therefore, M is the Architect, O is the beautician and N is the teacher.

Hence, the final arrangement is as follows;

Principal	Beautician	Doctor	Teacher
K	O	R	N
M	Q	L	P
Architect	Politician	Singer	Scientist

27. N is the teacher. Choice (A)

28. Except the principal and the singer in all other pairs, both the persons are sitting at the ends. Choice (D)

29. Both the third and the fourth options are definitely true. Choice (D)

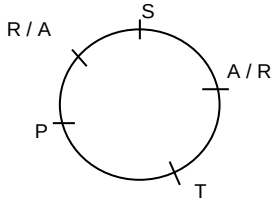
30. When Q interchanges his place with 'K', the beautician sits to the immediate left of Q. Choice (D)

Chapter – 2
(Circular Arrangement)

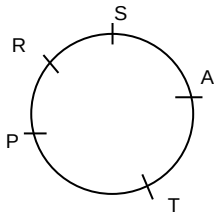
Exercise – 2(a)

Solutions for questions 1 to 5:

1. Let us denote all the names by their first letters.
It is given that,
T is to the immediate right of P while Q and R sit on either side of S. So the arrangement is as follows.

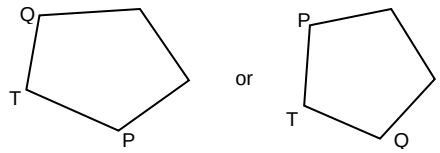


If there is only one person between R and T, the arrangement is as follows

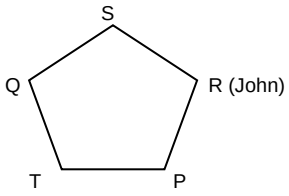


So P must be between R and T because if R and A exchange their positions, then there will be no one between R and T, hence Choice (B)

2. It is given that chair T is between chairs Q and P, i.e. QTP or PTQ,

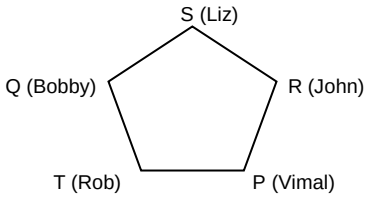


Whereas chair S is to the immediate left of chair Q. So the order P, T, Q is eliminated and the order will be S, Q, T, P. Now the arrangement will be as follows, as per the given conditions.



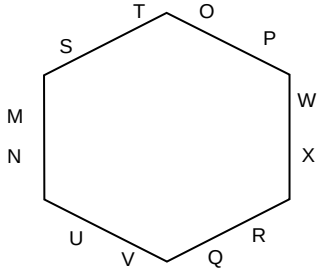
Liz and Vimal are on either side of R.
Bobby is to the immediate right of Liz.

So, Liz must be in chair S and the final arrangement is as follows.



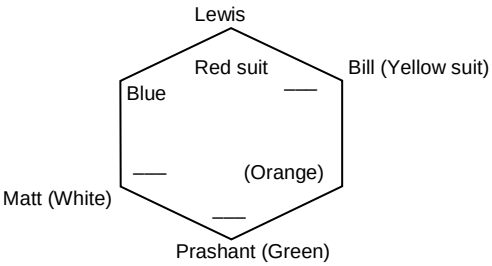
Vimal is in chair P. So choice (C) is false. Choice (C)

3. It is known that W sits to the immediate left of P and U sits to the immediate right of N. The pair M, N together sit opposite to the pair W, X together. O, P together sit opposite to the pair U, V.



S is not in any of the seats between V and X i.e. the pair ST has to be between M and O. So between M and P, the three persons are S, T and O. Choice (B)

4. Let us examine all the conditions. Matt and Bill sit opposite to each other, whereas Bill sits to the immediate left of the person, who is in Red suit. Matt sits to the immediate right of the person in Blue suit. Prashant sits to the immediate right of Matt. Lewis is in Red suit. Bill is in Yellow suit. The man in Blue suit is not next to the person in Green suit. (So Matt is not in Green suit) But the person in Blue suit is opposite to the man in Orange suit. So, the arrangement is as follows:

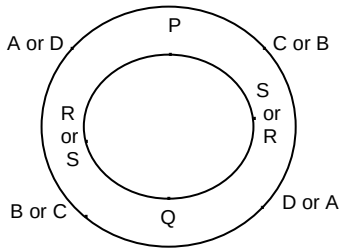


Blue suit is opposite to Orange one and Matt is not in Green suit.
If Prashant wears Green suit, then Khan and Rocky are left with Blue and Orange suits.
Khan and Rocky must sit opposite to each other.

So Choice (A) is false.
Choice (B) is true.
Choice (C) is partly true i.e. Prashant is not next to Lewis and he does not wear a white suit is true.
Choice (D) is true. Choice (A)

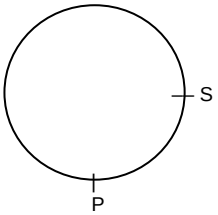
Note: In this question we could see that the statement given in choice (A) is false, so you need not have to check the other choices in the exam as choice (A) is the right answer. But all other choices are explained for your understanding.

5. The positions of the chairs of P, Q, R and S is inside the circle and the position of A, B, C and D is outside the circle. It is known that R and S are opposite each other as Q and R; A and D, B and C are opposite to one another. But the positions are not clear. ABCD can be anywhere outside the circle. Let us take PQRS arrangement first.

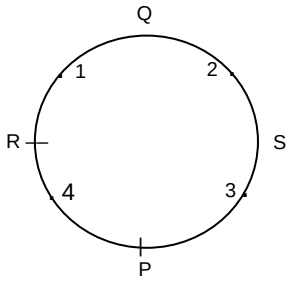


A and D can also occupy the positions of B and C. When we check all the choices, then only choice (D) helps in arranging all of them perfectly.

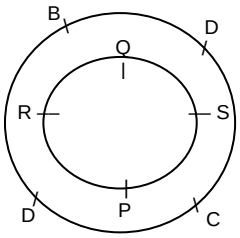
Let us check choice (D). S is to the right of P



Hence we know Q is opposite P and R is opposite S.



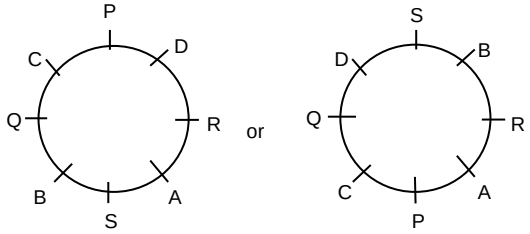
Now D is to the left of C between P and R. So, D will be at position 4 and C will be at position number 3.
So, the final arrangement will be as follows.



Choice (D)

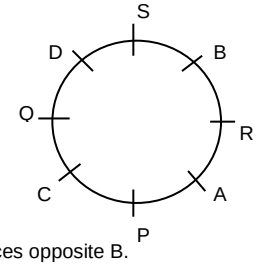
Solutions for questions 6 to 10:

It is known as per the data that four men - A, B, C, D - and four women - P, Q, R, S - dance on the floor, but no two men and no two women are next to each other.
A dances to the immediate left of R i.e. A ← R and R is opposite Q.
P and Q have only C between them, i.e. PCQ or QCP whereas P dances opposite S.
S is to the immediate right of B. i.e. B → S (BS)
So, the following arrangements are possible.
If all the above given conditions are analysed, then the arrangements are as follows:



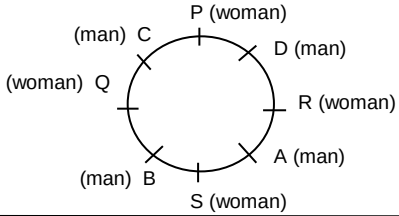
The actual positions of P and S are not fixed.

6. If B is the only person between R and S, then the dancing arrangement is as follows:

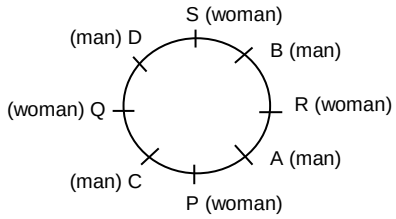


So, C dances opposite B. Choice (C)

7. In clockwise direction, the dancing order is Q, C, P, D, R, A, S, B as shown in the figures below

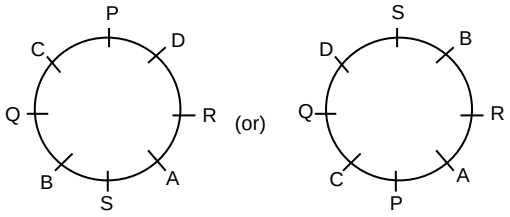


(or)



Choice (B)

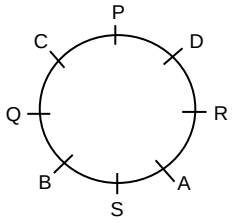
8. Q and R are definitely opposite to each other as shown in the dancing arrangements.



B and Q are not opposite to each other.
C and D are not opposite to each other.
A and B are not opposite to each other. Choice (A)

9. As shown in the above circular arrangements, either D may be between P and R or A may be between P and R, given in choice (C), which is correct. Choice (C)

10. If S is to the immediate left of A, then A is opposite C as shown in this circular arrangement.

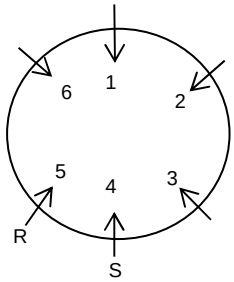


Choice (A)

Solutions for questions 11 to 15:

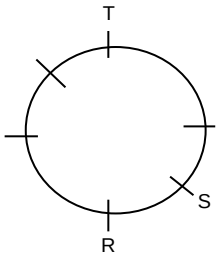
Let us represent all the names by the first letters of each name.
It is known that R sits to the immediate left of S. R ← S i.e. RS.

Neither T nor U can sit opposite S. So they cannot be in seat number 1. So it may be P or Q in seat number 1. Further it is clear that K cannot sit in seat number 2 as R cannot be opposite K.



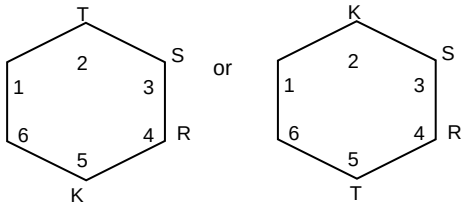
11. If K sits to the immediate right of S, then she would be in seat 3. Neither T nor U can be in chair (1). So P must be opposite S. Choice (B)

12. If T sits opposite to R, the arrangement will be as follows as R is the immediate left of S.



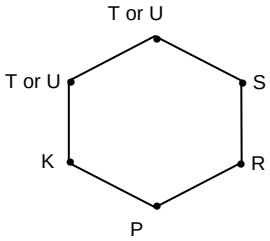
It is given that P is not opposite K, but P may be opposite S or P may be opposite U with K opposite S. So P or K may be opposite S whereas P and U may be opposite each other, whereas K and U may be opposite to each other. So, as per this arrangement none of the statements given in the choices are true. Choice (D)

13. If T is opposite to K, then the arrangement is as follows.



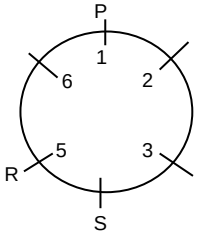
R and S also cannot come in seats 1 and 6. As P and U are the only people left out, they must sit next to each other. So it is false that they have one person between them. Whereas choice (A) is definitely true, choices (B) and (C) can also be true as P and U are next to each other in any order. Choice (D)

14. If P sits to the immediate left of R, then the arrangement is as follows. As R is to the immediate left of S and neither T nor U can be opposite S, K must be opposite S.



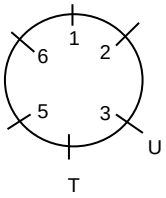
So, Choice (C)

15. When the statement given in each choice is considered, it is found that as per the basic conditions none of them can fix the seating arrangements.
Let us see each choice
Choice (A) T is opposite S is anyway not possible, as it is given that, neither T nor U can be opposite S.
Choice (B) If P is opposite S, then the arrangement is as follows.



But position 2 can be occupied either by T or U and position 6 and 3 can be occupied by anyone.

Choice (C) If T and U are next to each other, then the arrangement can be as follows.



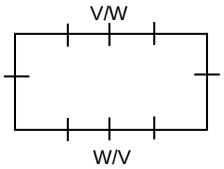
Now S can be neither in seat 1 nor in seat 6, so it can be in seat 5 or 2 so the arrangement cannot be completely fixed.
Choice (D)

Solutions for questions 16 to 20:

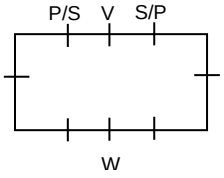
All the names are denoted by their first letters. The following are known:

(i) V and W are opposite each other and not at extreme ends.
(ii) T is on the smaller side.
(iii) U is to the immediate left of K, but not on the same side as K.
(iv) P, V and S are on the same side of the table.
(v) R is opposite P and to the immediate right of T.

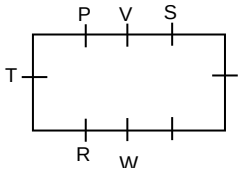
Applying (i), we get:



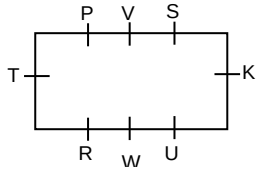
Applying condition (iv), we get:



Applying (v) and (ii) simultaneously, only the following arrangement is possible.



Now applying (iii), we get the final configuration.



16. S is opposite U. Choice (C)

17. S and R is the only pair of persons who are diagonally opposite each other. Choice (B)

18. V sits to the immediate right of S. Choice (A)

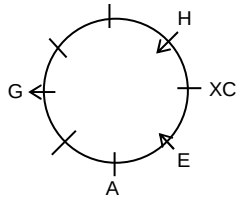
19. U is between K and W. Choice (D)

20. There are 3 persons sitting between S and R anyway. Choice (B)

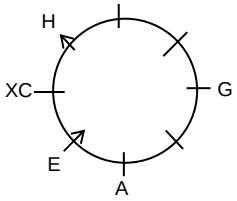
Solutions for questions 21 to 23:

It is given that, A sits third to the left of H, who sits adjacent to neither C nor E. Hence, H faces either away from the centre or the centre. Given, E faces the centre and sits three places away to the left of G, who is not adjacent to H. G and H face different directions. Hence we get the following arrangements.

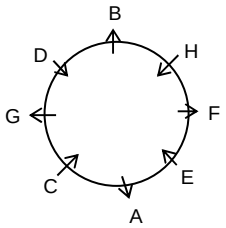
(i)



(ii)



Given, B sits third to the left of C but is not a neighbour of E. Hence in case (i), C faces the centre and sits to the immediate left of G and in case (ii), C faces away from the centre and sits to the immediate left of G. But as the neighbours of D do not face the centre, we can eliminate case (ii). In case (i) D sits to the immediate right of G and F sits to the immediate right of E. Given, no three persons sitting in consecutive positions face the same direction. Hence the final arrangement is as shown below.



21. Two persons. Choice (B)

22. D sits third to the right of A. Choice (B)

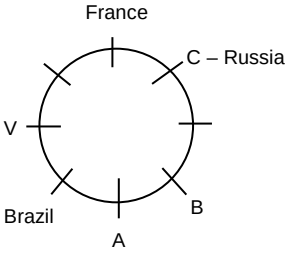
23. Except (C, B), all others sit adjacent to each other. Choice (D)

Solutions for questions 24 to 26:

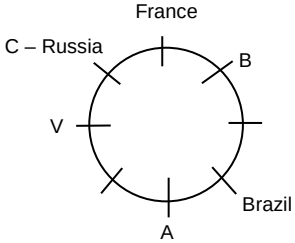
It is given that A sits opposite the President of France, who is second to the left of V.

President of Brazil is two places away to the left of B and A is not the President of Brazil. C, the President of Russia, sits opposite the President of Brazil. Also neither W nor Y is the President of Brazil. Then we get the following possible arrangements.

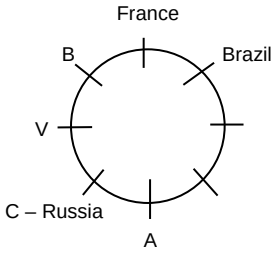
Case (i)



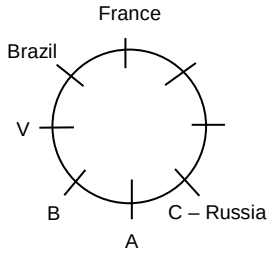
Case (ii)



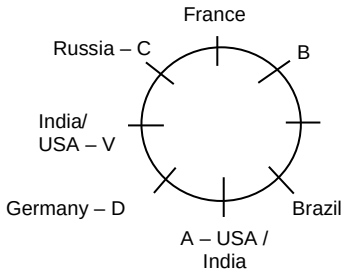
Case (iii)



Case (iv)

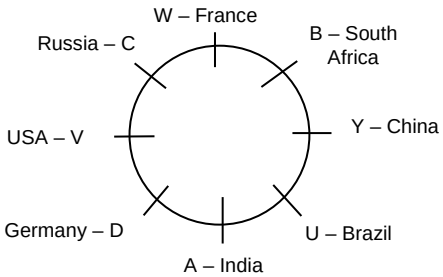


Since C, the President of Russia, is not adjacent to A, case (iii) and (iv) are eliminated. Also it is given that D, the President of Germany is adjacent to both the Presidents of USA and India. Since we cannot place D in case (i), it is also eliminated and the arrangement is as follows.



Also given that W is not the President of China, which means W is the President of France. Also given that A, W, and Y are not President of Brazil, U is the President of Brazil.

Since the President of USA is opposite the President of China, V should be the President of USA and Y should be the President of China. Therefore, A is the President of India. Then the final circular arrangement is shown below.



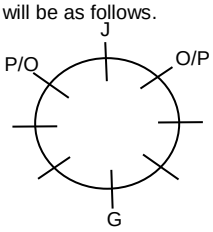
24. 'V' is the President of 'USA'. Choice (A)

25. 'A' sits third to the right of Russia's President. Choice (D)

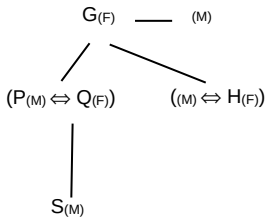
26. 'W and A are opposite each other' is definitely true. Choice (C)

Solutions questions 27 to 30:

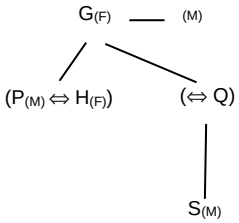
G is four places away from J $\Rightarrow$ G and J are opposite each other.
P and O are on either side of J.
The representation will be as follows.



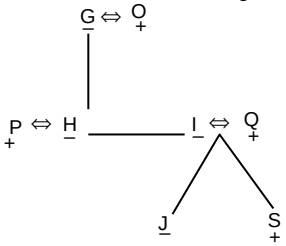
As P is a male, J must be a female and O must be a male.
H is sister-in-law of Q,
The spouse of P can be either H or Q.
Case (i): Let the spouse of P be Q.
Then the representation will be as follows.



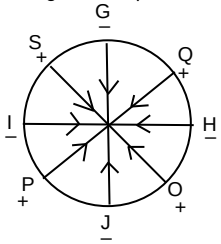
As, I is two places away to the left of his/her daughter, I's daughter must be Q and I must be spouse of G and not next to her.
The positions of I and Q in the circular arrangement is not possible.
$\therefore$ H is not the spouse of P.
Case (ii): Q must be the spouse of P.
The hierarchical representation will be as follows.



Here I can be spouse of either G or Q.
If I is spouse of G, Then I must be two places away to the left of H. The position of I and H in the circular arrangement cannot be represented.
$\therefore$ I must be spouse of Q.
As J is female and O is male.
O must be spouse of G and J must be daughter of I.



Finally the circular arrangement representation is as follows.



27. J is the granddaughter of O. Choice (A)

28. Three places away to the right of P is H. Choice (A)

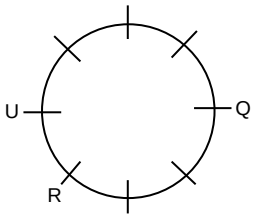
29. Q is the son-in-law of O. Choice (B)

30. Except SI, in each pair the second person is to the left of the first person. Choice (D)

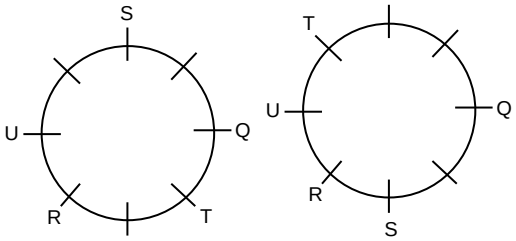
Exercise – 2(b)

Solutions for questions 1 to 3:

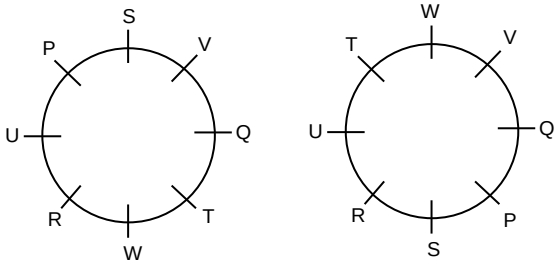
From conditions (2) and (4), we get



From condition (1), P and T can not be adjacent to R. From condition (3) and the above arrangement, we have the following two possibilities:



From (5) and the arrangements above we have the following possibilities:



(I) (II)

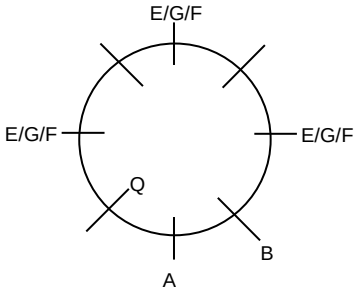
1. S is opposite W. Choice (B)

2. Cannot be determined. Choice (D)

3. Refer to case (I). Choice (D)

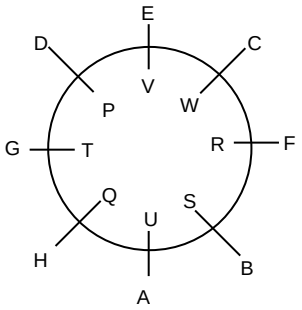
Solutions for questions 4 to 7:

From (1) and (3), we have:



From (2), no two persons, among P, T, V and W are opposite each other and no two persons from Q, R, S and U are opposite each other.

From (4) the persons from S cannot be opposite to the person from Q.
∴ The person from S must be B.
From (6), C is from W and H is from Q.
Also, C and H are opposite each other.
From (5), G must be to the immediate left of H.
∴ E is to the immediate left of D.
[from (4)]
From (6) and (2), E must be from V.
∴ F is from R.
∴ A is from U.
∴ The final arrangement will be as follows:



4. F is from R. Choice (D)

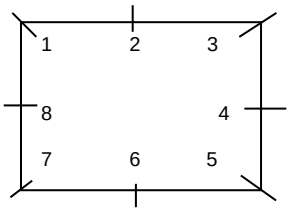
5. A is to the immediate right of H. Choice (C)

6. A is opposite to the person from V. Choice (A)

7. B is three places away to the right of G. Choice (A)

Solutions for questions 8 to 10:

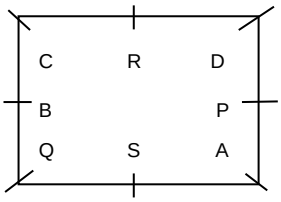
It is very clear from the given statements that the room (say table) has eight positions, of which four are at the corners and other four are at the four centres of the four sides of the table, which looks like the arrangement as follows.
Let us number the chairs 1 to 8.



PQRS, four girls and ABCD, four boys are occupying these eight chairs. Let us analyse all the conditions.

Q is at the corner seat, so it can be anywhere either at 1 or 3 or 5 or 7. Let us say that Q is at seat 7, but as it is given that R is not along the same wall as Q, hence R must be at seat 2 or 3 or 4 whereas A and C are diagonally opposite. So A and C must be at seat 1 and 5 not necessarily in that order. As B does not sit along any wall adjacent to the corner where A sits, but B is opposite P. So if A is at seat 1, then B is at 4 or 5 or 6. If so P must be at 8 or 1 or 2. Finally as it is given that C is to the immediate right of R who is between C and D, the diagram must be as follows.

Table I



8. S is sitting between Q and A. Refer the table (I). Choice (C)

9. If S and P interchange their positions, then the arrangement will be as follows.

C	R	D
B		S
Q	P	A

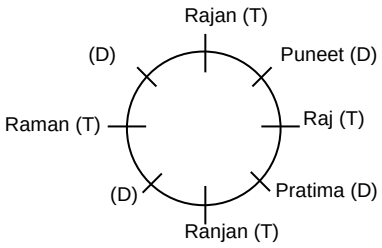
S is to the immediate left of D Choice (D)

10. The corner seat arrangement clockwise is ⇒ Q, C, D, A (or) C, D, A, Q (OR) D, A, Q, C (OR) A, Q, C, D.
The anti-clockwise arrangement is:
A, D, C Q (OR) D, C, Q, A (OR)
C, Q, A, D (OR) Q, A, D, C.
Choice (A) in Q, A, D, C – correct.
Choice (B) in A, Q, C, D – correct.
Choice (C) in D, A, Q, C – correct.
Choice (D) in D, Q, A, C – incorrect. Choice (D)

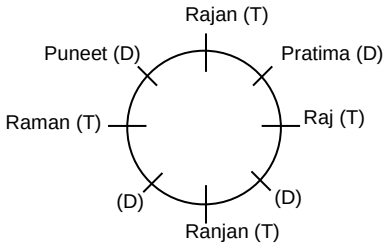
Solutions for questions 11 to 13:

The arrangements which can be made based on the data given.

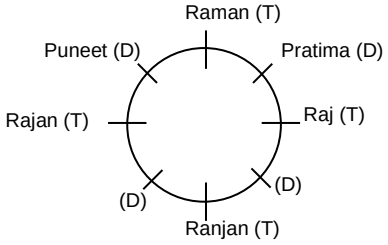
I



II



III



11. Here cases I and II prevail and it is evident that Raman is two places to the left of Ranjan. Choice (A)

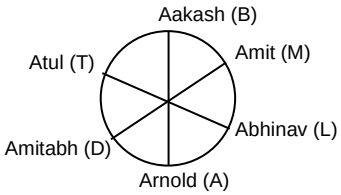
12. If Pratima is adjacent to Raman, then case III prevails and Rajan is opposite Raj. Choice (C)

13. If Pratham is not opposite Puneet, then in any of the two cases Pratham has to be opposite Pratima. Choice (B)

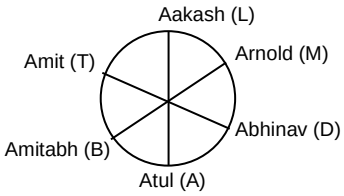
Solutions for questions 14 to 16:

We arrive at the following two different arrangements. The first letters of the names of the professions are used to denote the profession.

Case 1:



Case 2:



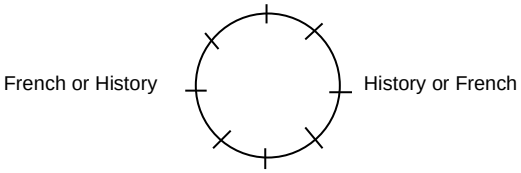
14. In all the cases, it can be observed that Amit is between the Lawyer and the Business Analyst. Choice (A)

15. This question refers to case (2), in which Abhinav is the Doctor. Choice (A)

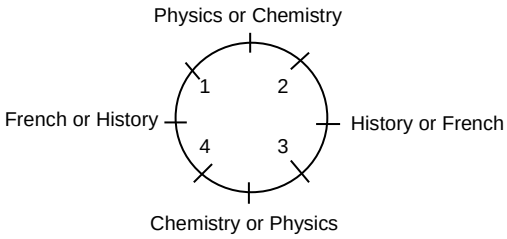
16. This question refers to case (2), where Arnold is sitting opposite Amitabh. Choice (C)

Solutions for questions 17 to 20:

Let us analyse all the conditions. A person has eight shelves around him.
French books and History books are on opposite shelves. French, German and English books are in side by side shelves. Physics and Chemistry books are in opposite shelves.

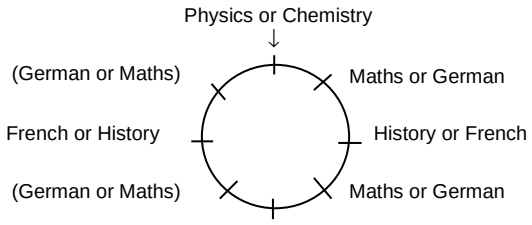


Physics and Chemistry should be on the perpendicular diagonal shelves. The final arrangement is



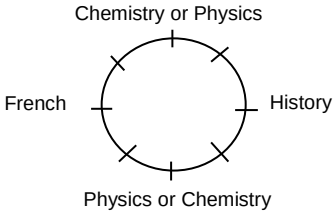
As French books must have English and German books on either side, these can be 1 and 4 or 2 and 3.

17. If the books on German are opposite the shelf of Maths books, the arrangement will be as follows



As German is between Physics and French, it can be at any of the two places as shown.
Then, Mathematics books may be between History and Chemistry shelves.
Then, English and Sociology shelves would be opposite each other. Choice (A)

18. The shelf of Sociology is between the shelves with Physics and History books. Then the arrangement is



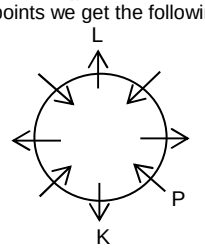
Hence, the books on Mathematics should be between books on History and Chemistry. Choice (B)

19. English books are to the immediate left of Physics books, so that shelf must be between the shelves with French and Physics books. So, German books would be between the shelves of Chemistry and English. So, they are to the immediate right of Chemistry or French books. Choice (B)

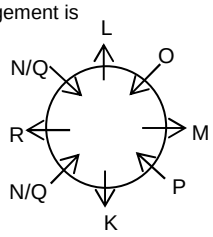
20. The shelves with language books are all together. So, they have to be side by side. Then it is only natural that shelves with books of other kinds must be together. The positions of Physics and Chemistry books separate the two kinds of sets - the languages and the others. Choice (B)

Solutions for questions 21 to 23:

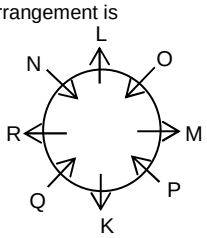
From (vi), L sits opposite K and faces away from the centre. From (iv) no two persons sitting next to each other face the same direction and from (i), P sits to immediate left of K.
From the above points we get the following arrangement.



And from (ii), M and R are sitting opposite each other. From (v), R is the neighbour of both N and Q.
Hence, the arrangement is



From (iii) either Q or O sits next to L.
Hence, the final arrangement is



21. Among KM, ML, and NO, second person sits second to the left of the first person.
In PO, second person is second to the right of the first person. Choice (D)

22. L sits to the immediate right of 'O' is definitely true. Choice (D)

23. If M and N interchange their places, L sits to the immediate left of M. Choice (C)

Solutions for questions 24 to 26:

It is given that,

(i) P(+) — Q; P — A(–)

(ii) ( )+ — (B) = ( )(+)

(iii) (D) — ( )+; R(+) ⟺ W(–); V(–) ⟺ P(+) — S(–) ⟺ U(+); V(–) — T(–); U(+) — Q(+)

Given, P is the brother of Q, who is not adjacent to either P or S. Hence Q sits either at the left end or right end and R sits adjacent to Q. Also given, A is the daughter of P and sits to the immediate right of B's husband. C is the niece of P. Hence, D is the husband of B and as D is not opposite to either P or S, we get the following cases.

(i) P/S S/P R Q
— — D A

(ii) Q R S/R P/S
D A — —

(iii) Q R S/P P/S
— D A —

Given, C does not sit opposite either P or S, hence case (i) and (ii) can be eliminated. In case (iii), C sits at the left end, B sits at the right end. Given, B is not opposite S, but is opposite her brother. Hence, B is opposite P, who is the brother of B. As, D has only one child who is a male, it is either R or S and C is the daughter of Q but, given Q is the daughter of C's grand father who is not R. Hence R should be the son of D and S is the grand father of C. Therefore the final arrangement and the family tree are as follows

Q R S P ↓
C D A B ↑

S(+); D(+) = B(–) — P(+) — Q(–); R(+); A(–); C(–)

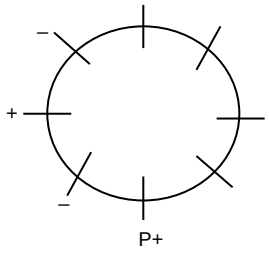
24. D's father-in-law (S) is to the immediate right of P. Choice (C)

25. Q's daughter sits at an end. Choice (C)

26. Choice (B) is true. Choice (B)

Solutions for questions 27 to 30:

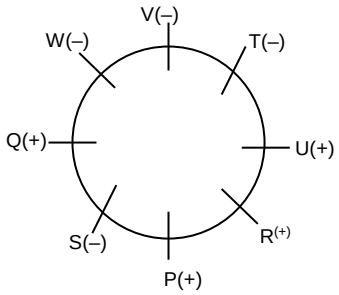
It is given that, P sits second to the right of his nephew whose neighbors are females.
V is the wife of P and sits to the immediate right of her daughter T.



V(–) ⟺ P(+) — [ ] ⟺ [ ]; [ ](+)

U sits second to the right of his brother-in-law and opposite his son Q. Hence, Q must be the nephew of P who is the brother-in-law of U. From (2), we come to know that V sits to the immediate right of her daughter T. We can place T only to the immediate right of U. From (4), we can say that S is the daughter of R and wife of U. From (5), we can say that W is the wife of R, and P and S are their children. Finally the positions are, W sits to the immediate right of V, R sits to the immediate left of U, and S sits to the immediate right of P.

The final arrangement of the given family members is as follows.



27. Both the options (A) and (B) say about the wife of U. Choice (D)

28. All the options (A), (B) and (C) are saying about the niece of S. Choice (D)

29. None of the given options is true. Choice (D)

30. Except option (C), in all other options the opposite genders are given. Choice (C)

Chapter – 3
(Double Line Up / Distribution)

Exercise – 3(a)

Solutions for questions 1 to 5:

1. Green and Yellow have to go to one boy. Red and Orange have to be with two different boys which means even White and Blue have to be with two different boys. Since Madan already has White kite with him, the other kite will have to be either Red or Orange. Since Mohan is not having Red or Blue, it means he can have Green and Yellow or White and Orange. But White is with Madan. Hence, choice (A) Choice (A)

2. C is neither an M.B.A. nor an M.A., and not an M.C.A. So C is an M.Tech. D is not an M.C.A. or M.Tech., so, he can be an M.B.A. or M.A. A is neither an M.B.A. nor an M.Tech. So, A can be an M.C.A. or an M.A.
Now it is given that B is an M.C.A.
So, we have the distribution as follows.
C – M.Tech.
B – M.C.A.
A – M.A.
D – M.B.A. Choice (C)

3. X, Y and Z are three supervisors. P, Q and R are three bearers. It is further known that Reception, Tables, Kitchen are the three places in the Restaurant, each to be attended by a supervisor and a bearer together. It is also given that Y is not a receptionist, R is always at the Tables and Q is a cook. X does not come to the Tables but P and X always work together. Now the following is clear.

Reception	Tables	Kitchen
–	R	Q
–	–	–

So P and X must be at the reception. Y is not a receptionist, so he may be at the Tables or at the Kitchen with Z at the other place. So, Reception shall have P and X. Tables shall have R and Y or Z. Kitchen shall have Q and Z or Y. So, the definite combination is X and P at the Reception. Choice (D)

4. Kamal, Lankesh and Manav are three boys. They receive two prizes each of P, Q, R, S, T and U. Lankesh receives neither Q nor U. So, he may receive two out of P, R, S, T. The possible pairs are, PQ, PR, PS, PT, PU, QR, QS, QT, QU, RS, RT, RU, ST, SU, TU. Lankesh does not receive QU and Q and U cannot be awarded to the same person. So, Lankesh may have any one of PR, PS, PT, RT, RS, ST.

Choice (A): Kamal receives Q and S. That will not fix the distribution.

Choice (B): Manav receives T and U. It cannot fix the distribution.

Choice (C): If Lankesh receives PS, then one of Kamal and Manav can receive any two of RTU or RTQ.

But this also cannot fix the distribution completely.
Choices (B) and (C) together can fix the arrangement.
Choice (D)

5. Hudson is in Moscow and New York has Yamuna. So, Volga may be in Paris or Tokyo whereas Ya – Fen may be in Tokyo or Delhi. Siene may be in Paris or Tokyo or Delhi. So choice (A) is true. If Volga flows through Tokyo, then Siene may be in Paris. So Siene cannot be in Delhi. Choice (B) is thus false. Choice (C), if Ya – Fen is in Tokyo, Siene may be in Delhi. Choice (D) Ya – Fen may be in Tokyo or Delhi is true. Choice (B)

Solutions for questions 6 to 8:

From (i) and (vii), Neha is working in A or F or E.
But from (vi) Neha is not working in E.
From the above and (ii), it can be said that Neha and Nitya and working in A and F in any order.
From (v) it can be concluded that Nikita is working in B.
$\Rightarrow$ Men are working in C, D and E
From (iii), (iv) and the above, it can be said that Vinay is working in C.
From (vii) and the above, it can be said that Vijay is working in E.
$\Rightarrow$ Vivek is working in D.

Hence the possible cases are,

Names	Cases	
Vinay	(a)	(b)
	C	C
Vivek	D	D
Vijay	E	E
Neha	A	F
Nithya	F	A
Nikita	B	B

From (viii), Vinay and Nikita belong to the organizations P_2 and P_3 respectively. Either Neha or Nithya is working in P_1.

From (iii), Vijay is working in P_1, as each male belongs to a different organization Vivek belongs to P_3. Hence, Neha and Nithya belong to P_1 and P_2 in any order.

i.e.,

	P_1	P_2	P_3
(i)	A, E (Neha, Vijay)	C, F (Vinay, Nithya)	B, D (Nikita, Vivek)
(ii)	A, E (Nithya, Vijay)	C, F (Vinay, Neha)	B, D (Nikita, Vivek)
	P_1	P_2	P_3

6. If the department in which Neha is working is in organisation P_2, then Nithya and Vijay are working in P_1.
Choice (C)

7. If Nithya is working in F, then Neha is working in A.
Choice (A)

8. 'Vivek and Nikita are a married couple' is true.
Choice (C)

Solutions for questions 9 to 12:

Let us represent the data in short form:
Rad ≠ Mumbai, Delhi, Jaipur, Bangalore.
Pam ≠ Kolkata, Hyderabad.
John ≠ Bhopal, Jaipur, Bangalore.
Mill ≠ Bangalore, Chennai.

As each person visits exactly two cities, and one city is visited by exactly one person. As Rad does not visit Mumbai, Delhi, Jaipur and Bangalore, he must visit any two among Chennai, Kolkata, Hyderabad and Bhopal. Similarly Mill visits any two among Delhi, Kolkata, Hyderabad, Mumbai, Bhopal and Jaipur. John visits any two among Delhi, Chennai, Kolkata, Hyderabad and Mumbai. Pam visits any two among Delhi, Chennai, Bangalore, Mumbai, Bhopal and Jaipur.

The given information can be represented in tabular form as,

	Hyderabad	Delhi	Bangalore	Jaipur	Bhopal	Chennai	Kolkata	Mumbai
Rad		×	×	×				×
Pam	×						×	
John			×	×	×			
Mill			×			×		

Now observe carefully and check the condition that each person visits two cities and one city should be visited by one person. Please note that the small stars are as per the directions given in each question.

9. Given Mill visits Delhi and Bhopal.

	Hyderabad	Delhi	Bangalore	Jaipur	Bhopal	Chennai	Kolkata	Mumbai
Rad		×	×	×	*			X
Pam	×	*	√	√	*	*	×	*
John		*	×	×	×			✓
Mill	*	×	×	*	√	×	*	*

Hence from the above Table, we can say that John must visit Mumbai. Choice (D)

10. Given Pam visits Bhopal and Mill visits Hyderabad.

	Hyderabad	Delhi	Bangalore	Jaipur	Bhopal	Chennai	Kolkata	Mumbai
Rad	*	×	×	×	*	√	√	X
Pam	×	*	√	*	√	*	×	*
John	*	√	×	×	×	*	×	√
Mill	√	*	×	√	*	×	*	*

Choice (A)

11. Given Rad does not visit Chennai and Hyderabad and Pam visits Chennai.

	Hyderabad	Delhi	Bangalore	Jaipur	Bhopal	Chennai	Kolkata	Mumbai
Rad	×	×	×	×	√	×	√	×
Pam	×	*	√	*	*	√	×	*
John			×	×	×	*	*	
Mill			×	✓	*	×	*	

From the above tabular form, John can visit Hyderabad and Mumbai. Choice (A)

12. Given John visits Hyderabad and Chennai.

	Hyderabad	Delhi	Bangalore	Jaipur	Bhopal	Chennai	Kolkata	Mumbai
Rad	*	×	×	×		*		×
Pam	×		√			×	×	
John	√	*	×	×	×	√	*	*
Mill	*		×			×		

Here from the above tabular form, choice (B) is the answer. Choice (B)

Solutions for questions 13 to 16:

It is given in the data, that P, Q, R, S, T and U are six post offices. A, B, C, D, E and F are six postmen, each of them work in one post office. It is further known that

A ≠ P, S; that means A may work in Q or R or T or U.
B ≠ TU, i.e. B may work in P or Q or R or S.
C ≠ QR, i.e. C may work in P or S or T or U.
D works in T and A works in Q, and B may be in P or R or S, whereas
C may be in P or S or U.
E may be in P or S or R or U.
F may be in P or S or R or U.

Nothing else can be concluded. So the tabular form is as shown below:

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

13. If B works in P and C does not work in U, then C must be working in S. Now the following can be said.
A is in Q.
B is in P.
C is in S.
D is in T.
So, E may be in R or U and F may be in U or R.
Choice (D)

14. If C and E works in post office S and U, then A works in Q is true.
D works in T is true, B works in R may be true.
C has S or U to work in. Choice (D) is false.
Choice (D)

15. It is concluded from the data given, that
B may be in P or R or S;
C may be in P or S or U;
E may be in P or S or R or U;
F may be in P or S or R or U.
So C, E, F have P, S, U to work in each of them. So U or P may have one each of C, E, F. Choice (C)

16. E works in Q is FALSE, as it is clear that A works in Q and no two people can work in the same post office. Choice (D)

Solutions for questions 17 to 20:

A, B, C, D and E are five theatres. Each theatre screens two of the ten kinds of films - Romance, Thriller, Horror, Adventure, Children, Drama, Documentary, Historical, Religious and Cartoon.

Each theatre has two slots for the two films it screens.
From the data, we get the following conditions which are written in short.

I. C = Horror Films = 1st slot
II. E = Historical Film = 2nd slot
III. B = Thriller Film = 2nd slot
IV. D = Documentary Film

V. Drama Film = 2nd slot
VI. Children and Cartoon Films = Same theatre
VII. Religious Film ≠ 1st slot

Now if all the above mentioned conditions are observed, then it is not clear that A and D release the films in slot 1 or 2.

As per the conditions V and VI, it is clear that children's films and cartoon films must be in theatre A.
As per conditions VI and VII, film on drama and Religious film can be in theatres A or C or D.
As per condition IV, Documentary film has to be in the 1st slot as theatre C and D will release the Drama and Religious films in the 2nd slot, not necessarily in that order.

Let us draw a grid based on the data available

	Theatres				
Slots	A	B	C	D	E
1st	Children Or Cartoon	Adventure Or Romance	Horror	Documentary	Romance Or Adventure
2nd	Cartoon Or Children	Thriller	Religion Or Drama	Drama Or Religion	Historical

17. If C screens the Religious film, then D must exhibit Drama in its 2nd slot. Hence, D exhibits Documentary and Drama as per the above table. Choice (B)

18. A exhibits the Cartoon film and the Children's film as per the table drawn above. Choice (A)

19. If a film on Drama is screened after the film on Documentary in the same theatre, then the film on Religion is preceded by the film on Horror. Choice (A)

20. Romance film is exhibited along with the Historical film. C and D are full with Religious and Historical films. So, B is left with an Adventure film in slot 1 and Thriller film in slot 2. Choice (D)

Solutions for questions 21 to 23:

The given information can be tabulated as shown below.

Name	Gender	Clinic	Specialty
A	Female	Nilgiri	
B			
C	Male		Ophthalmologist or Neurologist
D	Female		Neurologist or Ophthalmologist
E	Male	Vindhya	
F			
G		Vindhya	

Given, at least one male and one female doctor work for each clinic. A and her friend, the Dentist, only work in Nilgiri. E and his friend G only work for Vindhya clinic. Hence the Dentist is male and G is female. Given the Cardiologist is a woman who works for Vindhya clinic. Hence, G is the Cardiologist. Given, B is neither a Dentist nor an ENT specialist. None of those who works for Vindhya is an ENT specialist. Hence F is the male Dentist. A is the ENT specialist. At least two and at most three doctors work in each clinic. Only two doctors work in each of Vindhya and Nilgiri. Hence B, C, and D work in Himalaya clinic. The Nephrologist does not work in the same clinic as C and D. Hence E is the Neurologist. The ENT specialist and the Neurologist are sisters. Therefore, D is the Neurologist and C is the Ophthalmologist. B is the Oncologist.

The final distribution can be shown as below.

Name	Gender	Clinic	Specialty
A	Female	Nilgiri	ENT specialist
B		Himalaya	Oncologist
C	Male	Himalaya	Ophthalmologist
D	Female	Himalaya	Neurologist
E		Vindhya	Nephrologist
F	Male	Nilgiri	Dentist
G	Female	Vindhya	Cardiologist

21. B, C, and D work for Himalaya clinic. Choice (A)

22. G, A, D are all females. Choice (B)

23. A – female – Nilgiri – ENT specialist. Choice (D)

Solutions for questions 24 to 27:

From (2), we come to know that Uma lives on the second floor and works in BOB. From (3) and (4), we come to know that the person working in PNB lives on the first floor and Geetha on the top floor. From (1), Sudha lives on an even numbered floor and below the person working in SBI. From (4), since the person working in SBI does not live on the fifth floor, he must be on the top floor and Sudha on the sixth floor.

7	Geetha	SBI
6	Sudha	
5		
4		
3		
2	Uma	BOB
1		PNB

From (5), Rani works in Axis and lives two floors below Geetha's floor hence, she must be on the fifth floor. From (2), neither Veena nor the person working in OBC lives adjacent to Uma. Hence, Veena must be on the fourth floor. From (6), the person working in HDFC lives immediately above Radha's floor. We can place Radha only on the third floor and the person working in HDFC on the fouth floor. Hence, Veena must be working in HDFC. Thus, Jyothi must be working in PNB and Sudha must be working in OBC.
Hence, the final arrangement is as follows.

7	Geetha	SBI
6	Sudha	OBC
5	Rani	Axis
4	Veena	HDFC
3	Radha	ING
2	Uma	BOB
1	Jyothi	PNB

24. Veena who lives on the fourth floor, works in HDFC. Choice (D)

25. 'Veena lives below Radha's floor' is definitely false. Choice (B)

26. Except in option (C), in all other options the person is living three floors above the person working in the given bank. Choice (C)

27. Four floors are there between the person working in OBC and Jyothi's floor. Choice (C)

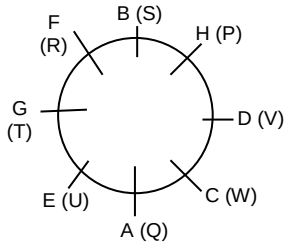
Solutions for questions 28 to 30:

It is given that, A sits third to the left of the person, who is from P. B and D are adjacent to the person from P, but none of them is from Q. Hence, B and D sit adjacent to the person from P, in any order. As A is not from V and is not adjacent to the person from V and the person from Q sits second to the left of the person from V. Hence, the only possibility is A is second to the left of the person from V and A from Q and also given, only

one person sits between B and the person from T. Hence, B sits opposite A and the person from T sits opposite D. Given, G is not a neighbor of either A or B, hence G sits opposite D and is from T. As F is neither from P nor from S and is also not a neighbor of A, F sits to the immediate right of B. Given C is from W and the person from S is a neighbor of the person from R. So we can say that, F is from R and B is from S.

As E is not a neighbor of D, E sits to the immediate left of A and C sits to the immediate right of A.

Therefore, the final arrangement is,



28. No one sits between H and the person from V. Choice (D)

29. Except (A – T), all other pairs are correct combinations. Choice (D)

30. 'A is from Q', is true. Choice (A)

Exercise – 3(b)

Solutions for questions 1 to 4:

We can have the following table which we can fill as we go through the statements given.

	A	B	C	D	E
Car					
Colour					

From statements (i), (ii), (iii), (iv) and (v), we can fill up the following.

	A	B	C	D	E
Car			Mercedes	Fiat	
Colour		Green			

We have used all the information given and hence, we can now start answering the questions.

1. If A owns a blue Sierra, then B owns Audi (because E cannot own Audi) and hence, E owns a Maruti. Similarly, if A's car is blue, then E's car will be red or black. Hence, E will have red Maruti or black Maruti. Choice (A)

2. If A owns white Audi, then E will own Sierra (because B cannot own a Sierra). Only Choice (D) has Sierra. (Also note that if A owns a white car, then the colour of E's car can be blue, red or black). Choice (D)

3. If A's car is Maruti, then E can own only a Sierra. If A's car is red and D's white, then E can own only a blue car (because C's car cannot be blue). Hence, E has a blue Sierra. Choice (B)

4. If E owns a red car and A owns a white car, then D can have only a blue car (because C cannot have a blue car). Choice (C)

Solutions for questions 5 and 6:

5. It is given that each of Kapil, Karan, Kusum and Kiran is a lecturer in different subject. Kapil teaches Maths, Kiran is a lecturer in Chemistry and Kusum is not a lecturer in Physics.

$\Rightarrow$ Kusum is a lecturer in Biology and Karan is a lecturer in Physics.
It is given that Kunal, Kamat and Karishma belong to the same subject group as Kapil i.e. Maths.
It is given that Kamal is a lecturer of Chemistry and Kiran and Kate teach the same subject.
Hence, Kamal, Kiran and Kate teach Chemistry.
Kamini is in the same subject group as Karan, i.e., Physics.
It is given that Amar, Beena, Chander and Deepak are the professors of the subject groups with lecturer stength of 4, 3, 2, and 1 respectively.
As per the given instructions, we get the following arrangements:

Maths	Physics	Biology	Chemistry
Kapil Kamat Kunal Karishma	Karan Kamini	Kusum	Kiran Kate Kamal
4	2	1	3
Amar	Chandar	Deepak	Beena

Only (B) is correct. Choice (B)

6. None of the given names belongs to the subject group Maths. Choice (D)

Solutions for questions 7 to 10:

It is given that the number of goals scored by India in both the matches is the same and the total number of goals scored by India in both the matches put together is less than that of any other team.

$\therefore$ The total number of goals scored by India in one round cannot be 4 or 5, as the team which scores zero goals in one of the rounds cannot have more number of total goals than India.
Similarly, the number of goals scored by India cannot be 3.
$\therefore$ It must be 2.
Germany scored a total of 7 goals.
The possibilities are
(i) 6 goals in one round and 1 goal in the other.
(ii) 7 goals in one round and zero goals in the other.
(iii) 5 goals in one round and 2 goals in the other.
(iv) 4 goals in one round and 3 goals in the other.

Of the above, the first two possibilities are ruled out as a team scoring 6 goals in one round cannot score 1 goal in the other.
Similarly, a team scoring 7 goals in one round cannot score zero goals in the other.

Now, case (iii) is not possible as India has scored two goals in each of the matches.

$\therefore$ Germany lost the match in which it scored four goals and won the match in which it scored three goals.
The total goals scored in each of the matches of Netherlands is 8.
The scores of the matches could have been one of

3 – 5	6 – 2	3 – 5
5 – 3	2 – 6	6 – 2

As the total number of goals scored by Netherlands is not 8, the first two cases are not possible.

$\therefore$ Netherlands should have scored 3 goals in one of the matches and 6 goals in the other match, in which it won against India.

Matches

Winner	Loser
Netherlands (6)	India (2)
Germany (3)	(1)
(5)	(4)

Matches

Winner	Loser
India (2)	(0)
(5)	Netherlands (3)
(7)	Germany (4)

Now, the number of goals conceded by Australia is the same in both the matches.

∴ Australia should have scored one goal in one of the matches and five goals in the other match. As goals scored by South Korea in the first round is same as conceded by it in the second round.

∴ South Korea scored 4 goals in the first round and conceded 4 goals in the next round.

I Round		II Round	
Winner	Loser	Winner	Loser
Netherlands (6)	India (2)	India (2)	Pakistan (0)
Germany (3)	Australia (1)	Australia (5)	Netherlands (3)
Pakistan (5)	South Korea (4)	South Korea (7)	Germany (4)

7. South Korea scored the maximum number of goals in both the matches put together. Choice (A)

8. India won the match against Pakistan. Choice (B)

9. The number of goals scored by Netherlands in the match it won is 6. Choice (D)

10. Pakistan scored the least number of goals in a match. Choice (B)

Solutions for questions 11 to 14:

The given information can be represented in the tabular form as follows.

Name of the persons	City	Car
P		BMW
Q		
R	Cochin (×) Bengaluru (×) Baroda (×)	
S	Hyderabad	
T	Pune (×) Bengaluru (×) Baroda (×)	
U	Chennai	Hondacity
V	Kolkatta	Honda Brio
W	Bengaluru (×)	

Different cars

Same cars

From the given information, V is not travelling by Honda Brio, we can say that V is travelling by Hondacity, since the person who is travelling by BMW is from Pune.25
Also we can say that only two persons are travelling by BMW.
From the given information, R and W are travelling by the same car, we can say that they are travelling by Honda Brio.
∴ T, U and V are travelling by Honda City.
As S is from Hyderabad, he cannot travel by BMW.
∴ S, R, W are travelling by Honda Brio.
∴ Q is from Pune and travelling by BMW.
P is from Bengaluru, since R, T and W cannot be from Bengaluru.
∴ W is from Baroda.
As R is not from Cochin, T is from Cochin.
∴ R is from Noida.
The final arrangement is as follows.

Name of the person	**City**	**Car**
P	Bengaluru	BMW
Q	Pune	BMW
R	Noida	Honda Brio
S	Hyderabad	Honda Brio
T	Cochin	Honda City
U	Chennai	Honda City
V	Kolkatta	Honda City
W	Baroda	Honda Brio

11. R is from Noida. Choice (D)

12. R, S and W are traveling by Honda Brio. Choice (D)

13. W is travelling by Honda Brio and is from Baroda. Choice (B)

14. Choice (C) is true. Choice (C)

Solutions for questions 15 to 17:

Given, only G and M, went to Zoo – III and one of them has a dog. E has a monkey and went to Zoo – I. The person, who went to Zoo – II has a tiger, but is not C. C and the person, who has a cat, went to Zoo – II. Neither A nor K has a tiger, but one of them went to Zoo – II. A and H went to the same Zoo. H has an elephant. So, A cannot go to Zoo – II as already the person who has a tiger and C went to Zoo – II and A cannot go to Zoo – III as only G and M went to Zoo – III. Hence A and H went to Zoo – I and hence K went to Zoo – II. As K does not have a tiger, K has a cat. Three persons A, E and H went to Zoo – I, so P went to Zoo – II and therefore P has a tiger. The person, who has a camel did not go to either Zoo – II or Zoo – III, So A, who went to Zoo – I, has a camel. The person, who went to Zoo – III, does not have a lion, hence C has a lion. One among G and C has a horse. As C already has a lion. G has a horse and therefore, M has a dog.

∴ The tabular form of the persons, their animals and the Zoo to which they went is

Person	Zoo	Animal
A	I	camel
C	II	lion
E	I	monkey
G	III	horse
H	I	elephant
K	II	cat
M	III	dog
P	II	tiger

15. A, H and E went to Zoo – I. Choice (D)

16. C has a lion. Choice (C)

17. P has a tiger. Choice (C)

Solutions for questions 18 to 20:

The given information can be tabulated as shown below.

Name of the person	Colony	Street
A	xP	I
B	xP	
C	R	
D		
E		
F	P	
G	xQ	III
H	R	

From the given information, A and E belong to neither the same colony nor the same street. So E belongs to either street II or street III. D and F belong to the same colony. Hence D belongs to colony P. G and C belong to the same street, hence C belongs to street III. E and C do not belong to the same street, hence E belongs to street II as E cannot belong to the same colony as A and C. B and C do not belong to the same colony, hence B belongs to colony Q. C, D and E belong to different colonies and different streets, hence D belongs to street I as C and E belong to street III and street II respectively and E belongs to colony Q as C and D belong to colony R and P respectively. A and B neither belongs to the same colony nor colony P, hence A belongs to colony R. B and G belong to the same street, hence H belongs to street III. The given condition is that the persons who belong to the same colony do not belong to the same street, hence H belongs to street II as A and C belong to street I and III respectively and atleast two and atmost three persons belong to each colony and each street, hence G belongs to colony P and F belongs to street II.

∴ The final arrangement is as shown below.

Name of the person	Colony	Street
A	R	I
B	Q	III
C	R	III
D	P	I
E	Q	II
F	P	II
G	P	III
H	R	II

18. G belongs to colony P. Choice (C)

19. The correct combination of person, colony and street respectively is 'F – P – II'. Choice (A)

20. D, F and G belong to the same colony. Choice (A)

Solution for questions 21 to 24:

Males	Females	Salary (₹ lakhs / annum)
Kambli		x + 4
Kumble	Karishma	x + 1
Kamlesh		X
Kareem		
Kishan		6

x + y is a natural number and $x \geq 1$
$\Rightarrow$ x is a natural number.
Also, form (4), $x < 6$
If x = 5, then salary (in lakhs / annum) of husband of Karishma = x + 1 = 6.
This is not possible as each earns a different salary
$\Rightarrow x \neq 5$.
If x = 4
Salary (in lakhs/annum) of Kumble = x + 1 = 5.
This contradicts Rule (2)
If x = 2
Salary of Kambli (in lakhs / annum) = x + 4 = 6 salary of Kishan.
This is not possible as each earns a different salary.
If x = 1,
Salary (in lakhs / annum) of Kambli = x + 4 = 5,
This implies, from rule (2), that Kambli must be married to Kamini, which however violates the condition (5) $\Rightarrow x \neq 1$

The only possible value of x = 3.

Males (husband)	Females (wives)	Salary (₹lakhs / annum)
Kumble	Karishma	4/3/2
Kamlesh	(Kareeena / Kunti)	3/2/1
Kareem	Kamini	5
Kishan	Kirti	6
Kambli	Kunti / Kareena	9

21. Kareem earns ₹5 lakhs / annum. Choice (A)

22. Kishan is married to Kirti. Choice (C)

23. Kambli is not married to Kunti, implies Kamlesh is married to Kunti, then the husband of Kunti earns the minimum salary. Choice (A)

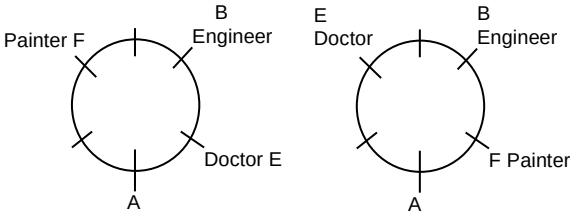
24. Arranging the names of the males in the ascending order of the salary earned: Kamlesh < Kumble < Kareem < Kishan < Kambli. Choice (C)

Solutions for questions 25 to 27:

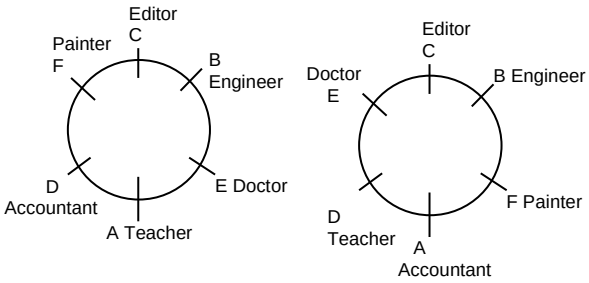
B is either engineer or editor. Neither A nor D is a doctor. But exactly one of them is an accountant. Either E or F is painter and C is either editor or an accountant. But either A or D is an accountant. Hence, C is the editor, and B is the engineer. The information can be represented in the following table. Since E is the doctor, F is the painter.

Person	Profession
A	Teacher / Accountant
B	Engineer
C	Editor
D	Accountant / Teacher
E	Doctor
F	Painter

It is given that the engineer is sitting second to the right of A and the doctor and F are sitting opposite to each other. We have the following possible arrangements.



Since, the editor is not sitting opposite the engineer. Hence the final arrangements will be as follows.



25. D is sitting opposite the engineer. Choice (C)

26. The painter is sitting to the left of the accountant. Choice (A)

27. "A is sitting opposite the editor" is definitely true. Choice (D)

Solutions for questions 28 to 30:

It is given that there are three floors between C's floor and D's floor from top to bottom. Either B or E lives on the top floor and an takes exam on Wednesday. Let us represent these points in the following floor arrangement.

Also given that neither F nor G takes the exam on Tuesday and there is one person between them who writes exam on Saturday.

Since there are only two floors below A's floor which that means A lives on the third floor. The possible arrangements are as follows:

Floor	Person	Day
7	B/E	Wednesday
6	F/G	Saturday
5	C	
4	G/F	
3	A	
2		
1	D	

Floor	Person	Day
7	B/E	Wednesday
6		
5	C	
4	F/G	
3	A	Saturday
2	G/F	
1	D	

Since either B or E takes an exam on Wednesday, C takes an exam on Sunday and therefore, case(i) is eliminated. Also given that only two persons live between B and G, B should live on the top floor and G should live on the fourth floor and as B takes an exam on Wednesday, G takes an exam on Monday.

Floor	Person	Day
7	B	Wednesday
6	E	
5	C	Sunday
4	G	Monday
3	A	Saturday
2	F	
1	D	

Since, the person who takes an exam on Tuesday does not live on an even – numbered floor. Hence D takes an exam on Tuesday. Also given that the person who takes an exam on Thursday is adjacent to the person who takes an exam on either Saturday or Monday. The only possibility is F takes an exam on Thursday and E takes on Friday. The final arrangement is as follows.

28. E lives on the sixth floor. Choice (D)

29. A takes an exam on Saturday. Choice (B)

30. Three persons live between E and F. Choice (D)

Chapter – 4
(Selections)

Exercise – 4(a)

Solutions for questions 1 to 5:

1. Two batches have to be formed from boys J, K, L, M, N, O, P and Q. If K and L are in one batch, then Q must be in that batch, as K and Q are together. J cannot be in that batch as it is given that J and L cannot go together. K, L, Q form a team of 3 members, then the fourth member may be M or N or O or P. As M and O do not go together, either M alone or O alone should go with K, L and Q. So the other batch may be either "J, N, O, P" or "J, M, N, P". Choice (C)

2. It is given that

(i) if Law is selected, then Physics cannot be selected.
(ii) if Sekhar selects Chemistry, then Jim does not select Law. Hence if Jim selects law, Sekhar cannot select Chemistry.
(iii) if Black selects Psychology, then Sekhar cannot select Chemistry. Hence if Sekhar selects Chemistry, Black cannot select Psychology.
(iv) if Jim selects Physics, then Sekhar selects History and Law. Hence if Sekhar does not select History or does not select Law, then Jim cannot select Physics. Sekhar does not select Chemistry, as Black selects Psychology. Further if law is slected, Physics cannot be selected. Therefore, the subjects that Shekar cannot select now are Physics and Chemistry. Choice (A)

3. If Kareem is selected, Puja cannot be selected, then Tinku and Shalu also cannot be selected. That leaves only Ronak and Umesh. Hence Ronak and Umesh must be selected. Choice (C)

4. It is given that P may go to A or B and must be seen, whereas S goes to only A, and T goes to only B. It is clear from the data that O has gone back and neither (M and R), nor (U and Q) go together. If Q, R and S go to one director and meet him, the other director sees any two of M, N, U and T along with P, who must be seen. M does not go with R and U, so P, N, T or P, U, T are seen. Only B can see them as S goes to A. So B – P, N, T or P, U, T is correct.
Choice (A)

5. Choice (A): If B is selected, then A and E cannot be selected. The other 3 must be from C, D, F and G but D and F have to be together so the team will be B, D, F and any one of C or G. So D must be selected in the team, hence this choice is definitely TRUE.
Choice (B): If A is selected B cannot be chosen. The other 3 members can be any 3 from C, D, E, F and G. This choice is not definitely TRUE.
Choice (C): If B is selected, then A and E are ruled out. The other 3 can be chosen from C, D, F and G. Of this D and F must be chosen with the last member being either C or G. This choice is not definitely TRUE.
Choice (D): C need not be chosen on every team. If we select D, F, E and G, this is a valid team without C.
Choice (A)

Solutions for questions 6 to 10:

It is given that no team can have more than four players. I alone forms a team of one member only as it is given clearly. The other teams must have members of 4, 3 and 2 each, as all of them have different number of members in their teams.

The other conditions are as follows.
(i) C and G are in one team.
(ii) A and F are in one team.
(iii) B and E cannot be in one team.
(iv) F and E cannot be in one team, i.e., A and E also cannot be in one team as A and F are in one team.

6. B, D, E, H is not acceptable as per rule (iii) given above.
B, F, A, G is not acceptable as C and G should be together.
A, C, F, H is not acceptable as per rule (i).
But A, F, C, G is an acceptable selection as no rule is violated. Choice (A)

7. If A, D, F and J form a team, then B, C, G can be in one team and E, H can be in one team.
Choice (A) is incorrect. B and E cannot be together as per rule (iii) given above.
Choice (B) is also incorrect, as per rule (iii) given above.
Choice (C) is correct, as B, C, G can be in a team and E, H can be in another team. Choice (C)

8. If A and F are in one team of two members, then the two teams can be of different members. Let us see each choice.
Choice (A) is incorrect because B and E cannot be together.
Choice (B) is incorrect, as C and G have to go together.
Choice (C) is incorrect, as B and E cannot go together in one team as per rule (iii).
Choice (D) is correct, as no rule is violated. Choice (D)

9. If B, D, J are in one team, then A, E, G and H is not an acceptable selection as A and F must be together.
C, G, H and I is also an incorrect combination for the reason that I has to be alone in the team.
A, C, E, G is an incorrect selection as A and F must be together. F, B, A and C is also incorrect as F and B should not be selected in the same team. Choice (D)

10. A, E, H, B in choice (D) is incorrect as A and F have to be together and B and E cannot be together, whereas all other teams given in other three choices are acceptable.
Choice (D)

Solutions for questions 11 to 15:

A team of 5 members with at least three boys and at least one girl from five boys P,Q,R,S,T and three girls U,V,W has to be selected. It is further known that if P is in the team, then R is not, i.e.,

$P^{\checkmark} \Rightarrow R^{X}$ So, $R^{\checkmark} \Rightarrow P^{X}$

If S is in the team, then V is not in the team,

i.e., $S^{\checkmark} \Rightarrow V^{X}$ So, $V^{\checkmark} \Rightarrow S^{X}$

11. If Q, R and V form a team of three members, then one or two more boys or one more girl has to be selected. Now V and S will not be in the team. So choice (B) is eliminated. Now choice (A) also is not possible as both are girls. Hence, choices (B) and (C) are possible. Choice (D)

12. If P and Q are selected, then S or T may also be selected from the boys. So the boys may be PQS or PQT. If PQS form the team, then the team should be PQSUW. If PQT are the boys, the teams may be PQTUV and PQTUW.
Choice (B)

13. If P and S are the boys selected, then R cannot be selected. So the boys can be P and S along with Q or T. i.e., PSQ or PST or PSQT (three ways of selection). Then the girls U or W can be selected as V cannot go with S. So the teams may be PSQUW, PSTUW, PSQT with U or W. Hence, altogether there are four ways of selection.
Choice (D)

14. If four boys can be selected as PQRS, PQST, PQRT, PRST, QRST but P and R cannot be together, then PQST or QRST is possible. In either case V cannot be selected as S and V do not go together. Choice (B)

15. Among the choices PQRVW cannot go as a team, as P and R cannot be together, whereas the other given teams can be selected. Choice (D)

Solutions for questions 16 to 20:

Let us write the data in short.
2 boys = A and B
2 girls = C and D
2 men = P and Q
2 women = R and S
2 cars = Black and White

Conditions are as follows:

(i) 2 children and 2 adults must be there in one car.
(ii) $A \neq Q$, i.e., A and Q cannot be in one car.
(iii) $P \neq D$, i.e., P and D cannot be in one car.
(iv) $R \neq S$, i.e., R and S cannot be in one car.
(v) 2 males + 2 females = each car, i.e., 2 males and 2 females must be there in each car.

It is clear that 1 boy, 1 girl, 1 man and 1 woman must be there in each car. As A and Q cannot be in one car, it can be concluded that A and P must be in one car. As P and D cannot be together, P and C must be in one car. So B, Q and D must be in the other car, whereas R and S can be in any of the cars. So, the distribution is as follows.

Cars	
Black Or White	White Or Black
A P C R or A P C S	B Q D S or B Q D R

Now let us solve the questions.

16. If P and A go in one car, P is a man and A is a boy.
So, they should have two females in their team – one woman and one girl. They can be R or S and C or D. So any of RD, RC, SC, SD can be with them. Choice (B)

17. If Q and R go together, the car must have a boy and a girl in it. D cannot go with P. So, D must go with Q and R. The boy may be A or B, but A and Q do not go together. So Q, R, D and B must go in one car.
Choice (C)

18. The car which is carrying D cannot carry P, hence P must be in the other car. Four members must be in each car of which two children and two adults (two males and two females) must be there. So, the selection may be as follows.

Car 1 2Children + 2Adults	Car 2 2Children + 2Adults
C A P	D B Q

R and S can be in any car. But D cannot go with P. So A, C, P cannot go with D. Choice (A)

19. P, S, A and C is a correct combination. Choice (A) is not true, as it states that P, S, A, C is not the correct combination but Q, R, B, D is correct. Hence choice (B) is also not true for the same reason as that of choice (A).
P, Q, A, C cannot go in one car. But P, S, A, C can go in one car. Choice (D)

20. P, S, A, C and Q, R, B, D are correct, as P is a man. A is a boy. S is a woman. C is a girl. Choice (B)

Solutions for questions 21 to 26:

Let the names of the persons be represented by the first letter of their respective names.
Amitabh – A, Binod – B, Jeetendra – J, Tapan – T, Shahruk – S, Irfan – I, Rafeek – R, Zayeed – Z.
Given, JT (X), SI (X) (X implies these two cannot go with the same marketing head).

The following four cases arise where two different groups can be obtained.

Case (i)
Group I — Group II
J — T
S — I
R
Z

Case (ii)
Group (I) — Group (II)
J — T
I — S
R
Z

Case (iii)
Group (I) — Group (II)
T — J
I — S
R
Z

Case (iv)
Group (I) — Group (II)
T — J
S — I
R
Z

21. Clearly, Binod has selected two executives. He can select JI or JS or TS, or TI.
He cannot select Rafeek and Zayeed. Choice (D)

22. This refers to case (iii) and case (iv) where Binod must select Rafeek and Zayeed.
He has to select exactly one out of Irfan and Shahrukh. Choice (D)

23. There are four different ways of forming groups. While corresponding to each of the four ways there are two ways in which any group could be given to Amitabh or Binod.
A total of eight ways. Choice (D)

24. Here case (i) and case (iv) will prevail.
First way
Binod $\rightarrow$ (I, T)
Amitabh $\rightarrow$ (J, S, R, Z)
Second way
Binod $\rightarrow$ (I, J)
Amitabh $\rightarrow$ (T, S, R, Z)
There are two ways. Choice (A)

25. Amitabh $\rightarrow$ (J), Binod $\rightarrow$ (S)
First way
Amitabh $\rightarrow$ (J, I, R, Z)
Binod $\rightarrow$ (T, S)
Second way
Amitabh $\rightarrow$ (J, I)
Binod $\rightarrow$ (T, S, R, Z)
There are two ways. Choice (A)

26. It can be observed that in (A), Jeetendra should not be with Tapan;
in (B), Shahrukh should not be with Irfan.
Choice (C) does not violate any condition. Choice (C)

Solutions for questions 27 to 30:

P, Q, R, S, T, U, V and W are eight buses. A, B and C are three Inspectors. Each of them inspect at least two buses. Further it is known that B inspects neither P nor Q i.e. B $\neq$ P and Q. Further given that A inspects U whereas C inspects Q and S.

A	B	C
U		Q S

27. If A inspects R, then A will inspect R and U as it is already given that, A inspects U. Now V and Q do not get inspected by the same inspector. So V must be inspected by B or A but C inspects Q and S. So B inspects V and one or more buses, but he does not inspect P or Q or both. So the buses left out are T, V and W. So, B can inspect any two or three or four, or all of them, provided A inspects only R and U. Hence, choice (D) is correct. Choice (D)

28. If each of A and C inspects 3 buses only, then B is now left with only 2 buses as all the eight buses are to be inspected. C inspects Q and S hence, C will inspect one more bus. A inspects U and two others. B has now any two of R, T, V and W as he cannot inspect P and Q. So he can inspect any two out of R, T, V and W. Choice (D)

29. If B inspects T, V and W only and C inspects only Q and S, then A has to inspect P, R and U. Choice (B)

30. C may or may not inspect 4 buses, so choice (A) may or may not be true. B inspects R, T, V as per choice (B) but this also may be True or may not be True. A may inspect U and P hence choice (C), also may or may not be True, but as there are only 8 buses, and each inspector has to inspect at least two buses, only two of them can inspect 3 buses each. Choice (D)

Exercise - 4(b)

Solutions for questions 1 to 4:

It is given that there are ten candidates, of which 2 are M.As, 2 are M.B.As, 2 are M.C.As and 4 are B.Techs. The conditions are as follows.
1 M.B.A $\Rightarrow$ 2 B.Techs
2 B.Techs $\Rightarrow$ M.B.A $\geq$ 1
Exactly one M.A candidate must be selected.

1. If Two B.Tech candidates are selected, then one M.B.A and one M.A are selected. More than one M.As cannot be selected according to the data. One M.B.A and only M.C.A with one M.A does not make a total of six. One M.A is already there. Now 2 B.Techs, one M.B.A. and one M.A make a total of four candidates. Now 2 more candidates must be there. Those two can be 1 M.B.A + 1 M.C.A. So, choice (D). Choice (D)

2. Two M.C.A candidates are selected. So, the choices must be 2 M.C.As + 1 M.A + 1 M.B.A + 2 B.Techs. 1 M.B.A and 1 B.Tech is not accepted. 3 B.Techs implies 2 M.C.As cannot be selected. Choice (C)

3. The given data says that 1 M.B.A is followed by 2 B.Tech candidates. If four B.Techs are selected, 2 M.B.As cannot be selected because 1 M.A must be selected and total has to be six candidates only.
Choice (A)

4. Let us validate each choice.
Choice (A): If 2 M.B As are selected, then 2 B.Techs must also be selected and 1 M.A is in every selection, which makes the total of 5 persons and the 6th can be an M.C.A, which is an acceptable selection.
Choice (B): If 2 M.C.As are selected then any way 1 M.A is there and the remaining three will be M.B As and B.Tech, i.e. 1 M.B.A and 2 B.Tech.
Choice (C): If 2 B.Techs are selected, then it does not violate any rule as explained in choice (B).
Choice (D): If no M.C.A is selected, then we need to select 6 out of M.B.As, M.As and B.Techs, i.e., 1 M.A and 5 out of M.B.A and B.Tech. The maximum of 2 M.B.A can be selected and then only 2 B.Tech should be selected. If so, we have to take 1 M.C.A also. So this choice is false.
Choice (D)

Solutions for questions 5 to 9:

Let us analyse all the conditions. It is given that only one out of French, German and Russian must be chosen. Only one of Philosophy and Sociology must be chosen. If Economics is chosen, Ecology must be chosen. Sociology and Anthropology cannot be chosen together.

5. Economics, Ecology and History can be chosen as the other three as per the above conditions. He cannot make the other choices as in the others, Economics is taken without Ecology. Choice (C)

6. Ecology, Russian, Anthropology are chosen. Then, Sociology cannot be chosen. French and German cannot be chosen. So, answers (A), (B) and (C) are wrong. But Philosophy and History can be chosen. Choice (D)

7. Philosophy, Russian and French are not chosen, so German must be chosen as one of the three languages must be chosen. It is known that if Philosophy is not chosen, then Sociology is chosen. So, Anthropology is not chosen. Choice (B)

8. If Economics is chosen, Ecology must be chosen as it is given as one of the conditions. Choice (B)

9. It is given that Economics must be chosen with Ecology. Answer (A) is not acceptable, so there is no need of checking the other choices. Choice (A)

Solutions for questions 10 to 14:

Three persons Ajay, Bony and Chetan buy two each out of 6 items P, Q, R, S, T and U. If Ajay buys R, Bony does not buy P or S or both. If Bony buys Q, Chetan does not buy U or T or both.

10. If Ajay buys R and T, then Bony cannot buy P or S or both. So Bony buys Q and U. Choice (B)

11. If Bony buys Q and S, then Chetan cannot buy T and U. So, Ajay must buy T and U, as each one has to buy two each. Choice (B)

12. If Chetan bought P and S, Ajay and Bony have to choose any two each of Q, R, T, U. Ajay may have any pair of QR, QT, QU, RT, RU or TU. So, we cannot say anything about their purchases as all the choices (A), (B) and (C) be true always. Choice (D)

13. If Ajay buys P and Bony buys Q, then Chetan buys neither T nor U. So, Chetan can buy the pair of R and S only.
Choice (A)

14. Let us validate each choice.
Choice (A): if Ajay buys R, Bony cannot buy P and S but he can buy Q or T or U. So it is not necessary to buy Q.
Choice (B): If Chetan buys T or U, that means Bony cannot buy Q. So this is also false.
Choice (C): Ajay bought R, then it is not necessary for Bony to buy T as explained in Choice (A).
Choice (D): If Ajay buys R and Bony buys Q, then Chetan has to buy only P and S, as he cannot buy T and U. Chetan has to buy P and S. Choice (D)

Solutions for questions 15 and 16:

From (1), at least one of E or B must be selected,
E can be selected.
B can be selected.
B and E can be selected.
At most one of A or D can be selected.
One of A or D can be selected or none of A or D is selected.
From (3), A, F and G together cannot be selected.
From (2), either C or D must be selected.

15. If A is selected then D cannot be selected. D is not selected implies that C must be selected. Choice (D)

16. If neither A nor D is selected, then the four persons can be selected in four ways.
1. CEFG
2. CBFG
3. CBEF
4. CBEG Choice (B)

Solutions for questions 17 to 20:

Let each student be denoted by the first letter of his name.
From (1) and (4), the teams can be (K, M), (P, J), (R, S) or (K, M), (P, S), (R, J).

From (3), in any case, if J is in Chemistry team, then M is in History team.
∴ S must be in Physics team, which is violating (2).
∴ J cannot be in the Chemistry team.
∴ We have the following possibilities:

	Physics	Chemistry	History
1	R, J	P, S	K, M
2	R, J	K, M	P, S
3	K, M	P, S	R, J
4	P, J	R, S	K, M
5	P, J	K, M	R, S
6	K, M	R, S	P, J

17. Choice (D)

18. Choice (B)

19. Choice (D)

20. Choice (B)

Solutions for questions 21 to 23:

We will represent the instructions as below.

(1) B, D and F $\rightarrow$ at least 1 must be selected.
(2) If B $\rightarrow$ not C and not G
(3) A and F not together
(4) If D $\rightarrow$ E
(5) If C $\rightarrow$ A

21. The possible combinations of a team with 4 members are as follows:
(1) B, A, D, E
(2) B, D, E, F
(3) D, E, A, C
(4) D, E, A, G
(5) D, F, E, G
∴ There are five ways to select a team of four members.
Choice (C)

22. A team of five members is ACDEG.
Hence, B cannot be selected. Choice (D)

23. The possible combinations of the team with three members are as follows:
(1) A, B, E
(2) B, D, E
(3) D, E, F
(4) B, E, F
(5) D, E, A
(6) D, E, G
(7) E, F, G
∴ There are 7 ways possible. Choice (A)

Solutions for questions 24 to 26:

From (i), the book printed in either 2004 or 2008 is selected or the book written by A is selected or the book printed in 2004 and 2008 are selected or none among them is selected.
From (ii), only the book printed in 2006 or the books printed in 2006 and 2007 or 2006 and 2008 or 2006, 2007 and 2008 can be selected or none among them is selected.
From (iii), the book written by D or the book printed in 2007 the book written by and D or the book printed in 2008 the book written by and D or the book written by D, the books printed in 2007 and 2008 can be selected or none among them is selected.
From (iv), the book printed in only 2005 or only 2007 or none among them is selected.
From (v), the book written by C and the books printed in 2004 and 2005 or the book written by C and the books printed in 2005 and 2006 or the book written by C and the books printed in 2006 and 2007 or the book written by C and the books printed in 2007 and 2008 can be selected or none among them is selected.
∴The possible selections are,
(i) A, B, C, 2006, 2007
(ii) B, C, D, 2007, 2008

24. The book printed in 2005 cannot be selected.
Choice (B)

25. The book printed in 2006 must be selected, if the book written by A is selected. Choice (C)

26. The book written by A must not be selected, if the book written by D is selected. Choice (A)

Solutions for questions 27 to 30:

From the given data, the possible combinations for each position are as follows.
Goal Keeper: J or K
Defenders: A + B, A + C, A + K, B + C, B + K, C + K
Mid-fielder: C or D or E or F
Forward: F + G, F + H, F + I, G + H, G + I, H + I

27. Given, J is selected. From (i), K will not be selected. According to (iv), neither F nor C will be selected. Hence, only A and B can be selected as defenders. According to (iii), when B is selected neither F nor I will be selected. Thus, only G and H can be selected as forwards.
Choice (B)

28. Given, F is selected as the mid-fielder. From (iii) B will not be selected. From (iv), J will not be selected. Hence A and C both have to be in the team as a defenders, but it violates (v) i.e., only one among C and F can be selected.
∴ No such team is possible. Choice (D)

29. When D is selected, from (ii) neither C nor K will be selected. Then J will be the goalkeeper and there is only possible combination of defenders to select, i.e. A + B. Since B is selected, from (iii), neither F nor I will be selected. Then there is only one possible combination of forwards to be selected, i.e. G + H. Thus there is only one way in which the team can be selected.
Choice (A)

30. When F is selected as forward, from (iv) K will be the goal keeper and from (v) C will not be selected. In such case only A and B can be selected as defenders. But from (iii), even B cannot be selected. Thus F cannot be selected as forward. Choice (A)

Chapter – 5
(Ordering, Sequencing and Comparisons)

Exercise – 5(a)

Solutions for questions 1 to 5:

1. Neither tree M nor tree N is the tallest.
Tree L is taller than tree P but is shorter than tree K, whereas tree O is as tall as tree P, but taller than tree M.
So, the order may be as follows

1	2	3	4
K	L	P	M
		O	

As the tree N is not the tallest, K must be the tallest.
Choice (C)

2. Company B has more profit than D, whereas B has less profit than E. i.e. E > B > D. A has more profit than C, but less than E. So the order must be as follows.

1	2	3	4	5
E	B	D	–	–
E	A	C	–	–

E > B > D and A > C. Certainly E got the maximum profit among all, as A also got less than E. Choice (B)

3. As it is given that C leaves the station before F leaves, but after D leaves, i.e. D > C > F.
So D C F can be the order of their departure.
E leaves the station before B leaves, who leaves before F leaves, i.e. E > B > F.
So E B F can be the order of their departure.
A leaves the station after F and C leave the station,
i.e. C > F> A.
So A is the last person to leave as shown below.

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

Choice (B)

4. It is given that R is 3rd from the bottom and V is 2nd from the top, then R and U have only one line between them, i.e. either S or P. Now the possible arrangement will be as follows.

Lines	I	II	III	IV
1	T or S	T or P	T or P	T or P
2	V	V	V	V
3	Q	Q	U	U
4	S or T	P or T	S	P
5	R	R	R	R
6	P	S	P	S
7	U	U	Q	Q

So, T or S or P has to be in line 1 and the poem starts with T or S or P. Choice (C)

5. In terms of weight, the Blue box stands 4th in order of 1 to 5 from the heaviest to the lightest. The Green box is the lightest of all boxes. The Orange box is heavier than the Blue box. The Red box is lighter than the White box and heavier than the Orange box.

So the order will be as follows.
Heaviest to the lightest.

1st	2nd	3rd	4th	5th
White	Red	Orange	Blue	Green

The White box is the heaviest of all. Choice (B)

Solutions for questions 6 to 8:

It is given that
The total prize amount = 150 lakhs.
The prize amount for singing round = 40% of 150 lakhs
= 60 lakhs.
The prize amount for acting round = 50% of 150 lakhs
= 75 lakhs.
Hence, the prize amount for dancing round = 15 lakhs.

From (i), (ii), (iv) and (v), we have,

Acting round	Singing round	Dancing round
Vinay > Sanjay> Vijay >Ajay	Vijay > Sanjay Ajay > Vinay	Vinay > Ajay > Vijay

From (iii) and (vi), we have
For acting round : Vinay > Sanjay > Vijay > Ajay
For singing round : Vijay > Sanjay > Ajay > Vinay
For dancing round : Vinay > Sanjay > Ajay > Vijay

In singing round, the prize amounts got by each person are,

Vijay = $\frac{6}{15} \times 60 = 24L$
Similarly,
Sanjay = 16L,
Ajay = 12L and
Vinay = 8L.

In acting round, the prize amounts got by each person are,

Vinay = $\frac{6}{15} \times 75 = 30L$
Similarly,
Sanjay = 20L,
Vijay = 15L and
Ajay = 10L.

In dancing round, the prize amounts got by each person are,

Vinay = $\frac{6}{15} \times 15 = 6L$
Sanjay = 4L,
Ajay = 3L and Vijay = 2L

Hence, the total amount got by each person is as follows.
Vinay = 30 + 8 + 6 = 44L
Sanjay = 16 + 20 + 4 = 40L
Vijay = 15 + 24 + 2 = 41L
Ajay = 10 + 12 + 3 = 25L

6. Sanjay got the same rank in all the three rounds. Choice (C)

7. Ajay got the least prize amount. Choice (D)

8. Ajay got 3 lakhs in dancing round alone. Choice (C)

Solutions for questions 9 to 12:

P, Q, R, S and T are five cars. In terms of speed it is given that T is faster than R, which is faster than P, which is faster than Q. But S is the slowest.
This can be represented as T > R > P > Q > S.

Table I
Speed wise

1	2	3	4	5
T	R	P	Q	S

In terms of cost, it is known that P is costlier than R, which is costlier than T. S is the cheapest of all. R is the third costliest, so P has to be before R in the arrangement which can be represented as

Costliest – Q > P >R > T> S or P > Q > R > T > S

Table II
Cost wise

1	2	3	4	5
P / Q	Q / P	R	T	S

P or Q may be the costliest or the second costliest. Now in terms of power, it is given that Q is more powerful than T, which is more powerful than R while S is the most powerful of all which can be shown as R > P but S > all cars. Thus, Q > T > R, whereas P can be most powerful than Q or T or R or may not be more powerful.

Table III
Strengthwise

1	2	3	4	5
S	Q	T	R	P

9. T is the fastest of all the cars (refer (Table I)). Choice (D)

10. The car which has as many cars more powerful and as many cars less powerful than it implies that the car should be in the exact middle in the order. T is the third more powerful, and it is in the middle in order of power as per (Table III). Choice (D)

11. P has two cars faster than it and two cars slower than it as per Table I. Choice (C)

12. The costliest car as per the given data can be either Q or P. Refer to Table II. Choice (D)

Solutions for questions 13 and 14:

The given conditions are as follows.

P, Q, R are three girls.
A, B, C are three boys.
Q is taller than R i.e. Q > R.
C is taller than Q i.e. C > Q.
C is taller than A i.e. C > A.
P is taller than B i.e. P > B.
B is taller than C i.e. B > C.

Now, the arrangement can be as follows.
C > Q > R and P > B > C and C > R.
Now, after considering all the above given conditions, the arrangement is as follows.

(Table I)

1	2	3	4	5	6
P	B	C	A/Q	A/Q/R	A/R

	1	2	3	4	5	6
I	P	B	C	A	Q	R
II	P	B	C	Q	A	R
III	P	B	C	Q	R	A

13. P is the tallest of all. Choice (A)

14. R is the shortest among the three girls.
P > Q > R. Choice (C)

Solutions for questions15 to 17:

Form (iii) the expected expenditure and the number of students who are attending the competition which is going to be conducted by E are ₹6 lakhs, 1500 students or ₹4 lakhs, 1000 students.
From (i) and above discussion, the estimated expenditure of E is ₹4 lakhs.
From (ii) and above discussion, the expenditure of A and D are ₹3 lakhs and ₹5 lakhs respectively.
∴ The expenditure of C is ₹2 lakhs.
From (vi) and the above results, the expected number of students attending in A and B are 1200 and 1500 in any order.
∴ The expected expenditure per student in A and B are ₹250 and ₹400 respectively or ₹200 and ₹500 respectively.
But from (iv), the expenditure per student in 2011 must be ₹550 or ₹500. ₹550 is not possible as none of the expenditures is a multiple of 11.
∴ The expected expenditure of B can be ₹500.
∴ B is going to conduct the function in 2011.
From (v) and as the expenditure per student for neither C nor D can be ₹200 or ₹800, E is going to conduct in 2010.
∴ In 2009, D has to conduct. The expected students must be 2000 so that the expenditure per student will be ₹250 and that for C is ₹125.
∴ The distribution is:

College	A	B	C	D	E
Year	2012	2011	2013	2009	2010
Expenditure (in lakhs)	3	6	2	5	4
Number of students	1500	1200	1600	2000	1000
Expenditure per students (in rupees)	200	500	125	250	400

15. Choice (D)

16. Choice (B)

17. Choice (C)

Solutions for questions 18 to 20:

Let the number of apples with A, B, C, D, E, F be a, b, c, d, e, f respectively.
Given,
∴ b = 2d and c = 3e.
Let a = b + k ⇒ a = 2d + k
∴ e = f + k
⇒ a + b + c + d + e + f = 2d + k + 2d + 3e + d + e + e - k
= 5d + 5e = 40.
∴ d + e = 8
But e ≥ 2 and d ≥ 3
If e = 2, d = 6, but c = 3e = 6, which is not possible.
If e = 4, d = 4, which is not possible.
∴ e = 3, d = 5 is the only possibility.
⇒ b = 10, c = 9, d = 5, e = 3
Now, a + f = 40 – (10 + 9 +5 + 3) = 13.
∴ a = 12 and f = 1 or a = 11 and f = 2.

18. Choice (C)

19. Choice (D)

20. Choice (A)

Solutions for questions 21 to 25:

21. As at least one of them has at least one black hat and A says "I know the colour of my hat, means A can see the both hats that are of white colour. Hence that order is black, white, white. Choice (D)

22. As atleast one of them has at least one white hat and A says "I don't know the colour of my hat" means he can see hats (white, white) or (white, black) or (black, white) respectively on C and B. B says I don't know the colour of my hat" means C's hat can be either white or black, Hence order cannot be determined. Choice (D)

23. Because X bought only two white hats, A can know that the colour of his hat is black means he can see the both hats that of that are of white colour.
As there are three black hats, X is still he left with 2 black colour hats. Hence both (A) and (C) are true.
Choice (D)

24. A could not know the colour of his hat implies, he could see at least one black hat on either B or C. In this case B can determine the colour of his hat if he can see white hat on C. But he could not know the colour of his hat implies that a is wearing black hat. If both B and C are wearing white colour hats, A cannot say that doesn't he don't know the colour of his hat.
Hence C is definitely false. Choice (C)

25. (A), (B), (C) may be true but D is definitely true.
Choice (D)

Solutions for questions 26 to 30:

From the given data we can tabulate the program of the players in various rounds in the following manner:

Round	1	2	3	4	5 (QF)	6 (SF)	7 (Final)
Number of players	80	40	20	10	5	3	2
Number of Matches	40	20	10	5	1 Bye 2 Matches	1 Bye 1 Match	1
Matches when there are no upsets	1 Vs 80 2 Vs 79 . . . . 39 Vs 42 40 Vs 41	1 Vs 40 2 Vs 39 . . . . 19 Vs 22 20 Vs 21	1 Vs 20 2 Vs 19. . . . . 9 Vs 12 10 Vs 11	1 Vs 10 2 Vs 9 . . . . 4 Vs 7 5 Vs 6	Rank 1 (Bye) 2 Vs 5 3 Vs 4	Rank 2 (Bye) 1 Vs 3	1 Vs 2

26. From the above, the number of byes in the tournament are 2 (one in QF and other in SF). Choice (C)

27. From the table, seed 4 plays with seed 3. Choice (A)

28. One upset in QF can happen in two ways.
(1) If seed 5 wins, then semi finalists are seed 1, seed 3, seed 5 upset in semi final takes place in match between seed 1 Vs seed 5. ∴ Finalists are (seed 3, seed 5)

(2) If seed 4 wins, then the semi finalists are seed 1, seed 2, seed 4. Upset in semi final takes place in match between seed 1 Vs seed 4. Finalists are seed 2 and seed 4. Choice (C)

29. Seed 1, seed 2, seed 3, seed 4 and seed 5 are the players who reached the quarter finals. From quarter final to semi final odd number of players are qualified hence one bye takes place here and seed 1 player reaches directly to semi-final. As there are no upsets in quarter final, seed 2 and seed 3 players will reach semi final. From semi final to finals odd number of players are qualified hence one bye takes place here and seed 2 player reaches directly to semi final. The semi final match happens between seed 1 and seed 3. As there is one upset, winner must be seed 3 player.
Hence, the final match happens between seed 2 and seed 3 player.
Hence, without an upset the winner is seed 2 player.
Choice (C)

30. In the first round, seed 50 plays with seed 31.In the second round ,seed 50 plays with winner of the match between seed 10 and seed 71.In the third round, seed 43 and the winner of the matches between seed 11 and seed 70 or the match between seed 30 and seed 51 are played.

Hence 50^{th} seeded player would have played with 11^{th} or 30^{th} or 51^{st} or 70^{th} seeded player in the third round.
Choice (B)

Exercise – 5(b)

Solutions for questions 1 to 4:

In terms of cleverness, it is known that
A is cleverer than B, C is cleverer than B, E is the least clever of all, i.e. A > B and C > B, but there is no relation between A and C.
So, both A and C are cleverer than B and E is the last in order of cleverness. So it is clear that neither A nor C can be 4^{th} and B cannot be 1^{st} or 2^{nd}, as A and C are cleverer than him.

1	2	3	4	5
-	-	-	-	E

So nothing can be decided about the exact order. In terms of scores, it is given that A scores less marks than D, i.e. D > A and C gets more marks than B i.e. C > B, whereas E scores more than C, i.e. E > C so E > C > B. Now the order cannot be decided. It can be only said that E can be neither 4^{th} nor 5^{th}. B cannot be 1^{st} and 2^{nd}. D cannot be 5^{th} and A cannot be 1^{st} in the order of score.

1. If D is the cleverest of all, the order is as follows.

1	2	3	4	5
D	A or C	C Or A	B	E

Then one of the orders can be, D, C, A, B, E.
Choice (C)

2. If B is cleverer than D, then A or C stands first in terms of cleverness.

1	2	3	4	5
A/C	C/A	B	D	E

Choice (D)

3. C stands second in order of marks. Then the third score may be of B or D. So, who gets the third position cannot be determined. Choice (D)

4. The order of cleverness or marks is not clearly given. So it cannot be determined who is cleverer and also scores more marks than two people. Choice (D)

Solutions for questions 5 to 8:

As, the total sum = 30, and least sum (1, 2, 3) = 6, and the highest sum is (2, 3, 4) = 9, the sum of the ranks must be 6, 7, 8 and 9.
From the given information, we have,

	Rajesh	**Tarun**	**Praneeth**	**Sravan**
Quant	1			
Reasoning			3	
Verbal		4		
Total				9

As sum of the ranks of Sravan is 9, the ranks must be 2, 3 and 4.
∴ Praneeth got the first rank in Verbal.
⇒ Tarun got the first rank in Reasoning.
In reasoning, if Rajesh got the second rank and Sravan got the 4^{th} rank, then Praneeth must have got the fourth rank in Quant.
As only Rajesh can get the sum (1, 2, 3) as 6, Rajesh's rank in Verbal must be 3.
∴ Sravan's rank in Verbal must be 2^{nd}, which is violating (4).
∴ In Reasoning, Rajesh got the fourth rank and Sravan got the second rank.
Now, only Praneeth can get the sum as 6.
∴ Praneeth's rank must be two in Quant.
Tarun's sum cannot be 7, Rajesh's rank in Verbal must be two.
∴ Sravan's ranks in Verbal and Quant are 3 and 4 respectively.
∴ Tarun got the third rank in Quant.

	Rajesh	Tarun	Praneeth	Sravan
Quant	1	3	2	4
Reasoning	4	1	3	2
Verbal	2	4	1	3
Total	7	8	6	9

5. Tarun got the third rank in Quant. Choice (A)

6. Sum of the ranks of Praneeth is 6. Choice (C)

7. Rajesh got the second rank in Verbal. Choice (B)

8. Sum of the ranks of Rajesh is 7. Choice (B)

Solutions for questions 9 to 12:

Let each person be denoted by the first letter of his name.
From the given information we have:

	A	S	B	C	T	V
Height	2					
Weight				4		

From (2) and (6), we have
Height: V > S, V > C, S > T
⇒ V > S > T, V > C
Weight: V > S, V > C, B > A

From (1), neither B nor T got 2^{nd} or 4^{th} rank in any category.
∴ T's rank in height must be 5 or 6.
If T's rank in height is 6, then B's rank in weight will be 6, which violates (6).
∴ T's rank in height is 5 and B's rank in weight is 5.
∴ A's rank in weight will be 6.
Also, as none of B, S, T, V can get the 6^{th} rank in height, C gets the 6^{th} rank in height.
∴ B and V got the first and the third ranks in height respectively.
∴ S got the 4^{th} rank in height.

Now, in weight if V gets the first rank, then T must get the third rank.
In height B must get the third rank.
⇒ V gets the 1^{st} rank in weight as well, which violates (3).
∴ In weight, V gets the second rank.
∴ S gets the third rank.

$\Rightarrow$ T gets the first rank.
$\therefore$ In height, B gets the first rank and V gets the third rank.

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

	A	S	B	C	T	V
Height	2	4	1	6	5	3
Weight	6	3	5	4	1	2

9. Sunil got third rank in weight. Choice (A)

10. Chanty's rank in weight is 4^{th}. Choice (C)

11. Bunty got the 1^{st} rank in height. Choice (D)

12. Five. Choice (D)

Solutions for questions 13 to 15:

The given data is that the five types of vegetables are – Carrot, Tomato, Brinjal, Cabbage and Cauliflower.

In terms of freshness, it is given that:

Tomato is more fresh than Cauliflower, i.e. Tomato > Cauliflower.
Carrot is more fresh than Cabbage, i.e. Carrot > Cabbage.
Cauliflower is more fresh than Cabbage, i.e. Cauliflower > Cabbage.
Tomato is more fresh than Brinjal, i.e.Tomato > Brinjal.
So, Tomato is more fresh than Brinjal and Cauliflower.
Carrot and Cauliflower are more fresh than Cabbage.

Let us denote Tomato by To, Brinjal by Br, Cauliflower by Cl, Carrot by Cr and Cabbage by Cb.

The following things are known.

Freshness wise	To > Br To > Cl > Cab Cr > Cab
Weight wise	Cr > Br > To > Cl Cab > To

So, the order of freshness cannot be decided.
Tomato is heavier than Cauliflower, i.e. Tomato > Cauliflower.
Carrot is heavier than Brinjal, i.e. Carrot > Brinjal.
Cabbage is heavier than Tomato, i.e. Cabbage > Tomato.
Brinjal is heavier than Tomato, i.e. Brinjal > Tomato.
So, the order can be as follows.

Table I

1	2	3	4	5
Carrot	Brinjal	Cabbage	Tomato	Cauliflower
Cabbage	Carrot	Brinjal	Tomato	Cauliflower
Carrot	Cabbage	Brinjal	Tomato	Cauliflower

13. The order of freshness is :
Tomato, Brinjal, Cauliflower, Carrot, Cabbage
Tomato, Carrot, Cauliflower, Brinjal, Cabbage
Tomato, Carrot, Cauliflower, Cabbage, Brinjal
So either Cabbage or Brinjal is the least fresh of all the vegetables. Choice (D)

14. If Cabbage is the heaviest, the order is

1	2	3	4	5
Cabbage	Carrot	Brinjal	Tomato	Cauliflower

in terms of the heaviest to the least heavy.
So, Cabbage is the heaviest and Carrot is the 2^{nd} heaviest. Choice (D)

15. If Carrot is not the freshest of all, then only Tomato is the freshest. Choice (B)

Solutions for questions 16 to 18:

From (ii), the square and cube numbers can be (16, 64), (25, 27), (36, 64), (49, 27), and (81, 27). Since the weight of all the seven boys is a 2 – digit number. (64, 64) is not possible, since no two boys have the same weight. Hence, D's weight can be 40, 26, 50, 38 and 54 respectively. From (iv) and the above, the possible weights are as shown bellow.

Person	A	B	C	D	E	F	G
Case (i)		6		40			
Case (ii)		15		26			
Case(iii)		26		50			
Case (iv)		39		38			
Case (v)		71		54			

Case (i) is eliminated, since the weight of B is a single digit number. Case (iv) and case (v) are eliminated, since the persons are standing in increasing order of their weights from left to right.

In case (ii), C's weight is 25 and E's weight is 27.
In case (iii), C's weight is 36 and E/F/G's weight is 64. From (v), Case (ii) is eliminated, Since A's weight can be 9 or 18 or 27 and so on. A's weight cannot be 9, as 9 is a single digit and A's weight cannot be > 15.
In case (iii) A's weight is 18.
i.e.,

Persons	A	B	C	D	E	F	G
Case (i)	18	26	36	50	64		
Case (ii)	18	26	36	50		64	
Case (iii)	18	26	36	50			64

From (iii), in case (i) and case (ii) G's weight is = 26 + 50 = 76.
Case (iii) is eliminated as G's weight $\neq$ 76.
From (i),

In case (i), E's weight = $\frac{50 + \text{F's weight} + 76}{3}$

$$64 = \frac{126 + \text{F's weight}}{3}$$

$\therefore$ F's weight = 66.

In case (ii), E's weight = $\frac{50 + 64 + 76}{3}$ = 63.3 not a 2-digit number.
Hence case (ii) is eliminated.
$\therefore$ The persons and their weights are as shown below.

Persons	A	B	C	D	E	F	G
Weights	18	26	36	50	64	66	76

16. F's weight is 66 kgs. Choice (C)

17. The difference between G's weight and A's weight is 58 kgs. Choice (B)

18. The weight of all the boys together is 336 kgs. Choice (A)

Solutions for questions 19 to 21:

From the given information,

Team	Win	Loss	Draw
A		2	
B		1	
C	–	–	5
D	2	2	1
E		1	1
F		3	1

As C had drawn a match with every other team the five matches should reflect in the other's score sheets also.

Hence, the number of matches drawn by A and B should be at least '1' each and E and F should be at least '2'.
It can be further seen that the number of matches drawn is 6, as we already have 9 losses in the loss column, we need to have 9 wins in the wins column.

Hence, the final score sheet is,

Team	Win	Loss	Draw	Score
A	2	2	1	80
B	3	1	1	130
C	–	–	5	100
D	2	2	1	80
E	2	1	2	110
F	–	3	2	10

19. B and E advance into the finals. Choice (C)

20. A and D have the same score. Choice (B)

21. The total number of winners in the first round is 9. Choice (B)

Solutions for questions 22 to 25:

From the information on time taken to traverse a stretch, we can determine their speeds in km/h. Further, at all signals, the maximum wait time in any direction is 9 minutes, This implies that the signal remains green for three minutes each direction. Also implies that the signal turns green after every 12 minutes in each direction: Towards north, signal turns green at 8 : 30, 8 : 42, 8 : 54, 9 : 06, 9 : 18, 9 : 30 and so on. Thus in any hour, at any signal, the signal turns green at 06th, 18th, 30th, 42nd and 54th minutes invariably.
No given speed or travel matches the cycle of green signal at the signal posts.

Thus, invariably each person will wait at each signal post irrespective of his speed.

Speed KMPH	Travel time to reach next signal	Waiting time	Time to start next stretch
80	15 min	9 min	24 minutes
75	16 min	8 min	24 minutes
60	20 min	4 min	24 minutes
40	30 min	6 min	36 minutes

22. D's initial speed = 75 kmph.
$\Rightarrow$ time on 1st stretch = 16 minutes.
Earliest time
$\Rightarrow$ speed has to be increased = 80 kmph.
$\Rightarrow$ time taken on second, and third signal stretches = 15 minutes.
$\Rightarrow$ time taken = (16 + 8) + (15 + 9) + (15 + 0)
= 63 minutes. Earliest time = 8 :30 + 63
= 9.33 Choice (B)

23. 10 : 45 − 8 : 30 = 2 : 15 = 135 minutes
Choice (A) = 36 + 24 + 24 + 36 + 20
= 140 minutes
Choice (B) = 36 + 36 + 24 + 24 + 15
= 135 minutes
Choice (C) = 36 + 36 + 24 + 36 + 15
= 157 minutes
Choice (D) = 36 + 24 + 36 + 24 + 16
= 136 minutes. Speeds in Choices (B) takes B to signal 5 by 10 : 45 pm. Choices (B)

24. Initial speed = 80 kmph $\Rightarrow$ Time to reach signal 3
= (15 + 9) + $\underline{x}$ + 20 x can be 24 or 36
$\therefore$ Time to reach signal 3 = 44 + 24 or 44 + 36
= 68 or 80 minutes
$\Rightarrow$ Time = 9 : 38 or 9 : 50 Choices (D)

25. Starts at signal 2 = 9 : 30
$\Rightarrow$ time = 60 minutes = 24 + 36 (24 > 36) minimum waiting time = 4 + 6 = 10 minutes. Maximum waiting time = 9 + 6 = 15 minutes. Choices (A)

Solutions for questions 26 to 30:

Given that India won all the 5 matches and scored 6 goals and conceded 1 goal.
Hence in exactly one match, India scored 2 goals while the opponent scored 1 goal. From (i), that opponent is Thailand.
Now, if we consider Thailand, which lost all the matches, it scored a goal and there are 6 goals against it.
Hence, in each match except one, the opposite team scored a goal and in one match the opposite team scored 2 goals, while Thailand scored a goal.
Given, Japan won 4 matches.
$\therefore$ Japan won each match against each of the other teams except India.
Similarly for Pakistan; it won every other match except those against India and Japan.
$\therefore$ China won only against Korea and Thailand and Korea won against only Thailand.
Now in the match between Korea and China, the result was 3-2.
$\therefore$ In the remaining two matches, there are 0 goals for Korea and 2 goals against Korea.
$\therefore$ In the match between Pakistan and Korea. If the result is (1, 0) and in the match between Japan and Korea the result is (1, 0).
In the remaining matches of China, it scored 1 goal for them and there are 5 goals against them.
In both the matches China lost and as, in any match the maximum goal difference is 2, in the match when China scored 1 goal, there must be 3 goals against it and in the other match the result must be 0-2.
Now comparing the goals of Pakistan and Japan, we can find that, in the match between Japan and China the score is 3 – 1 and Pakistan and China is 2 – 0.
$\therefore$ The result of the match between Japan and Pakistan is 2 – 1.
The following table gives the complete result with respect to the teams given in the left most column.

Team	Against					
	Pakistan	India	Korea	Japan	China	Thailand
Pakistan	---	Lost (0-1)	Win (1-0)	Lost (1-2)	Won (2-0)	Won(1-0)
India	Won (1-0)	--	Won(1-0)	Won(1-0)	Won (1-0)	Won (2-1)
Korea	Lost(0-1)	Lost (0-1)	--	Lost (0-1)	Lost (2-3)	Won (1-0)
Japan	Won (2-1)	Lost (0-1)	Won (1-0)	--	Won(3-1)	Won(1-0)
China	Lost (0-2)	Lost (0-1)	Win (3-2)	Lost (1-3)	--	Won (1-0)
Thailand	Lost (0-1)	Lost (1-2)	Lost (0-1)	Lost (0-1)	Lost (0-1)	--

26. Choice (D)

27. Choice (B)

28. Choice (C)

29. Only choice (D) is false. Choice (D)

30. This happened in a total of four matches. Choice (D)

Chapter – 6
(Binary Logic)

Exercise – 6(a)

Solutions for questions 1 to 7:

1. Let us analyse the statement given by Kiran, Lalit and Manish.
Kiran : I am not a liar.
If Kiran is the truth-teller, then this statement given by him is true, hence Kiran must be the truth-teller.
Lalit : Manish is not a liar.
If Lalit is the truth-teller, then Manish must be the truth-teller. But we cannot have two truth-tellers, hence Lalit cannot be the truth-teller. Lalit is a liar.
Manish : Lalit is a truth-teller.
If Manish is the truth-teller, then Lalit is also a truth-teller, which means that there are two truth-tellers. As it is given that exactly one person among them is a truth- teller, hence Manish cannot be a truth-teller. Manish is a liar. Hence, Kiran is a truth-teller and Lalit and Manish are liars.
Choice (A)

2. Let us assume any person to be the truth-teller.
Let A be the truth-teller.
If A is the truth-teller, then B must be the liar, which means that C must be the alternator. As B is a liar, both his statements must be false. Hence, C is the alternator, whose one statement is true and the other is false.
Let us assume B is the truth-teller.
If both the statements given by B are true, then both B and C must be the truth-tellers, which is not possible – as there is exactly one truth-teller among these three persons.
Let us assume C is the truth-teller.
If both the statements given by C are true, then B also becomes the truth-teller, which is not possible. Hence, A is the truth-teller, which implies that C is the alternator and B is the liar. Choice (B)

3. Let us assume that Charles is the truth-teller.

	I	II	Thief
Charles	T	T	×
Raj	F	F	✓
Soban	T	F	×

As per this case, Raj is the thief. Assuming that Raj is the truth-teller, we get:

	I	II	Thief
Charles		F	
Raj	T	T	×
Soban		T	

As per the above table, Soban stands a chance of becoming the alternator, then Charles should be the liar. But when we take Soban's first statement to be false, we get

	I	II	Thief
Charles	T	F	
Raj	T	T	
Soban	F	T	✓

Hence, we get two alternators, which means that Raj is not the truth-teller.

Assuming that Soban is the truth-teller, we get:

	I	II	III
Charles	F	F	✓
Raj	T	T	×
Soban	T	T	×

Hence, we get two truth-tellers, hence Soban can never speak the truth. As per our assumption that Charles speaks the truth, we find that Raj is the thief. Choice (C)

4. Assuming that Akshay is the truth-teller, we get the following arrangement.

	I	II		
Akshay	T	T	Truth-teller	Tallest
Sanjay	F	F	Liar	Shortest
Sunil	F	T	Alternator	2nd Tallest

Assuming that Sanjay is the truth-teller, we get the following arrangement.

	I	II		
Akshay	F	T	Alternator	Shortest
Sanjay	T	T	Truth-teller	Tallest
Sunil	F	F	Liar	2nd Tallest

Assuming Sunil is the truth-teller, we get the following arrangement.

	I	II		
Akshay	F	T	Alternator	2nd Tallest
Sanjay	F	F	Liar	Shortest
Sunil	T	T	Truth-teller	Tallest

Hence, either Akshay or Sunil can be the 2nd tallest, but not Sanjay. Choice (B)

5. If Johnson always speaks the truth, then Bailley won Gold, Johnson got Bronze. Hence Jones get Silver, which also means that Bailley is also the truth-teller. Hence neither Johnson nor Bailley is the truth-teller. Therefore Jones must be the truth-teller, which gives us the following arrangement.
Johnson → Gold
Bailey → Bronze
Jones → Silver Choice (A)

6. Each among Laxman, Mehar and Kashyap is an alternator. Let Kashyap's first statement be true and second be false.

	I	II	Rank
Kashyap	T	F	1
Laxman	F	F	2
Mehar	F	T	3

Hence, Laxman is not an alternator, which means our assumption was false. Let Kashyap's first statement be false and second be true.

	I	II	Rank
Kashyap	F	T	2
Laxman	F	T	3
Mehar	T	F	1

Hence, the correct order is Mehar, Kashyap, Laxman.
Choice (C)

7. Let Raman be the truth-teller.

	I	II	Subject
Raman	T	T	Physics
Yashwant	F	F	Chemistry
Pranay	T	T	Mathematics

In this case, we get two truth-tellers and one liar, which violates the conditions.
Let Yashwant be the truth-teller.

	I	II	Subject
Raman	F	F	Chemistry
Yashwant	T	T	Mathematics
Pranay	F	T	Physics

Hence Raman's statements are lies, which is against the given conditions. Hence, Pranay must be the truth- teller and the arrangements we get:
Case (i) Raman – Physics
Yashwant – Chemistry
Pranay – Mathematics

Case (ii) Raman – Chemistry
Yashwanth – Physics
Pranay – Maths
Case (iii) Raman – Physics
Yashwant – Maths
Pranay – Chemistry

If we check the falsity and truth of the statements, we will get the correct arrangement as:

	I	II	Subject
Raman	T	F	Physics
Yashwant	T	F	Mathematics
Pranay	T	T	Chemistry

Choice (A)

Solutions for questions 8 to 10:

Case (i): Let Kambli be the truth-teller.

Truth	I	II	Sport
Kambli	T	T	Cricket
Kumble	F	T	Football
Krishnan	F	F	Tennis

Case (ii): Let Kumble be the truth-teller.

	I	II	Sport
Kambli	F	F	Foot ball
Kumble	T	T	Cricket
Krishnan	T	T	Tennis

As there are two truth-tellers, this is not possible.
Case (iii): Let Krishnan be the truth-teller.

	I	II	Sport
Kambli	F	F	Football
Kumble	T	T	Cricket
Krishnan	T	T	Tennis

As there are two truth-tellers. This is not possible.

8. Krishnan is the liar. Choice (C)

9. Krishnan is the Tennis player. Choice (C)

10. Kumble plays Football. Choice (B)

Solutions for questions 11 to 13:

(i) Let us assume Dinit always speaks the truth:

	I	II	Profession
Dinit	T	T	Doctor
Farah	T	T	Lawyer
Adarsh	T	F	Professor

(ii) Let us assume that Adarsh always speaks the truth:

	I	II	Profession
Dinit	F	T	Professor
Farah	F	T	Lawyer
Adarsh	T	T	Doctor

In the above two cases, Dinit and Farah always speak the truth in case (i) and Adarsh speaks the truth in case (ii).

11. Farah is the Lawyer. Choice (B)

12. Dinit can be either Doctor or Professor. Choice (D)

13. The person who always speaks the truth cannot be determined. Choice (D)

Solutions for questions 14 and 15:

14. If each scored equal number of runs i.e., 20 + 20 + 20, then the arrangement is as follows:

	I	II	Runs
Sanjay	T	T	20
Rahul	F	F	20
Sanat	F	T	20

Rahul is the liar. Choice (B)

15. If the runs scored by them are 15, 20 and 25, then we get the following arrangements.

(i) Assume that Sanjay speaks the truth.

	I	II	Runs
Sanjay	T	T	20
Rahul	F	T	15
Sanat	F	F	25

(ii) Assume that Rahul speaks the truth.

	I	II	Runs
Sanjay	F	T	25
Rahul	T	T	15
Sanat	F	F	20

(iii) Assume that Sanat speaks the truth.

	I	II	Runs
Sanjay	F	T	15
Rahul	F	F	20
Sanat	T	T	25

In cases (i) and (ii), Rahul scored 15 runs, whereas in case (iii), Sanjay scored 15 runs but Sanath did not score 15 runs in any case.

Choice (C)

Solutions for questions 16 to 18:

It is known that Hewitt won the U.S. Open, which means that the 2nd statement made by Agassi must be true, whereas the 2nd statement made by Hewitt is false. As each player won exactly one Grand Slam, this means that Fedarar always speaks the truth, as there must be at least one person who always speaks the truth.

	I	II	Won
Safin	F	F	Wimbledon
Agassi	F	T	Australian
Fedarar	T	T	French
Hewitt	T	F	U.S.

16. Agassi won the Australian Open. Choice (B)

17. Safin always lies. Choice (A)

18. Fedarar won the French Open. Choice (B)

Solutions for questions 19 and 20:

The statements given by Bhargav is "I am a liar". If Bhargav always speaks the truth, he will not call himself a liar. Similarly, if Bhargav is a liar, then he will not speak the truth by admitting that he is a liar. Hence, Bhargav is the person whose statement is neither true nor false. Then Chandu's statement must be false, as there is only one person whose statement cannot be classified as true and false and that is Bhargav. Hence, Anand always speaks the truth. Therefore

Anand → always speaks the truth.
Bhargav → neither speaks truth nor lies.
Chandu → always lies.

19. Anand got the first rank. Choice (A)

20. Chandu is the liar. Choice (C)

Solutions for questions 21 to 24:

Let the scores obtained by Akbar, Birbal, Shahjahan and Humayun be A, B, S and H respectively.
Assume Karan is lying, and others are not lying.

$\therefore$ Total score = $\frac{30+40+50+60}{3}$

One combination of three persons has scored 60 points. This would imply, the fourth person has scored 0 points.
So, Karan may or may not be lying.
Assume Yuahishtra is lying, total score

= $\frac{20+40+50+60}{3}=\frac{170}{3}$

This is not possible as the total score must be a natural number.
Assume, Duryodhan is lying, then total score

= $\frac{20+30+50+60}{3}=\frac{160}{3}$ (not a natural number)

Here again, Duryodhan must not be lying.
Assume, Shakuni is lying.

Total score = $\frac{20+30+40+60}{3}=50$

This is not possible as the total score cannot be less than the combined score of three persons.

Assume Kunti is lying, total score

= $\frac{20+30+40+50}{3}=\frac{140}{3}$ is not possible.

Thus, Yudhishtra, Duryodhan, Shakuni, Kunti are definitely not lying.
Hence, Karan is definitely lying.

21. Karan is lying. Choice (A)

22. Total score obtained = (30 + 40 + 50 + 60) / 3 = 60. Choice (A)

23. Total score = 60
Since three players together scored 60 points, the fourth player must have scored 0 points.
Let's assume one more player has scored 0 points.
Let, remaining two players scored x, y.
(0, 0, x, y) are the scores of four players. Which is not possible as this would lead to data inconsistency.
$\therefore$ Only one player scored 0. Choice (B)

24. Let the scores be 0, x, y and z
(0 + x + y) = 30 → (I)
(0 + x + z) = 40 → (II)
(0 + y + z) = 50 → (III)
(x + y + z) = 60 → (IV)
(IV) – (III) gives x = 10.
(IV) – (II) gives y = 20.
(II) gives z = 30.
$\therefore$ Highest score obtained = 30 points. Choice (D)

Solutions for questions 25 to 27:

The given statements are:

Person	Statement I	Statement II
Ajay	A > S	B > V
Binoy	V > A	B < K
Kumar	K < S	V > B
Vijay	S > A	V > S
Sanjay	K < B	K > A

In the above table, each person is represented by the first letter of his name. Given, each person makes at least one false statement.

25. It is given that B > A and V > S.
We have the following possibility:

A :	I A > S	T
	II B > V	F
B :	I V > A	T
	II B < K	F
K :	I K < S	F
	II V > B	T
V :	I S > A	F
	II V > S	T
S:	I K < B	T
	II K > A	F

The possible sequence is V > B > A > K > S.
Choice (B)

26. It is given that B > S and V > B
We have the following possibilities

		(a)	(b)	(c)	(d)
A:	I A > S	T	T	T	T
	II B > V	F	F	F	F
B :	I V > A	F	F	T	F
	II B < K	T	T	F	F
K :	I K < S	F	F	F	F
	II V > B	T	T	T	T
V :	I S > A	F	F	F	F
	II V > S	F	F	T	T
S :	I K < B	F	F	T	T
	II K > A	T	F	F	F

From (a), we get the following sequences :
K > A > V > B > S
From (b) we get
(1) A > K > V > B > S
(2) A > V > K > B > S
(3) A > V > B > K > S

From (c), we get
(1) V > A > B> K > S
(2) V > B > A > K > S
(3) A > V > B > K > S

From (d), we get
A > V > B > K > S
There are eight such possible cases. Choice (C)

27. Given that there are exactly five true statements and B is the youngest, we get the following arrangements.

A:	I A > S	T
	II B > V	F
B :	I V > A	F
	II B < K	T
K :	I S > K	F
	II V > B	T
V :	I S > A	F
	II V > S	T
S :	I B > K	F
	II K > A	T

K is the oldest. Choice (A)

Solutions for questions 28 to 30:

Case (i): P is the truth teller.
This implies Q is from India, R is from Pakistan and P is from China.

From the above, the first and the third statements of Q are false and the third statement of R is false.

Q could be either an alternator or a liar. If Q is an alternator, his second statement will be true and hence, the first two statements of R will be false. All these deductions hold good without causing any contradiction.

Thus, when P is the truth teller, Q is an alternator and R is a liar. P is from China, Q is from India and R is from Pakistan.

Case (ii): Q is the truth teller.
This implies Q is from Pakistan, P is from India and R is from China.

From the above, all the statements of P and also that of R are false. This contradicts the given information that one of them is an alternator.

Hence, Q cannot be the truth teller.

Case (iii): R is the truth teller.
This implies Q is a liar and P is from Pakistan. Hence, P is the alternator. From the statements of R it is clear that his first statement is false and hence, the second one is true and the third one is false. It implies Q is from India and R is from China.

Thus, when R is the truth teller, P is an alternator and Q is a liar. P is from Pakistan, Q is from India and R is from China.

28. Q is from India. Choice (B)

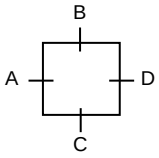
29. P cannot be a liar. Choice (A)

30. Q made at least two false statements. Choice (B)

Exercise – 6(b)

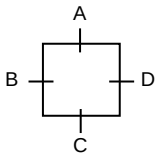
Solutions for questions 1 to 3:

Case (i):
Let us assume that A speaks the truth.
The arrangement is



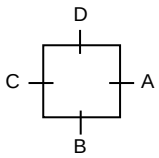
	I	II	
A	T	T	Truth-teller
B	F	T	Alternator
C	F	F	Liar
D	F	T	Alternator

Case (ii):
Let us assume that B is the truth-teller, then the arrangement is



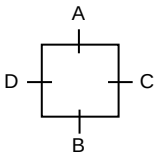
	I	II	
A	F	T	Alternator
B	T	T	Truth-teller
C	F	F	Liar
D	F	F	Liar

Case (iii):
Let us assume that C is the truth-teller, then the arrangement is



	I	II	
A	F	F	Liar
B	F	F	Liar
C	T	T	Truth-teller
D	F	F	Liar

Case (iv):
Let us assume that D is the truth-teller, then the arrangement is



	I	II	
A	F	F	Liar
B	F	F	Liar
C	F	F	Liar
D	F	F	Truth-teller

As it was given that there is exactly one person who alternates between the truth and lies, the arrangement in case (ii) is the valid one.

1. B is the truth-teller. Choice (B)

2. C and D are the liars. Choice (B)

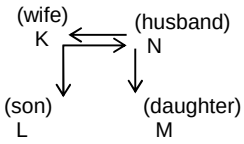
3. B sits opposite to D. Choice (B)

Solutions for questions 4 to 6:

Among the four members, there is one couple, their son and their daughter. The statements given by L is definitely false because, according to his statements there are three generations. So, L cannot be the truth-teller.

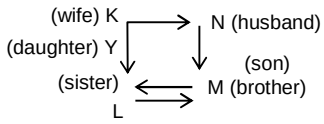
Case (i):

Let us assume that K is the truth-teller, then



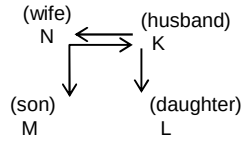
	I	II	
K	T	T	Truth-teller
L	T	F	Alternator
M	F	F	Liar
N	T	F	Alternator

Case (ii):
Let us assume that M is the truth-teller, then the arrangement is as follows.



	I	II	
K	T	F	Alternator
L	T	F	Alternator
M	T	T	Truth-teller
N	F	T	Alternator

Case (iii):
Let us assume that N is the truth teller.



	I	II	
K	F	F	Liar
L	F	F	Liar
M	F	T	Alternator
N	T	T	Truth-teller

4. L can never be the truth-teller. Choice (B)

5. In case (iii), N is the truth-teller, and K and L are the liars. Choice (C)

6. In case (ii), N and L are the alternators and K is the truth-teller. Choice (A)

Solutions for questions 7 to 10:

It is given that each of the four persons alternates between truth and lies in any order and that the second statement of exactly two persons, one on them being Abhinav, is true. This implies that the first and the last statement of each of these two persons is false. Hence, from Abhinav's statements, which are in the order of false, true and false, we know the following.
Bipash is not from Delhi.
Chandar plays Chess.
Danny is the tallest.

Now, with the above information, let us check the first statement of each of the other three persons.

From the above information, the truth or falsity in the first statement of Bipash and Chandar cannot be found out. But we know that Danny's first statement is false. Hence, the second statement of Danny is true. Since, there are only two persons, whose second statement is true, we get the following information.

Abhinav: Bipash is from Delhi - False
Chandar plays Chess - True ⇒ Chandar – Chess
Danny is not the tallest - False ⇒ Danny – tallest
Bipash: Abhinav is from Kolkata - True
⇒ Abhinav - Kolkata
Chandar is not the shortest - False
⇒ Chandar – shortest
Danny plays badminton - True
⇒ Danny – Badminton
Chandar: Abhinav is the 2nd tallest - True
⇒ Abhinav – 2nd tallest
Bipash plays Tennis - False
⇒ Bipash – does not play Tennis
Danny is from Delhi - True ⇒ Danny – Delhi
Danny: Abhinav plays Chess - False
Bipash is from Mumbai - True ⇒ Bipash - Mumbai
Chandar is not from Hyderabad - False
⇒ Chandar - Hyderabad

From the above information, we get the following arrangement.

7. Danny is from Delhi. Choice (D)

8. Chandar is the Chess player. Choice (C)

9. The person who plays Chess is the shortest. Choice (B)

10. The second statement made by Abhinav and Danny are true. Choice (C)

Solutions for questions 11 to 14:

It is known that, except one person (who must be a liar whose statements are all false), each of the other four speak at least one true statement. Also, except one person (who must be the truth teller whose statements are all true) each of the other four speak at least one lie. Also, exactly one person always alternated between the truth and lies (an alternator) in any order – (True, False, True) or (False, True, False).

This means that there must be two persons, each of whom speaks at least one true and at least one false statement. Let us assume each person to be a truth-teller.

Let Anirudh be the truth-teller.

	I	II	III	Ranks
Anirudh	T	T	T	1st or 2nd
Brijesh	F	?	F	5th
Mayank	F	F	F	4th
Nakul	F	F	F	1st or 2nd
Pavan	F	T	F	3rd

In this arrangement, both Mayank and Nakul are liars, which violates the condition, as there is exactly one liar among them. Similarly, when we assume that Mayank always speaks the truth, the arrangement we get is:

	I	II	III	Ranks
Anirudh	F	?	F	3rd
Brijesh	F	F	?	2nd
Mayank	T	T	T	1st or 2nd
Nakul	?	F	F	5th
Pavan	F	?	?	1st or 4th

Either Anirudh or Pavan is the alternator, because if his last statement is false, then his second statement must be true, which is not possible, as exactly one person among Mayank and Pavan must be the 4th ranker. Hence, Anirudh must be the alternator and his second statement must be true.

The arrangement we get is

	I	II	III	Ranks
Anirudh	F	T	F	3rd
Brijesh	F	F	F	2nd
Mayank	T	T	T	4th
Nakul	T	F	F	5th
Pavan	F	T	T	1st

11. Mayank always speaks truth. Choice (C)

12. Pavan is the top ranker in the class. Choice (D)

13. Nakul is the person who always speak one truth and two lies, but does not alternate between the truth and lies. He is the 5th ranker in the class. Choice (B)

14. The person who always lies is Brijesh and he is the 2nd ranker in the class. Choice (D)

Solution for question 15:

15. Truth Kumar → TK
False Bhai → FB
Alti Singh → AS

If TK's 2nd statement is true, then FB is a liar; but then FB's first statement becomes true, which is not possible. Hence, TK is a liar. Then FB's first statement is false, but 2nd is true. Also, AS's both the statements are true.
Hence,
Truth Kumar = Liar
False Bhai = Alternator
Alti Singh = Truth Teller Choice (B)

Solutions for questions 16 to 20:

From the given data,
As Amar and Dinesh belong to same group, their last statements cannot be simultaneously true.
Hence, their 2nd statements must be true.
Similarly, Bharath and Chandu's second statements are false.
The final table of heights and weights

	Height	Weight	Age
1st	Chandu	Dinesh	Eswar
2nd	Dinesh	Bharath	Chandu
3rd	Eswar	Amar	Dinesh
4th	Amar	Eswar	Bharath
5th	Bharath	Chandu	Amar

16. Chandu is the tallest. Choice (A)

17. Eswar is the oldest. Choice (C)

18. Chandu is the lightest. Choice (D)

19. Amar is the 2nd shortest. Choice (B)

20. Dinesh is the 3rd youngest. Choice (A)

Solutions for questions 21 to 24:

Schindler said "I am not an alternator". From this, we can conclude that he is either a truth teller or an alternator.
Case (i): Schindler is a Truth Teller.

Since all the statements of Schindler are true, we can conclude from his statements that (a) Gretta is a liar and (b) he is not the shortest. Considering that Gretta is a liar, we can conclude that Gretta is not the tallest and that Fischer is not a liar. From the facts derived so far, we can conclude that Fischer's second statement is true and the third one is false. Hence, he must be an alternator. Thus, his first statement is false. Which implies Fischer is the tallest.

Since Schindler is not the shortest, he must be the second tallest and Gretta the shortest. Thus the final arrangement is as follows.

Tallest	Fischer	Alternator
2nd tallest	Schindler	Truth teller
Shortest	Gretta	Liar

Case (ii): Schindler is an alternator. In this case, his first and the third statements are true and the second one is false. From his statements, we get the same facts as we derived above. As a result, all other information that we have derived will also be the same except that Schindler is an alternator.

Tallest	Fischer	Alternator
2nd tallest	Schindler	Alternator
Shortest	Gretta	Liar

21. Either Schindler is the truth teller or none of them is a truth teller. Choice (D)

22. Fischer is the tallest. Choice (A)

23. They together made either three or four true statements. Choice (D)

24. Fischer is definitely an alternator. Choice (C)

Solutions for questions 25 to 28:

Case (i): Both the statements of P are true.
Facts from P's statements: S is male, Q and R are females.
Hence, R's first statement is false and the second one is true. S's second statement is true and the first one is false. Now, whether P is male or female, the above deductions hold good.

Thus in this case, both the statements of Q are false. Each of R and S made one true statement and one false statement.

Case (ii): Both the statements of Q are true.
Facts from Q's statements: R is male and both the statements of S are false.

Facts from S's statements: Q is male and S has three bothers or three sisters or two sisters and a brother.

Hence, for each of P and R, one statement should be true and the other one false. Clearly, P's first statement is false. Hence, his second statement is true. Which implies S is also male. Now, R's first statement is true and second one is true. Since Q and R are male and the first statement S is false, P should also be male.

Thus in this case, both the statements of S are false. Each of R and P made one true statement and one false statement. All of P, Q, R and S are male.

Case (iii): Both the statements of S are true.
Facts from S's statements: Q is female and both P and R are males.

In such case, Q's first statement is false and the second one is true. R's second statement is false. Now R's first statement cannot be true, because in such case, there will be three persons for each of whom one statement is true and the other one is false. Hence, R's second statement must be also be false. This means either both the statements of P are true or both are false. But in both the cases, the given data is violated. Hence, S cannot be the one with both true statements.
Thus cases (i) and (ii) are valid.

25. R definitely made one true and one false statement. Choice (C)

26. Swank definitely is male. Choice (B)

27. Either Qusac or Swank made two false statements. Choice (D)

28. Statement (D) is true. Choice (D)

Solutions for questions 29 and 30:

It is given that that day it is birth day of one of the two. Hence, Sharmila's second statement is false.

Let Sharmila's first statement be true or false.

Case (i): Sharmila's first statement is true.
It implies that Karuna is lying. Hence, it is Karuna's birthday but not Sharmila's.

Case(ii): Sharmila's first statement is false.
It implies that either both the statements of Karuna are true or one of them is true and the other one is false.

If the first statement of Karuna is true and the second one is false, it implies it is not the birthday of any one of them. If the first statement is false and the second one is true, then it is the birthday of both of them. But both the cases violate the given information. Thus, it can be concluded that both the statements of Karuna must be true. Hence, it is the birthday of Sharmila.

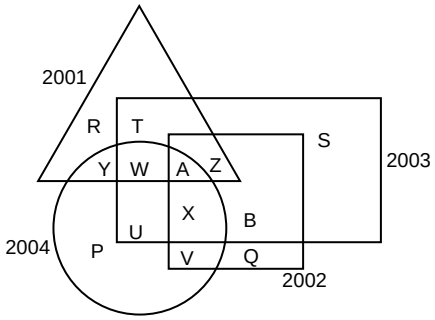
29. If Sharmila's first statement is false, it would be Sharmila's birthday. Choice (B)

30. Statement (B) is true. Choice (B)

Chapter – 7
(Venn Diagrams)

Exercise – 7(a)

Solutions for questions 1 to 5:



1. The bikes which are manufactured only in the years 2002 and 2003 is the region common to the square and rectangle but not to the circle or the triangle. In the figure shown we can say that B is the required region.
Choice (B)

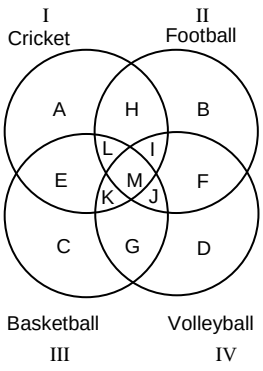
2. The bikes which are manufactured in all the given four years is the region which is common to the triangle, square, rectangle and circle. Here, in the above figure A represents that region. Choice (C)

3. The bikes which are manufactured only in the year 2003 is the region which belongs to only rectangle but does not belong to any other figure. So from the above diagram S is the required region. Choice (A)

4. The bikes which are manufactured only in the year 2001 and 2004 is the region common to the triangle and circle but having nothing common to the rectangle and square. In the figure shown that region is represented by square the letter Y. Choice (D)

5. The bikes which are manufactured in 2001, 2002 and 2003 but not in 2004 is the region which is common to the square, rectangle and triangle but having nothing in common with the circle. From the figure shown we can say that Z is the required region. Choice (D)

Solutions for questions 6 to 10:



6. The region which is common to all the four circles represents the students who play all the four games. From the figure, M is the required region. Choice (C)

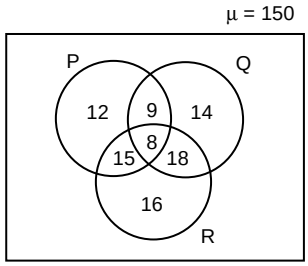
7. The students who play cricket and football only is the region common to the circles I and II but having nothing in common with circles III and IV. H is the required region.
Choice (C)

8. The students who play only volleyball is the area within the circle IV which has nothing in common with other circles. From the figure shown D is the required region.
Choice (D)

9. The students who play only football or only basketball is given by the regions showing students who play only football + students who play only basketball. Therefore regions C and B give the students who play only football or only basketball. Choice (A)

10. The students who do not play football or volleyball is the region which has not have anything in common with the circles I and III from the figure it is represented by the regions A, E and C. Choice (D)

Solutions for questions 11 to 15:



11. Number of elements in Q' = (μ) – (number of elements in Q)
= 150 – (14 + 18 + 8 + 9) ⇒ 150 – 49 = 101.
Choice (C)

12. Number of elements in P' ∩ Q' ∩ R' = μ – (P ∪ Q ∪ R)
= 150 – (12 + 15 + 9 + 8 + 18 + 16 + 14)
= 150 – 92 = 58. Choice (C)

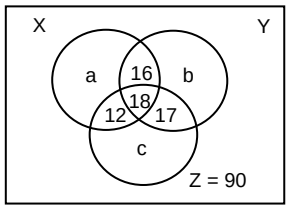
13. Number of elements in R = 16 +15+ 8+ 18 = 57.
Choice (B)

14. Number of elements in Q ∪ R = (14 + 9 + 8 + 15 + 18 + 16)
Number of elements in P = (12 + 9 + 15 + 8)
P ∩ (Q ∪ R) is the region common to P and Q ∪ R
Number of elements in P ∩ (Q ∪ R)
= 9 + 8 +15 = 32. Choice (A)

15. Number of elements in P ∩ Q = 9+ 8 = 17
number of elements in P ∩ Q ∩ R = 8
number of elements in Q ∩ R = 8 + 18 = 26
number of elements in R ∩ P = 15 + 8 = 23
∴ P ∩ Q ∩ R has the least number of elements.
Choice (B)

Solutions for questions 16 to 20:

From the figure shown



16. From the given figure c + 12 + 18 + 17 = 90
⇒ c = 43
given that n (X) = $\frac{2}{3}$n(Z)
⇒ a+ 12 + 18 + 16 = $\frac{2}{3}$ x 90
⇒ a = 14. Choice (C)

17. Given that, n (Y) : n (Z) = 4 : 5

$\Rightarrow \frac{b+16+18+17}{90} = \frac{4}{5}$

$\Rightarrow b = 72 - 51 = 21.$ Choice (D)

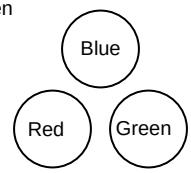
18. $(X' \cap Y' \cap Z') = \mu - (X \cup Y \cup Z)$
but we don't know the value of μ
$\therefore X' \cap Y' \cap Z'$ cannot be determined. Choice (D)

19. Given that, n (X) = n (Y) = n (Z) = 90.
$\Rightarrow a + 16 + 18 + 12 = 16 + 18 + 17 + b = 90$
$\Rightarrow a = 44, b = 39$
$\therefore (X \cup Y \cup Z) = a + b + 16 + 18 + 12 + 17 + c$
$= 44 + 39 + 16 + 18 + 12 + 17 + 43 = 189.$ Choice (A)

20. Given that the number of elements which belong to neither X nor Y nor Z is equal to p.
$\Rightarrow (X' \cap Y' \cap Z') = p$
$\Rightarrow \mu - (x \cup y \cup z) = p$
$\Rightarrow \mu - p = x \cup y \cup z$----- (1)
Now, $X^1 = \mu - X$ ----- (2)
From (1) and (2) we get that
$X^1 = X \cup Y \cup Z + p - X$
$= a + b + 16 + 18 + 12 + 17 + c + p - (a + 16 + 18 + 12)$
$= p + b + 60.$ Choice (C)

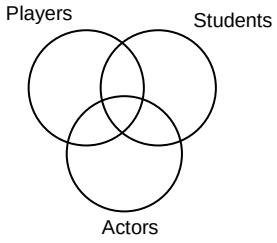
Solutions for questions 21 to 25:

21. Blue, Red, Green



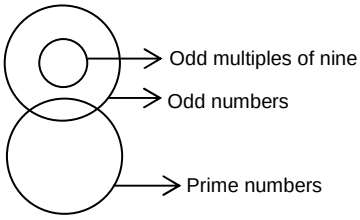
Here, blue, red and green are three different colours and have nothing in common. So the above diagram is the most appropriate representation of the given groups.
Choice (C)

22. Players, Students, Actors



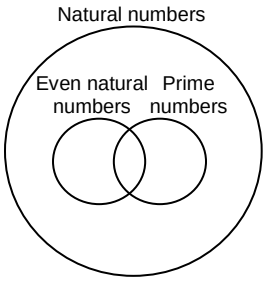
Here a player can be a student and also can be an actor, the same being the case with a student or an actor so the above diagram is the most appropriate representation of the given group. Choice (D)

23. We know that odd multiples of nine are also odd numbers. So the group of odd multiples of nine is a subset of odd numbers and none of these multiples is a prime number. But in the list of odd numbers we can also have prime numbers but not all prime numbers are odd as 2 is an even prime.



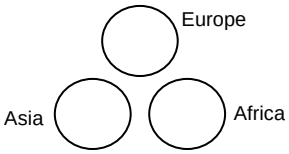
The above diagram is the most appropriate representation of the given group. Choice (B)

24.



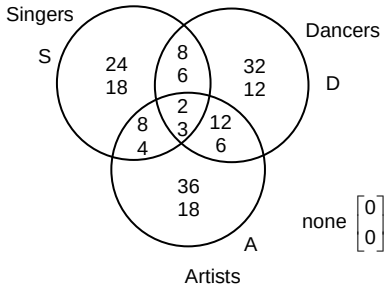
Now, we first say that even natural numbers and prime numbers are subsets of a set of natural numbers. Also we do have intersection of even natural numbers and prime numbers as '2' is an even prime. Therefore, the above diagram is the most appropriate representation of the given groups. Choice (A)

25.



We know that Asia, Europe and Africa are three continents having nothing in common. So the above diagram is the most appropriate representation of the given groups.
Choice (C)

Solutions for questions 26 to 30:



26. Number of female singers who are also dancers = 6 + 3 = 9. Choice (A)

27. Number of dancers who are artists
= (12 + 2) + (3 + 6) = 23. Choice (D)

28. Number of females who are not singers
= (12 + 6 + 18) = 36. Choice (C)

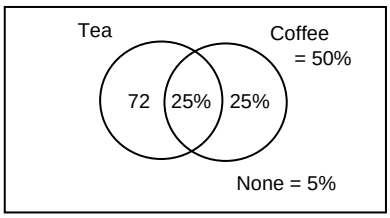
29. Number of male artists who are also singers
8 + 2 = 10. Choice (B)

30. Number of female dancers who are also singers as well as artists = 3. Choice (B)

Exercise – 7(b)

Solutions for questions 1 to 5:

From the given data, we get the following diagram.



Let the total number of students be x.
$\Rightarrow x = 72 + (25\% \text{ of } x) + (25\% \text{ of } x) + (5\% \text{ of } x)$

$\Rightarrow x - \frac{x}{4} - \frac{x}{4} - \frac{x}{20} = 72$

$\Rightarrow \frac{9x}{20} = 72$

$\Rightarrow x = 160.$

1. The total strength of the class = 160. Choice (A)

2. The number of students who drink only tea or only coffee
= 72 + (25% of 160)
= 72 + 40 = 112. Choice (B)

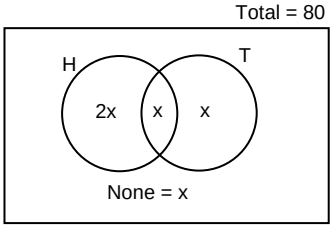
3. The number of students who drink neither tea nor coffee = none = 5% of 160
$= \frac{5}{100} \times 160 = 8.$ Choice (C)

4. The number of students who drink only coffee = 25% of 160 = 40. Choice (D)

5. The number of students who drink at least one of the two
= 72 +(25% of 160) + (25% of 160)
= 72 + 40 + 40 = 152. Choice (D)

Solutions for questions 6 to 10:

Let, H → The Hindu and T → Times of India
It is given that, H : T = 6 : 4 = 3 : 2
If T = 2x, then H = 3x.
H : both : = 9 : 3 = 3 : 1
Since H = 3x, both = x and none = x
∴ T = 2x and both = x, then only T = x.
From the above data, we get the following diagram.



H → The Hindu
T → The Times of India

Total = 80 people
$\Rightarrow 2x + x + x + x = 80$
$\Rightarrow x = 16.$
∴ (i) People reading only Times of India = x = 16
(ii) People reading only Hindu = 2x = 32
(iii) People reading both = x = 16

6. The number of people who read only Times of India = 16. Choice (C)

7. The number of people who read both the papers = 16. Choice (D)

8. The number of people who read only The Hindu = 32. Choice (B)

9. 12.5% of the people who read both = $\frac{12.5}{100} \times 16 = 2$
So, two people who read both the papers stop reading 'The Hindu'.
⇒ Total number of people reading 'The Hindu'
= 32 + 16 – 2 = 46
Percentage of the total number of the people reading 'The Hindu'

$= \frac{46}{80} \times 100 = 57.5\%$ Choice (A)

10. Half of the people reading only 'The Hindu' stop reading it and start reading Times of India.
⇒ Number of people now reading 'The Hindu'
= (32 + 16) – (50% of 32) = 32
The number of people now reading 'Times of India'
= 16 + 16 + (50% of 32) = 48
∴ The required ratio = 32 : 48 = 2 : 3. Choice (D)

Solutions for questions 11 to 15:

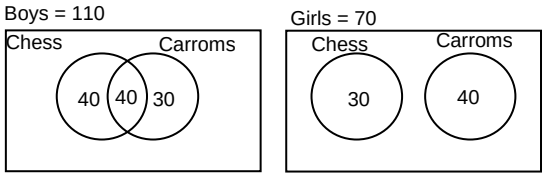
Given that the total number of students = 180
Further,

(i) The number of boys in the class is 40 more than the number of girls.
Let the number of girls be x.
$\Rightarrow x + x + 40 = 180$
$\Rightarrow x = 70$
⇒ The number of boys is 110 and the number of girls is 70.

(ii) The number of students playing both the games
$= \frac{200}{9}$ % of 180 = 40

(iii) None of the girls play both the games.

As per the available data, we get the following Venn diagrams.



Now we can complete the table as shown below.

	Carroms	Chess	Both	Total
Boys	70	80	40	110
Girls	40	30	0	70
Total	110	110	40	180

11. The number of girls who play only chess = 30. Choice (B)

12. The number of students who play both chess and carroms = 40 + 0 = 40. Choice (C)

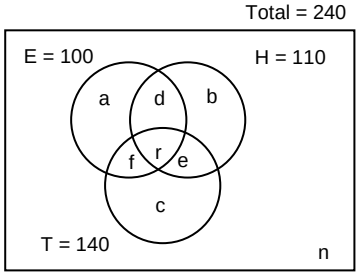
13. The number of boys who play only chess = 40. Choice (A)

14. The number of students who do not play both the games = Total – The number of students who play both the games
= 180 – 40 = 140. Choice (B)

15. The number of students who play caroms = 70 + 40 = 110. Choice (D)

Solutions for questions 16 to 20:

From the above data, we get the following diagram.



E → English
H → Hindi
T → Telugu

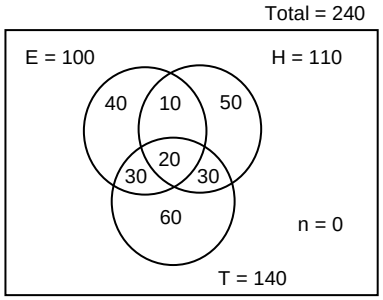
It is given that, 30 speak English and Hindi.
⇒ d + r = 30 --- (1)
50 speak Hindi and Telugu.

$\Rightarrow$ e + r = 50 --- (2)
50 speak Telugu and English.
$\Rightarrow$ f + r = 50 --- (C)
20 speak English, Telugu and Hindi
$\Rightarrow$ r = 20 --- (D)

From (i) and (iv) d = 10
From (ii) and (iv) e = 30
From (iii) and (iv), f = 30
E = a + d + r + f = 100.
$\Rightarrow$ a + 10 + 20 + 30 = 100 $\therefore$ a = 40
H = b + d + r + e = 110
$\Rightarrow$ b + 10 + 20 + 30 = 110 $\therefore$ b = 50
T = c + f + r + e + 140
c + 30 + 20 + 30 = 140 $\therefore$ c = 60

Total T = a + b + c + d + e + f + r + n = 240
40 + 50 + 60 + 10 + 30 + 30 + 20 + n = 240
$\therefore$ n = 0

From the above data, we get the following diagram.



16. The number of employees who speak only Hindi = b = 50. Choice (B)

17. The number of employees who speak both Hindi and Telugu but not English = e = 30. Choice (A)

18. The number of employees who speak exactly one language = a + b + c = 40 + 50 + 60 = 150. Choice (C)

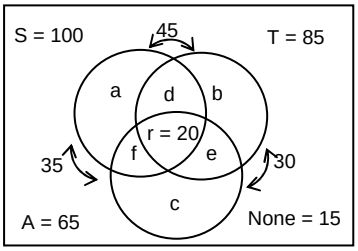
19. The number of employees who speak neither English nor Hindi = c = 60. Choice (B)

20. The number of employees who speak either English or Telugu = a + c + d + f+ e + r
= 40 + 60 + 30 + 10 + 30 + 20 = 190. Choice (D)

Solutions for questions 21 to 25:

The number of people who come for swimming, tennis and aerobics are 100, 85 and 65 respectively.
For every 10 people who came for swimming, there are 3 who come for aerobics and tennis.
$\Rightarrow$ The number of people who come for aerobics and tennis
$= \frac{100}{10} \times 3 = 30$
For every 17 people who come for tennis, there are 7 who come for swimming and aerobics.
$\Rightarrow$ The number of people who come for swimming and aerobics
$= \frac{85}{17} \times 7 = 35$
For every 13 people who come for aerobics, there are 9 who come for tennis and swimming.
The number of people who come for tennis and swimming
$= \frac{65}{13} \times 9 = 45$
The number of people who come for tennis, swimming and aerobics = 20
The number of people who do not come for any of these activities = 15

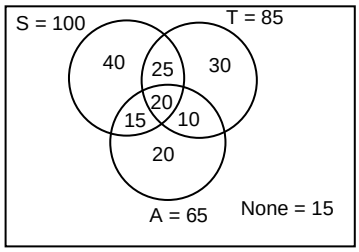
From this we get the diagram shown below.



S $\rightarrow$ Swimming
T $\rightarrow$ Tennis
A $\rightarrow$ Aerobics

Now,
d = 45 – 20 = 25; f = 35 – 20 = 15; e = 30 – 20 = 10
Also,
a = 100 – (d + f + r) = 40; b = 85 – (d + r +e) = 30;
c = 65 – (f + r +e) = 20

Now from the above, we can draw the following diagram.



21. The total number of members in the club
= a + b +c + d + e + f + r + none
= 40 + 30 +20 + 25 + 15 + 10 + 20 + 15
= 175. Choice (B)

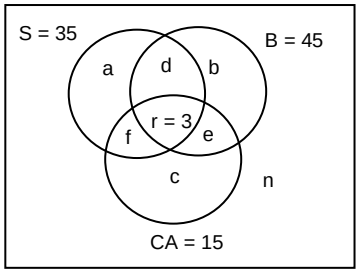
22. The number of people who come only for swimming.
= a = 40. Choice (C)

23. The number of people who come for both tennis and aerobics but not swimming = e = 10. Choice (D)

24. The number of people who come for neither tennis nor swimming = c + 15 = 20 + 15 = 35. Choice (D)

25. The number of people who come for at least one activity
= a + b + c + d + e + f + r
= 40 + 20 + 30 + 15 + 25 + 10 + 20
= 160. Choice (A)

Solutions for question 26 to 30:



S $\rightarrow$ Sports
B $\rightarrow$ Business
CA$\rightarrow$ Current affairs

$\Rightarrow$ 14 books are on at least two of the subjects.
$\Rightarrow$ d + e + f + r = 14
$\Rightarrow$ d + e + f = 11
From the above figure
35 + 45 + 15 = a + b + c + 2(d + e + f) + 3r
$\Rightarrow$ a + b + c = 95 – 22 – 9 = 64.

26. The number of books on only one subject
= a + b + c = 64. Choice (B)

27. The total number of books in the library
= d + e + f + a + b + c + r
= 11 + 64 + 3 = 78. Choice (A)

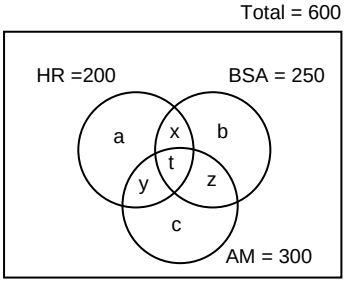
28. Total number of books on exactly two subjects
= d + e + f = 11. Choice (D)

29. At most two subjects = (a + b + c) + (d + e + f)
= 64 + 11= 75. Choice (D)

30. The number of books on only sports = a = 26.
We know that a + d + r + f = 35
$\Rightarrow$ 26 + d + r + f = 35 $\Rightarrow$ d + f = 6
Also, we know that
d + e + f = 11$\Rightarrow$ e = 11 – 6 = 5
$\therefore$ Number of books on both business and current affairs but not sports = 5. Choice (A)

Exercise – 7(c)

Solutions for questions 1 to 4:



HR - Hero Ranger = 200 $\Rightarrow$ a + x + y + t = 200 ---- (1)
AM - Atlas MTB = 300 $\Rightarrow$ c + y + z + t = 300 ---- (2)
BSA - BSA SLR = 250 $\Rightarrow$ b + x + z + t = 250 ---- (3)
70 had exactly 2 brands of cycles $\Rightarrow$ x + y + z = 70

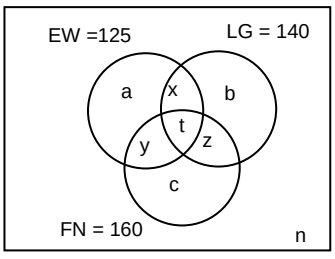
1. Given, total number of bicycle owners = 600
$\Rightarrow$ a + b + c + x + y + z + t = 600
$\Rightarrow$ a + b + c + t = 530 ---- (4)
(1) + (2) + (3) gives
a + b + c + 2(x + y + z) + 3t = 750
$\Rightarrow$ a + b + c + 3t = 610 ---- (5)
(5) – (4) $\Rightarrow$ 2t = 610 – 530 = 80
t = 40 and a + b + c = 530 – 40 = 490
$\Rightarrow$ 40 had all the three brands of cycles. Choice (D)

2. x + y + z = 70
16 had only BSA SLR and Atlas MTB
$\Rightarrow$ z = 16 $\Rightarrow$ x + y = 54
a + x + y + t = 200
a + 54 + 40 = 200
a = 200 – 94
a = 106 $\Rightarrow$ 106 had only Hero Ranger. Choice (D)

3. 160 had only BSA SLR $\Rightarrow$ b = 160
b + x + z + t = 250
$\Rightarrow$ 160 + 70 – y + 40 = 250 $\Rightarrow$ y = 20. Choice (B)

4. Number of owners who had only one brand
= a + b + c = 490. Choice (C)

Solutions for questions 5 to 8:



EW - Essel World
LG - Lumbini Gardens
FN - Film Nagar
25 visited all three $\Rightarrow$ t = 25
125 visited EW $\Rightarrow$ a + x + y + t = 125
$\Rightarrow$ a + x + y = 100 ---- (1)
140 visited LG $\Rightarrow$ b + x + t + z = 140
$\Rightarrow$ b + x + z = 115 ---- (2)
160 visited FN $\Rightarrow$ c + y + z + t = 160
$\Rightarrow$ c + y + z = 135 ---- (3)
Number of students who visited exactly 2 places = 5 times those who did not visit any $\Rightarrow$ x + y + z = 5n
200 students visited exactly one place
= a + b + c = 200.

5. Total number of students = 315
$\Rightarrow$ a + b + c + x + y + z + t + n = 315
$\Rightarrow$ 200 + 5n + 25 + n = 315
6r = 90 $\Rightarrow$ n = 15
$\therefore$15 did not visit any of the three places. Choice (D)

6. Number of students who did not visit more than one place = Number of students who visited exactly one place + those who did not visit any = a + b + c + n
= 200 + 15 = 215. Choice (D)

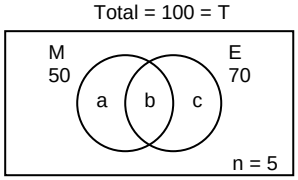
7. Number of students who visited at least one of LG and FN
= 255 => b + x + z + t + y + c = 255 --- (4)
We know a + b + c + x + y + z + t = 315 – n = 300 – (5)
(5) - (4) $\Rightarrow$ a = 45 visited only EW. Choice (A)

8. Number of students who visited only one among LG and FN
= b + c = 200 - a = 200 – 45 = 155. Choice (C)

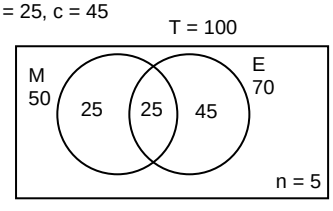
Solutions for questions 9 to 11:

(i) Number of students in the class = 100
(ii) Number of students who passed in Mathematics = 50
(iii) Number of students who passed in English = 70
(iv) Number of students who failed in both = 5

The number of students who failed in both is same as those who did not pass in any of these two subjects.
Let us represent it by a diagram.



So, to find the value of b, one can directly calculate instead of assuming x etc. as shown below
b = M + E + n – T
i.e., 50 + 70 + 5 – 100
i.e., 125 – 100 = 25
So, b = 25.
a = M – b i.e. 50 – 25 = 25
c = E – b i.e. 70 – 25 = 45
So, a = 25, b = 25, c = 45



Now, all the questions can be answered based on the above diagram.

9. The students who passed in both the subjects is represented by 'b' i.e., 25. Choice (A)

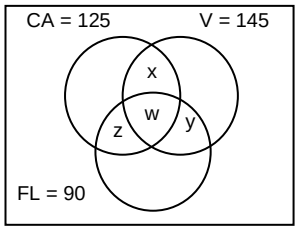
10. The students who passed in exactly one of the two subjects is represented by a and c. So a + c is 25 + 45 i.e. 70.
Choice (D)

11. The students who failed in at least one subject are those who failed in exactly one subject and those who failed in both the subjects. Now, observe that 25 students in area 'a' are those who passed in only Mathematics, that means they failed in English. Similarly, 45 students in area b are those who passed in English only, that means they failed in Mathematics. So, 25 failed only in English and 45 failed only in Mathematics, whereas 5 failed in both. So the number of students who failed in both subjects is a + c + N i.e. 25 + 45 + 5 = 75. Choice (D)

Solutions for questions 12 to 16:

Representing the given data by Venn Diagram,

T = 300



x + y + z = 32.
Total of all three circles together = 300
So, 125 + (145 – x – w) + (95 – y – z – w) = 300
360 – (x + y + z) – 2w = 300
$\Rightarrow$ 2w = 60 – 32 = 28 $\Rightarrow$ w = 14.

12. w = 14. Choice (B)

13. Given y = 6
So, x + z = 32 – 6 = 26
Only Carrier Aircon = 125 – (x + z + w)
= 125 – (26 + 14) = 85. Choice (D)

14. Only Voltas = 110
Only Carrier Aircon and Fedders Lloyd
= z = (x + y + z) – (x + y)
= (32) – (145 – 110 – w)
= 32 – (145 – 110 – 14) = 11. Choice (A)

15. Exactly one brand of air conditioners
= Total – exactly 2 brands – All 3 brands
= 300 – (x + y + z) – w = 300 – 32 – 14 = 254.
Choice (D)

16. Number of people owning at least two brands = 32 + 14 = 46
Now, the 5 owners who had Voltas and Fedders Lloyd buying Carrier Aircon also does not change this figure because there are moving from two brands to 3 brands and 46 is including both categories.
The 10 people owning only Carrier Aircon now buying Voltas also will be coming into the category of those "owing at least two brands" and hence the figure will now be 46 + 10 = 56. Choice (D)

Solutions for questions 17 to 20:

17. In less than 15 years group
Number of people who read BW = 210
Number of people who read BT = 220
Total number of people surveyed = 375
Number of people who read both = 80
Number of people who do not read either
= 375 – [210 + 220 – 80] = 25
Similarly in 15 – 34 yrs group
Number of people who do not read either BW or BT
= 455 – [280 + 210 – 90] = 55
Number of people below 35 yrs and do not read any of the 2 magazines = 25 + 55 = 80. Choice (B)

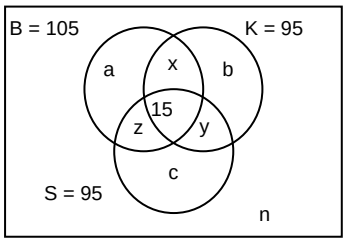
18. From the 15 - 34 years in the table
Number of males who do not read either BW or BT
= 265 – [175 + 105 – 40] = 25.
Choice (D)

19. Total BT readers = Total Males + Females reading BT = 380 + 250 = 630.
No of BT readers over 15 yrs = 225 + 185 = 410.
% of BT readers over 15 yrs
$= \frac{410}{630} \times 100 = 65\%$. Choice (C)

20. Females who do not read any of the 2 magazines
in < 15 yrs group = 115 – [65 + 65 – 130] = 15
15 - 34 yrs group = 190 – [125 + 85 – 50] = 30
> 35 yrs group = 195 – [135 + 100 – 45] = 5
% of females (below 15 years) who do not read any magazine
$= \frac{15}{15+30+5} \times 100 = 30\%$. Choice (A)

Solutions for questions 21 to 25:

T = 245



x + y + z = 3w, a + b +c = 190
We have 105 + {95 – (x + 15)} + {95 – (y + z + 15} + n = 245
i.e., x + y + z – n = 20
2n = 20
$\Rightarrow$ n = 10
x + y + z = 30.

21. It is n and hence 10. Choice (B)

22. 245 – 30 – 15 = 200. Choice (D)

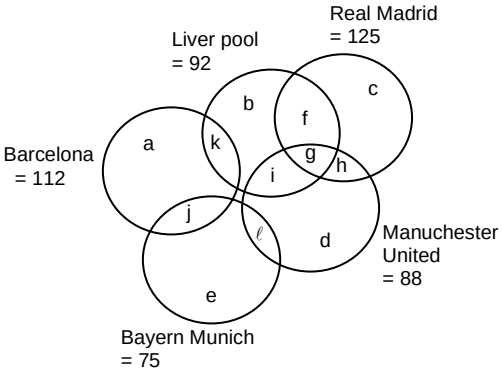
23. S + K – (S $\cap$ K) = S $\cup$ K
95 + 95 – p = 165
where p = (only S & K) + (S, K & B) = y + 15
p = 25
Since S, K & B = 15, y = 25 – 15 = 10.
Choice (C)

24. 105 + 95 – q = 180
where q = x + 15
= (only B & K) + (S, K & B) q = 20
Hence, x = 20 – 15 = 5
So, y + z = 30 – 5 = 25
Only Somnath = 95 – 15 – (y + z)
= 95 – 15 – 25 = 55. Choice (A)

25. Given z = 0;
Only Kedarnath = 95 – 15 – x – y
= 95 – 15 – 30 = 50.
Choice (D)

Solutions for questions 26 to 30:

From the given information it is clear that the set of people who like Barcelona has no intersection with Real Madrid or Manchester United. Similarly, the set of people who like Bayern Munich has no intersection with Liverpool or Real Madrid. Intersection between other sets of people is possible. Thus we get the following Venn Diagram.



From (i) h + g = 57 and from (ii) g = 10 and b = 10
Hence, h = 47
From (ii) j = h= 47 and j = k + 4
Hence, k = 43
From (iv), l = f = 1/3 of c
It is given that Real Madrid = 125. We know that h = 47 and g = 10.
Hence, c + f = 68.
Since, f = 1/3 of c, f = 17 and c = 51. Thus l = 17.
a = Barcelona - (j + k) = 22
e = Bayern Munich – (j + l) = 11
i = Liverpool – (b + f + g + k) = 12
d = Manchester United – (g + h + i + l) = 2

26. Exactly two clubs = f + i + l + j + k = 183. Choice (A)

27. Only Bayern Munich or only Barcelona = a + e = 33. Choice (C)

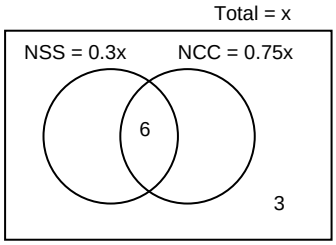
28. Manchester United but not Liverpool = h + d + l = 66. Choice (A)

29. Exactly one club = a + b + c + d + e = 96. Choice (D)

30. No one among the Barcelona fans likes at least two more clubs. Choice (D)

Exercise – 7(d)

Solutions for questions 1 to 4:



If x is the total number of students in the class, Number of students participating in NSS and NCC is 0.3x and 0.75x respectively.
Then, {0.3x + 0.75x - 6} + 3 = x $\Rightarrow$ 0.05x = 3 $\Rightarrow$ x = 60.

1. Total number of students = x = 60. Choice (C)

2. Percentage of students who want to participate only in NSS = 30% – $\frac{6}{60} \times 100$ = 20%. Choice (D)

3. Only in one programme
= 20% only in NSS + 75% - 6/60 x 100
only in NCC = 85%. Choice (A)

4. At least in one programme = Total – Number of students participated in neither of these two
$\Rightarrow$ 60 – 3 = 57. Choice (D)

Solutions for questions 5 to 9:

Out of the four newspapers, reading exactly two newspapers is possible in Six different combinations
$^4C_2$ = 6. They are ET - BS; ET - BL; ET - FE; BS - BL; BS - FE and BL - FE. Since each of these is 20 students,

Number of students reading exactly 2 newspapers
= 6 x 20 = 120
Also, there is nobody who reads exactly three out of the four newspapers. There are 30 students who read all four newspapers.

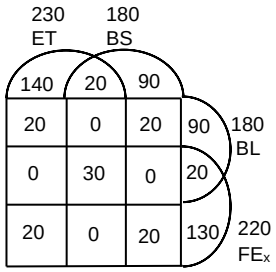
To get the number of students reading one particular newspaper alone, we have to subtract 3 times 20 (because students reading two newspapers is 20 in number and, for each newspaper, there will be three ways of pairing with one more newspaper) and 30 (which is the number of students reading all four newspapers).

Number of students reading only ET
= 230 – 3 $\times$ 20 – 30 = 140
Number of students reading only BS
= 180 – 3 $\times$ 20 – 30 = 90.
Number of students reading only BL = 180 – 3 $\times$ 20 – 30 = 90.
Number of students reading only FE
= 220 – 3 $\times$ 20 – 30 = 130.

Total Number of students reading exactly one newspaper
= 140 + 90 + 90 + 130 = 450.

Total number of students reading at least one newspaper
= 450 + 120 + 30 = 600.
This represents 80% of the total number of the students. So, total number of students = 600/0.8 = 750.
ˆ Number of students who do not read any newspaper
= 0.2 x 750 = 150.

This set can be solved with the help of the following diagram.



5. 120 students. Choice (A)

6. 450 students. Choice (B)

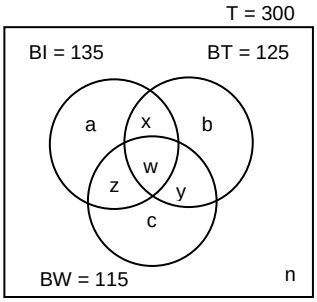
7. 150 students. Choice (D)

8. Number of Business Standard students reading at least one more newspaper.
= exactly two newspapers + all four newspapers
= 3 x 20 + 30 = 90.
As a percentage of all the students reading Business Standard, this is $\frac{90}{180} \times 100$ = 50%. Choice (C)

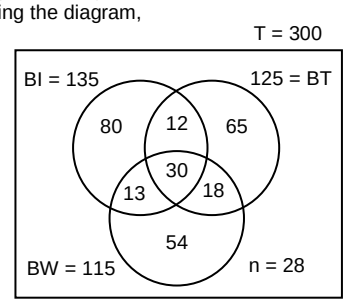
9. Least increase in the number of students who read all newspapers will come only if each student reads exactly one additional newspaper.
But, since the number of students who read exactly three newspapers in zero, there will not be any addition to the figure of 30 students who read all four newspapers.
Hence, the answer is 30. Choice (D)

Solutions for questions 10 to 16:

Referring to the Venn Diagrams given below,



Also, w = 30 -------- (1)
x + w = 42 -------- (2)
y + w = 48 -------- (3)
z + w = 43 -------- (4)
So, we get x = 12; y = 18; z = 13
Redrawing the diagram,



Number of respondents reading at least one magazine
= 135 + (125 - 42) + (115 - 43 - 18) = 272
Number of respondents reading none of the magazines
= T = 300 – 272 = 28

10. Exactly one magazine is a + b + c
i.e., 80 + 65 + 54 = 199. Choice (B)

11. Exactly two magazines is x + y + z = 12 + 18 + 13 = 43.
Choice (D)

12. Business India or Business World is
80 + 12 + 13 + 30 + 54 + 18 = 207. Choice (D)

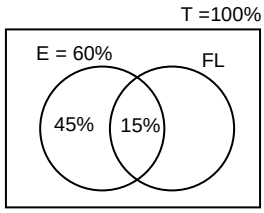
13. Neither Business World nor Business Today is
(135 – x – w – z) + n = (135 – 12 – 30 – 13) + 28
= a + n = 80 + 28 = 108. Choice (A)

14. When 7 respondents reading Business India alone start reading a second magazine also, it does not affect the number of respondents reading Business India because those 7 respondents read Business India plus one more magazine.
But, when 5 people Business India alone stop even that, the number of respondents reading Business India will come down by 5. Hence, the answer is 130.
Choice (D)

15. The respondents who shift from Business India to Business Today, they can be from those who were previously reading Business India alone or Business India and Business World alone. If we want the maximum number of respondents reading Business India alone (which was so initially) after the shift, the least number should shift from the category "Business India alone", i.e., the maximum possible number should shift from the category "Business India and Business World alone". In this category, there are 13 respondents and maximum number shifting means, 13 respondents shifting. Since the total number of respondents shifting is 15, at least 2 respondents reading Business India alone should shift. Hence, the maximum number of respondents reading Business India after the shift = 80 – 2 = 78. Choice (C)

16. By similar logic to that explained in the above problem, the maximum number of respondents reading Business India and Business World will come if the maximum number of respondents reading Business India and Business Today alone shift - and that is 12. So maximum number of respondents reading Business India and Business World = 43 + 12 = 55. (because already, 30 + 13 = 43 respondents read Business India and Business World). Choice (B)

Solutions for questions 17 to 20:



- 25% of 60%, i.e., 15% of the school passed in both English and Foreign Language.
- Since $66^2/_3\%$ of the students who passed in Foreign Language failed in English, $33^1/_3\%$ of students who passed in Foreign Language passed in English also, i.e., $^1/_3$ Foreign Language = 15%
  $\Rightarrow$ Foreign Language = 45%
  So, we have only passed in (English) = 60 – 15 = 45%,
  Only Foreign Language pass = 45 – 15 = 30%
  Passed both in English & Foreign Language = 15%.
  A total of 90% passed in at least one of the subjects. So, 10% failed in both.

  No. of students in the school = $\frac{20}{0.10}$ = 200.

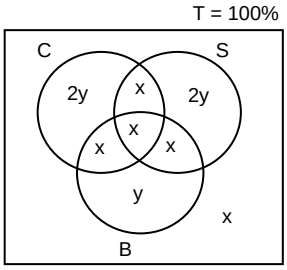
17. 200. Choice (C)

18. 45% + 30% = 75%. Choice (D)

19. 20% of 15% = 3% increase in pass in both subjects.
Hence, least value of pass only in English will come when all the new people who pass in both subjects are from the group which passed only in English.
i.e., 45 – 3 = 42%. Choice (A)

20. 40% of 20 students = 8 students. Out of this 4 students passed in exactly one subject. Hence, the remaining 4 students (which is 2% of the school strength) pass in both subjects.
So, pass in both the subjects = 15 + 2 = 17%.
Choice (D)

Solutions for questions 21 to 25:



The first three statements can be represented as shown in the diagram and hence, 5x + 5y = 100
(because we have taken x & y as percentages)
or x + y = 20 ---- (1)
From the fourth condition, we get (y + 3x) = B
i.e., y = 3x ---- (2)
From equations (1) and (2). We get x = 5% and y = 15%.

21. y = 15% = 150.

Hence, total number % of residents = x = $\frac{150\times100}{15}$

= 1000. Choice (B)

22. $\frac{3x}{3x+2y}=\frac{15}{45}=\frac{1}{3}$ = 33$^1/_3$%. Choice (D)

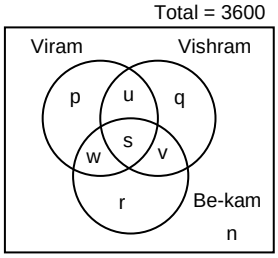
23. x = 5% = 15. Hence total = $\frac{15}{0.05}$ = 300. Choice (C)

24. 2y + 2y + y = 75%. Choice (D)

25. 2y + 2y + x = 65%. Choice (A)

Solutions for questions 26 to 30:

Represent in various segments as in the following diagram,



Members of at least two Unions = u + v + w + s = 500 -- (1)
Vishram members = q + s + u + v = 1400 ---------- (2)
Only Viram and Be-kam = w = 100 ---------- (3)
Vishram and Be - kam = s + v = 200 ---------- (4)
Only Be - kam = r = 550 ---------- (5)
Members of Viram who are members of only
one more union = w + u = 20% of (p + u + s + w) --- (6)
u + v + w= $^1/_8$ (Total workers) = 450. ----- (7)
From (1), (3) and (4), u = 200.
From equations (2),
q = 1400 – u – (s + v)
= 1400 – 200 – 200 = 1000.
From (7), v = 450 – 200 – 100 = 150
From (4), s = 200 – 150 = 50
From (6), p = 1150
n = 3600 – (p + q + r + s + u + v + w)
= 3600 – (1150 + 1000 + 550 + 50 + 200 + 150 + 100)
= 3600 – (3200) = 400.
Now, we have all figures and the questions can be answered.

26. s = 50. Choice (C)

27. n = 400. Choice (D)

28. p + r = 1150 + 550 = 1700. Choice (D)

29. Since 10 workers have given up their Be-kam membership and taken Vishram membership, it means these 10 workers were initially Be-kam members but not Vishram members, i.e., they must be a part of r or w. When they give up Be-kam and take up Vishram, they will move to q or u respectively. So, s does not undergo any change at all. Hence, 50 is the answer. Choice (B)

30. q + u = 1000 + 200 = 1200. Choice (C)

Chapter – 8
(Cubes)
Exercise – 8(a)

Solutions for questions for 1 to 5:

1. 125 smaller cubes will form a 5 x 5 x 5 cube. To cover it we require a 7 x 7 x 7 cube because one additional layer of cubes is required on all faces. Hence additional cubes required = $7^3 – 5^3$ = 218 Choice (D)

2. The 3 cuts can be at the middle of the cube in 3 perpendicular planes. First cut will make the cube into 2 parts. The second cut along a perpendicular plane at the centre will double the number of parts to 4. The third cut along the third perpendicular plane will double 4 parts to 8 parts. Choice (B)

3. The cuts can be two along one plane (giving 3 parts) third cut along a perpendicular plane (giving 3 x 2 = 6 parts) and the fourth cut along the other perpendicular plane (giving 6 x 2 = 12 parts). Choice (B)

4. Ten cuts will give 11 parts.
Now the two cuts can be along the other two perpendicular directions giving us 11 x 2 x 2 = 44 (doubling in each direction) pieces. Choice (D)

5. Four cuts can be along one plane (giving 5 parts), another four cuts along a perpendicular plane (giving 5 parts) and the remaining five cuts along the other perpendicular plane (giving 6 parts). Hence the maximum number of identical pieces will be 5 x 5 x 6 = 150 Choice (D)

Solutions for questions 6 to 9:

125 cubes will be put together as 5 x 5 x 5 only.

6. Out of 5 x 5 x 5 cubes, if one layer on all sides is removed, the inside cubes, i.e., 3 x 3 x 3 will have no paint at all. Choice (A)

7. On each face if all the cubes on the outside are removed, the remaining 3 x 3 cube (i.e., nine cubes) has one face painted. Hence, on 6 faces, 6 x 9 = 54 cubes. Choice (B)

8. On each edge, if the two corner cubes are removed the three cubes in the middle have two faces painted. Since there are 12 faces, 12 × 3 = 36 cubes with three faces painted. Choice (C)

9. The 8 corner cubes have 3 faces painted. Choice (D)

Solutions for questions 10 to 15:

10. Three cuts parallel to one face, two cuts in a perpendicular plane and one cut in the third perpendicular plane. Hence, six cuts. Choice (C)

11. Seven cuts to be distributed as 3 - 2 - 2 along the three perpendicular planes (all cuts parallel to the faces) and hence, we obtain $4 \times 3 \times 3$ = 36 pieces. Choice (A)

12. LCM of 2, 4, 5 (which is 20) will be the side of the cube of minimum dimensions.
Hence, number of cuboids = $\frac{20\times20\times20}{2\times4\times5}$ = 200
Choice (D)

13. Side of the cube = LCM of 1, 2 and 5 = 10 cms.
No. of cuboids = $\frac{10\times10\times10}{1\times2\times5}$ = 100. Choice (A)

14. Since there are 64 small cubes, the original cube is cut into four pieces along each face, i.e., $4 \times 4 \times 4$. Hence, the paint also would be 4 times, as the total surface area increases by 3 times. Choice (D)

15. Only distinct combinations have to be counted. Eg. if we say two adjacent sides are painted in one colour, it can be any two adjacent sides and we get the same combination always and not distinguishable from each other. Thus, the number of distinguishable combinations will be

All Black - 1
1 Black + 5 White - 1
2 Black + 4 White - 2
[Two black can be two adjacent or two opposite faces - hence 2 ways]
3 Black + 3 White - 2
[Three of one colour can be 3 adjacent or 3 faces in a row - hence 2 ways]

4 Black + 2 White - 2
5 Black + 1 White - 1
All White - 1
Total 10 Choice (B)

Solutions for questions 16 to 20:

216 cubes $\Rightarrow$ 6 smaller cubes on each edge.

16. No red paint at all $\Rightarrow$ remove the 2 opposite faces each having 6 x 6 cubes, 216 – 72 = 144. Choice (B)

17. Cubes having at least two different colours are all those along the edges which is $4 \times 6 + 8 \times 4 = 56$ (where 4 vertical edges each have 6 cubes and the other 8 edges have 4 cubes each). Choice (C)

18. If one layer of the outer cubes is removed on all sides, the remaining $4 \times 4 \times 4$ (i.e., 64) cubes will have no face painted at all. Choice (A)

19. The common edges are four and on each edge there are 4 cubes with only red and green.
(The eight corner cubes have blue also and hence not counted here). So, $4 \times 4 = 16$. Choice (D)

20. On the face where the particular colour is used, if we remove the outer cubes, the 4×4 square inside will have only one colour. So, 16 cubes in each face. We have 2 faces for green and 2 faces for blue and hence $4 \times 16 = 64$. Choice (A)

Solutions for questions 21 to 23:

With the given information we have only one possible arrangement i.e., the faces which are painted green must be opposite.

21. Number of colours on the cube are in the ratio 2 : 1 or 1 : 2.
This implies that they are cubes with three coloured faces which are as follows.
i.e., corners cubes.
1.BRG 2.RGG 3.BGR 4.GGR 5.GGB 6.GGB 7.BBG 8.BBG

There are total six smaller cubes which have number of colours on the cube in the ratio 2 : 1 or 1 : 2. Ans (6)

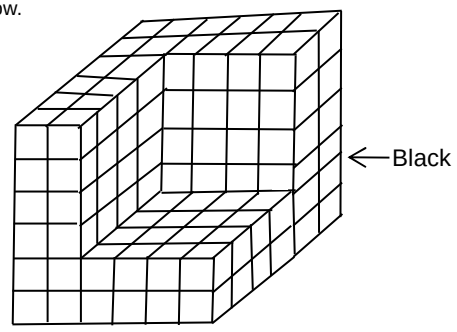
22. The smaller cubes which are painted with two different colours can be identified at edges and corners.
There are nine edges with two different colours = $9 \times 4 = 36$.
There are six corners with two different colours.
Total = 36 + 6 = 42. Ans (42)

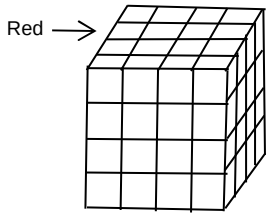
23. The smaller cubes which are painted with only one colour can be identified at the middle of each outer face, edges and corners.

Middle of the faces = $6 \times 16 = 96$.
Edges: $3 \times 4 = 12$
corners: 0
total = 96 + 12 + 0 = 108. Ans (108)

Solutions for questions 24 to 27:

According to the given conditions the cube looks as shown below.





24. By assuming $4 \times 4 \times 4$ cube is also not painted with red colour, the number of cubes with no faces painted is $= (6 - 2)^3 = 64$.

In these 64 smaller cubes now, in the second , third and fourth layer left most 9 cubes are painted red, on bottom surface four smaller cubes are painted red and on the fourth layer back most six smaller cubes are painted.

Hence, the total number of cubes with no face painted = 64 – 19 = 45. Ans (45)

25. The number of cubes which are three faces painted before removing 64 smaller cubes = 8 and after painting with red colour to those 64 smaller cubes seven new cubes will have three faces painted.
Hence, the total number of cubes with three faces painted = 8 + 7 = 15. Ans (15)

26. The number of smaller cubes painted on two faces in the larger cube after removing $4 \times 4 \times 4$ is illustrated as shown below.
9 edges with four smaller cubes with two faces painted
$= 9 \times 4 = 36$
3 edges with one cube with two faces painted = $3 \times 1 = 3$

In the red cube there are 24 cubes on 12 edges which are painted on two faces.

Hence the number of cubes with two faces painted
= 36 + 3 + 24 = 63. Ans (63)

27. The number cubes with one face painted in the larger cube $= 3 \times 16 + 3 \times 7 = 69$.
Number of cubes with one face painted in the 4×4 cube $= 6 \times 4 = 24$

Hence, the total number of smaller cubes with one face painted = 69 + 24 = 93. Ans (93)

Solutions for questions 28 to 30:

28. In the given pattern, all the smaller cubes in any straight line/diagonal in the larger cube will be in arithmetic progression.
$125 = 5 \times 5 \times 5$
End points of the required diagonal are the first and the last elements of the larger cube .i.e., Numbers 5 and 121.
Hence, sum of the number on the required diagonal
= n/2 x (a + l) = 5/2 x (5 + 121) = 315. Ans (315)

29. The inner cubes will not be visible
These cubes we can find in only 2nd, middle and fourth layers .
The total number of such inner cubes = $(5 - 2)^3 = 27$.
The sum of the numbers on these cubes on the second layer.
= 32 + 33 + 34 + 37 + 38 + 39 + 42 + 43 + 44 = 342.

The sum of the numbers on these cubes on the middle layer is 225 more than the sum of the numbers on such cubes on the second layer $\Rightarrow$ sum = 567.

The sum of the numbers on required cubes on the fourth layer is 225 more than the sum of the numbers on such cubes on the middle layer $\Rightarrow$ 792.
Hence, the required sum = 342 + 567 + 792 = 1701.
Ans (1701)

30. End points of the required middle cubes of the front and the rear layers of the larger cube are numbers 13 and 113.
Hence sum of the numbers on the required diagonal
$= n/2 \times (a + l) = 5 / 2 \times (13 + 113) = 315$. Ans (315)

Exercise – 8(b)

Solutions for questions 1 to 5:

1. No red paint means the two adjacent faces having red have to be removed, i.e., 36 + 30 = 66 cubes.
Hence, 216 – 66 = 150. Choice (D)

2. At least two different colours will mean out of the 56 cubes along all the edges together, we remove 4 cubes (excluding the corner cubes) for each colour, which have same colour on two faces i.e., 12 cubes. Hence, 56 – 12 = 44. Choice (D)

3. One face red $\Rightarrow$ out of 36 + 30 = 66 cubes (on both the red faces together), we need to remove 6 common cubes which have two faces painted red. Hence, 66 – 6 = 60.
Choice (C)

4. There are 3 common edges giving 6 + 6 + 4 cubes which have green and red i.e., 16. Choice (C)

5. Only one colour (blue or green) $\Rightarrow$ we have to consider two possibilities:
(i) the central 4×4 square on a face (which gives 16 cubes)
(ii) the four middle-cubes along the common edge of two faces having the same colour (i.e., two green faces have a common edge of 6 cubes out of which four cubes have only green colour).

Thus, if we take the cubes which have only green colour on their faces, there are 16 cubes for each of the two green faces plus four common cubes – a total of (16 + 16 + 4 =) 36 cubes with only green on their faces. Similarly, there will be 36 cubes which have only blue on their faces. Hence, a total of 72 cubes. Choice (B)

Solutions for questions 6 to 13:

6. The six cuts are distributed 2 along each perpendicular plane trebling the number of pieces each time. Hence, $3 \times 3 \times 3 = 27$ pieces. Choice (D)

7. Five cuts are distributed 2 along each of the two perpendicular planes and one along the third perpendicular plane. Hence, we get $3 \times 3 \times 2 = 18$ pieces. Choice (C)

8. Since the cube is placed on the table, there is no need of covering the bottom face by the smaller cubes. Hence, after we cover the cube on all sides as required, we get a $6 \times 6 \times 5$ cube - it will have 180 smaller cubes. Out of this, since we have 64 cubes initially, the number of additional cubes required is equal to (180 – 64 =) 116. Choice (D)

9. When a cube is cut by three planes, we will get a maximum of 8 identical pieces. The edge of each of these cubes is half the width of the original cube. Surface area of the given large cube is $6a^2$ and that of each small cube is $6 (a/2)^2$. Hence, for 8 small cubes, this is $8 \times 6 (a/2)^2 = 12a^2$
$\therefore$ The ratio is $6a^2 : 12a^2$ i.e. 1 : 2. Hence a 100% increase.
Choice (B)

10. We need to find three factors the product of which is $120 - 6 \times 5 \times 4$. So, to get 6 pieces parallel to one plane, we need to have 5 cuts; hence, the number of cuts to get $6 \times 5 \times 4$ pieces, we need 5, 4 and 3 cuts a total of 12 cuts along the three parallel planes to get 120 identical pieces.
Choice (D)

11. 125 cubes can be arranged in $5 \times 5 \times 5$ manner, along the diagonal of one face, there will be 5 cubes; the complete layer of cubes with these 5 cubes as the front portion and the depth of 5 cubes (equal to the depth of the large cube) will be cut by the knife - hence a total of 25 cubes will be cut by the knife. Choice (A)

12. 12 cuts should be divided equally parallel to the three perpendicular planes - 4 parallel to each of the three planes. When there are 4 cuts parallel to the plane, there will be 5 identical pieces. Hence, 4 cuts parallel to each of the three planes means there will be $5 \times 5 \times 5$ identical pieces i.e., 125 identical pieces. Choice (D)

13. 343 cubes, when put together, will give us $7 \times 7 \times 7$ configuration. Now, if a knife is passed, as discussed in Question No. 32, the first cut will pass through 7×7 or 49 cubes. Similarly, the second cut by the knife also passes through 49 cubes. But, out of this, one line of 7cubes is common to both the cuts. Hence, the total number of cubes cut is 49 + 49 – 7 = 91
So, 343 – 91 = 252 of the smaller cubes will not be cut by the knife. Choice (D)

Solutions for questions 14 to 16:

14. Cutting the large cube into 27 smaller cubes will give us a $3 \times 3 \times 3$ configuration. Out of these, if we remove all the outer cubes to get the number of cubes not having any face painted at all, we have to remove one layer of cubes on each of the faces so that we are left with a $1 \times 1 \times 1$ cube which is not painted at all. Hence, the answer is one cube.
Choice (B)

15. The cubes which are not along any edge are the ones that have only one face painted. On each face of the original cube, if we do not count the faces along the edges, then we have only one face at the middle which is painted only on one face. Hence, for six faces of the original cube, we get six cubes that have only one face painted. Choice (B)

16. The cubes along the edges but not at the corners will have two faces painted. Along each edge, if we remove the corner cubes, there is one cube that has two faces painted. Hence for 12 edges of the cube, there will be 12 cubes which have only two faces painted. Choice (C)

Solutions for questions 17 to 20:

17. When a cube is painted and cut into n number of smaller pieces along each edge, the total number of smaller cubes that we get will be n x n x n. From these, if we remove the complete outer layer of the cubes on all faces, we will have all smaller cubes with paint on them removed and we will be left with $(n – 2) \times (n – 2) \times (n – 2)$ cubes. In this case, if the number of cubes that do not have any face painted is 8, it is a $2 \times 2 \times 2$ cube; so before painting, it must have been a $4 \times 4 \times 4$ cube so the original cube was cut into 64 smaller cubes. Choice (C)

18. On each face of the original large cube, if we remove the outer row of cubes along all the four edges, the remaining 2×2 (=4) cubes will have exactly one face painted. On all six faces together, there will be 24 cubes that will have exactly one face painted. Choice (B)

19. Along each edge, if we remove the corner cubes, the remaining cubes have two faces painted; since the original cube is cut into $4 \times 4 \times 4$ cubes, on each edge, we will have 2 cubes with exactly two faces painted on all twelve edges we have $2 \times 12 = 24$ cubes. Choice (D)

20. The large cube is cut into 64 small cubes and this gives us a configuration of $4 \times 4 \times 4$. If we remove all the outer cubes in order to get the cubes with no paint at all, we have to remove one layer of cubes on each of the six faces and are left with $2 \times 2 \times 2$ configuration i.e 8 cubes that have no paint at all. Choice (B)

Solutions for questions 21 to 23:

When three faces of a cube are painted, there are two possibilities.

(i) One pair of opposite faces is painted. The third painted face will be adjacent to these two faces.

(ii) The three painted faces are mutually adjacent to each other. Thus, every painted face is opposite to an unpainted face.

21. By considering the painted cubes in case (i); number of painted faces = $(5 \times 5) + 2\ (5 \times 4) = 40 + 25 = 65$
Hence, the total number of cubes which are unpainted.
$= 125 - 65 = 60$. Ans (60)

22. By considering the case (i), there are two edges common and on each of the two edges, there are 5 cubes that have exactly two faces painted.
Hence, total required cubes = 10
By considering the case (ii)
There are three common edges and along each edge, four cubes have exactly two faces painted. $=3 \times 4 = 12$.
Ans (12)

23. By considering the case (i), on the two opposite faces painted we have $2 \times 5 \times 4 = 40$ cubes which have exactly one face painted and in the other faces, we have $5 \times 3 = 15$.
Hence, total required cubes = 55
By considering the case (ii), except the cubes at the edges and the corner remaining 4×4 cubes on each painted face have only $= 3 \times 16 = 48$. Ans (48)

Solutions for questions 24 to 26:

Given that 4, 5 and 6 cuts are made in three different directions.

We can visualizes 42 pieces on one pair of opposite faces, 35 on second pair of opposite faces and 30 on the third pair of opposite faces.

24. To get the maximum number of smaller pieces which have only back on them, the faces which have 42, 42, 35 and 35 pieces have to be painted in black.
Hence, the pieces which are painted only in black
$= 30 + 30 + 15 + 15 = 90$. Ans (90)

25. To get the maximum number of smaller pieces with black and yellow on them, the opposite faces which consists of 42 cuboids each are painted with black, the other pair of opposite faces which consists of 35 cuboids each are painted with yellow and the out of the remaining pair of opposite faces, one face is to be painted with black or yellow and the other has to be painted red .
Colours on faces : Opposite faces 7×6 = black/yellow.
Opposite face 7×5 = yellow/black.
One face of 5×6 = yellow/black (not black/yellow)
Other face of 5×6 = Red.

There are six cuboids including corners (excluding those corners which have Red paint) on 4 edges and 4 cuboids on 2 edges each which have only black and yellow on them.
Hence, required number of cuboids = $4 \times 6 + 2 \times 4 = 32$.
Ans (32)

26. By painting the three pairs of opposite faces of the larger cuboid with the three different colours, we have 8 corner pieces with three different colours on them. Ans (8)

Solutions for questions 27 to 30:

In the given pattern all the smaller cubes in any straight line/diagonal in each of the larger cube will be an in arithmetic progression.
$216 = 6 \times 6 \times 6$

27. End points of the required diagonal are the first and the last smaller cubes of the bottom layer. i.e., Numbers 1 and smaller cubes 36.
Hence, sum of the numbers on the required diagonal
$= n/2 \times (a + l) = 6/2 \times (1 + 36) = 111$. Ans (111)

28. End points of the required diagonal are numbers 10 and 190. Hence sum $= n/2 \times (a + l) = 6/2 \times (10 + 190) = 600$.
Ans (600)

29. End points of required diagonal are numbers 6 and 211:

Sum $= \frac{6}{2}(6 + 211) = 3 \times 217 = 651$ Ans (651)

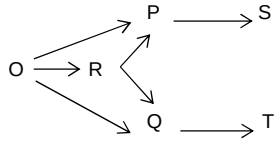
30. End points of the required diagonal are the numbers 1 and 186.
Hence, sum of the number on the required diagonal
$= n/2\ x(a + l) = 6/2\ x\ (1 + 186) = 561$. Ans (561)

Chapter – 9
(Routes and Networks)

Exercise – 9(a)

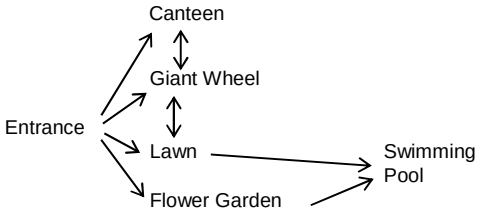
Solutions for questions for 1 to 5:

1. O can go directly to P and then to S or O can go directly to Q and then to T.
$O \rightarrow P \rightarrow S$ or $O \rightarrow Q \rightarrow T$
The diagram can be represented as follows.



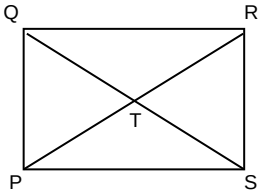
O can directly go to R and then to P and Q. O can go to P, then to S, then to T and return via Q and R. So, he cannot supply water to all without touching any of them twice. Hence, choice (A) is TRUE. Choice (A)

2. The swimming pool, the flower garden, the lawn, the gaint wheel, the canteen are the five items in the park. Each of them is directly connected to the entry.
The swimming pool has access from the flower garden and the lawn directly. The gaint wheel is between the lawn and the canteen.



From the giant wheel to the swimming pool, one has to cross the lawn so that he need not touch the entrance again. Choice (A)

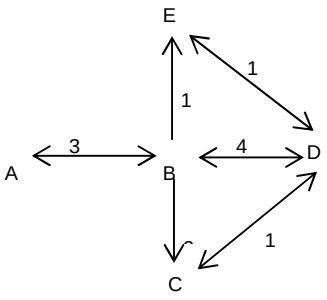
3. Towns P, Q, R and S are connected in the form of a square and also connected diagonally.
P, Q, R and S are in clockwise order as follows.



Town T is at the intersection of routes QS and PR. Any one can start from town T in four ways. TP or TS or TR or TQ touch all other towns at least once. The order of routes can be as follows.
TPSRQT or TQRSPT or TRSPQT or TSPQRT
Choice (A)

4. T_1 is connected to P by fax.
T_1 is connected to F1 by fax.
T_1 is connected to Q only by voice.
T_2 is connected to P or Q or R.
If T_2 is out of operation, only P or Q can be reached, but not R. Choice (D)

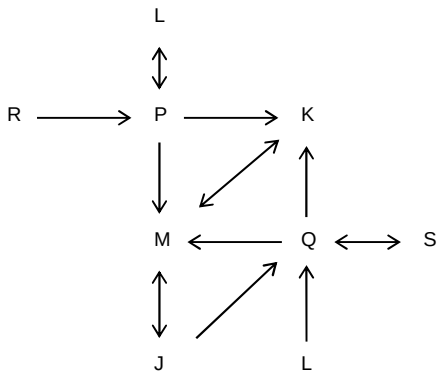
5. From the diagram it can be seen that to go from D to A the number of ways is 4 x 3 = 12 i.e.(D to B and B to A)



Hence choice (D). Choice (D)

Solutions for questions 6 to 10:

Let us draw a diagram based on the given data.



In the above diagram, PQRS are the girls and JKLM are the boys.

6. The person who does not take notes from any other person directly or indirectly is – R. Choice (D)

7. P gives his notes to K, L and M directly. Q gives his notes to K and M directly. S and R do not give their notes to any girl directly. P gives his notes to maximum number of girls directly. Choice (A)

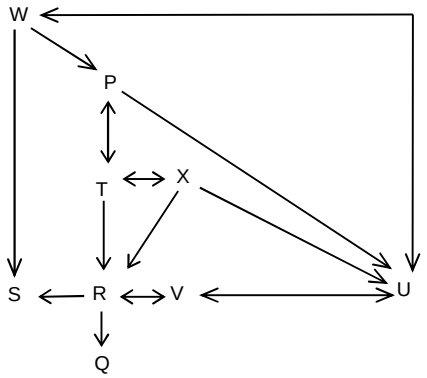
8. If L wants to give her notes to J, then she must definitely pass it through M. Choice (A)

9. Among the given choices, L and S are the persons who cannot exchange their notes at all. Choice (D)

10. All, except L, can take notes from all the other four boys. J can take the notes as follows.
RPMJ, SQMJ, and K can take notes in the order of RPK, SQK. M can take notes as follows. RPM, SQM. Choice (C)

Solutions for questions 11 to 15:

It is better to draw a diagram based on the data given.



Now all the given questions should be solved based on this diagram.

11. If the current has to pass from X to Q, then it has to pass through R, because the ways through which it can pass are in the order of XUVRQ or XRQ or XTRQ or XTPUVRQ. So, R is the pole which is there in every order. Choice (A)

12. If the current passes from T to W, then the current can pass through in four ways as in the order given below from the first to the last mentioned pole.
(i) TXUW
(ii) TPUW
(iii) TRVUW
(iv) TXRVUW Choice (B)

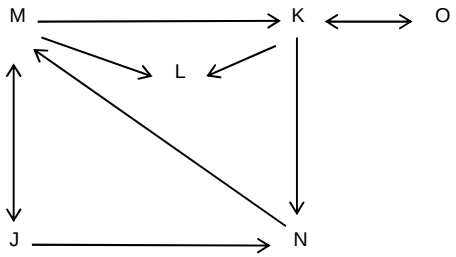
13. Let us check the choices.
X to P is XUWP or XTP obviously (A) is correct. Now choice (B) is X to W which has only one route i.e. XUW, so this choice is not correct. Choice (C), T to W has routes TPUW, TXUW, TXRVUW and TRVUW but no two combinations are such, where no route is common. Hence, this choice is also wrong. Choice (A)

14. Let us check the possible ways
(A) R to W has only one possible way i.e., RVUW
(B) S to V is not possible at all, as it is clear from the above diagram.
(C) P to X has only one way i.e. PTX.
(D) X to W has four possible ways i.e., in the order from the first to the last XUW, XTPUW, XTRVUW and XRVUW. Choice (D)

15. The poles S and Q can never pass the current back as it is clear from the above diagram. Choice (A)

Solutions for questions 16 to 20:

Let us draw a possible network based on the given data.



16. If a person wants to go from J to K then he can go in the order of JMK or JNMK. Choice (B)

17. If a person goes from J to O, then he can go in two ways, in order of JNMKO or JMKO. Choice (A)

18. L and N, M and O have either no or one market in between, J and O have either two or three markets in between i.e., JMKO or JNMKO.
N and O have two markets M and K between them.
Choice (D)

19. Maximum number of markets between K and L are 2 i.e. KNML, between M and N is one i.e., MKN or MJN, whereas between K and O, there is no market. Between O and N there is one market (OKN).
Choice (A)

20. All the five markets can be visited from market M.
Choice (B)

Solutions for 21 to 23:

21. To travel the minimum distance, the path is as follows:

A $\xrightarrow{10}$ B $\xrightarrow{5}$ C $\xrightarrow{6}$ D $\xrightarrow{8}$ I $\xrightarrow{11}$ H

∴ The minimum distance required to travel from signal A to signal H = 40 km.

Ans 40 km

22. To travel the maximum distance, the path is as follows:

B $\xrightarrow{20}$ D $\xrightarrow{8}$ I $\xrightarrow{4}$ E $\xrightarrow{10}$ F $\xrightarrow{7}$ G = 49 km

∴ The maximum distance required to travel from signal B to G = 49 km. Ans 49 km

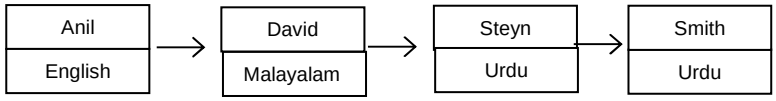
23. From signal A to I, the possible routes are,
(1) A B C D I
(2) A B D I
(3) A B E D I
(4) A B E I
(5) A E D I
(6) A E I
(7) A F G E D I
(8) A F G E I
∴ There are 8 ways to travel from signal A to I
An 8

Solutions for 24 to 26:

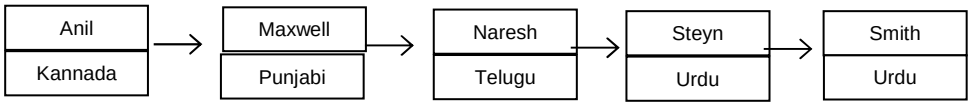
24. By observation we can say that David cannot c e with Maxwell directly.
As David knows two languages Malayalam and En e have to check with two possible languages to get h number of translators.
David, in English, can communicate with Anil, no n Kannada, can communicate with Maxwell. T e translator is sufficient.
∴ Less than one is not possible. Ans 1

25.

Case (i)



Case (ii)



∴ There are two different ways possible. Ans 2

26.

Anil	–	Hindi	–	Smith
Anil	–	English	–	David
Anil	–	Hindi	–	Jacob
Anil	–	Kannada	–	Maxwell
David	–	Malayalam	–	Steyn
Jacob	–	Hindi / Urdu	–	Smith
Jacob	–	Urdu	–	Steyn
Naresh	–	Telugu	–	Steyn
Naresh	–	Punjabi	–	Maxwell
Steyn	–	Urdu	–	Smith

∴ There are 10 pairs of persons who can communicate with each other directly. Ans 10

Solutions for questions 27 to 30:

Each of P, Q, R and S have one one-way connection and one two-way connection. And all one-way routes are from west-to-east direction only.
From (v), S is the eastern-most city, and R is to the west of S.
Thus from (ii), we can say that either H or G is to the west of S.
The other city may be in any direction but neither east nor west.
Thus we have two cases.
Case (I) if H is to the west of S.
From (v) and (ii), cities H and R are to the west of S.

R —— …..... H<——S

From (iii), and above, P cannot be towards east of H, This implies P must be between R and H. And the one-way road for P must be between H and P (westwards).

R<===>P<—— H <——— S

From (I) and (iii) R is connected to cities P and Q. With a two-way road between R and P, the road between Q and R must be one-way. This implies Q must be to the west of R. This violates the conditions (vii). Thus our assumption that H is to the west of S fails.

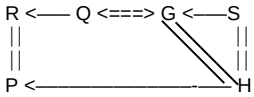
Case (ii) if G is to the west of S.
From (v) and (ii), we have the following arrangement.
R——..... G<——S

From (iii), P is connected to R and H. Now that H is neither east nor west of S, and in turn R, P and R are connected by a two-way road and P and H must be connected by a one-way road.
Thus from (I), R and Q are connected by a one-way road and thus Q and G are connected by a two-way road. This implies Q must be between R and G.

R <—— Q <===> G <——S
|| ||
|| ||
P <———————————— H

To fulfil condition (iv), there must be an additional road between G and H. As these two cities are not in the west-east direction, the road must be a two way road.

The final arrangement is as follows:
Note that P is to the west of H, and the road connecting these two cities can be either towards north or towards the south of the road connecting cites Q and G.



27. Only Choice (A) is definitely false. Choice (A)

28. There is no route available to reach city H from city R. Choice (D)

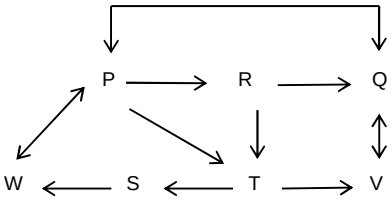
29. One can travel in the route S->H->G->Q->R->P. Choice (C)

30. Within the network, there is no possibility for another one-way road. Hence, only two-way roads are possible. Further IV is never possible because only one more city is permitted. Thus a two-way road is possible only between G and P. A two way road between G and Q violates condition (vii). Hence only II. Choice (B)

Exercise – 9(b)

Solutions for questions 1 to 5:

The diagram as per the data given is as follows.



1. If the phone R is switched off and a person wants to send a message from P to V, then he has to send it to either Q or T as the possible way is order PQV or PTV. Choice (C)

2. If phone V can now send the message to phone T, then it can send the message to P in the order of VTSWP or VQP from first to last. Choice (A)

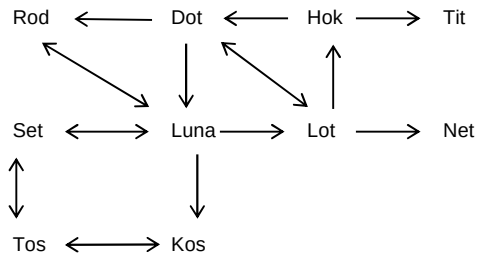
3. If phone T is out of order, then the link to S will be broken. Choice (C)

4. The message from W to V can be passed in the order of WPTV, WPRTV, WPRQV or WPQV from first to last. Choice (D)

5. If a person wants to send a message from Q to V, then he can send in the order of QV, QPRTV or QPTV in the order of first to last. Choice (A)

Solutions for questions 6 to 10:

Let us draw a possible network as per the data given.



6. If tower Kos has to send signal to Hok, then it sends through four other towers in the order of Kos, Tos, Set, Luna, Lot and Hok. Choice (A)

7. If the tower Luna sends signal to Hok, then it has to send through Lot. Choice (A)

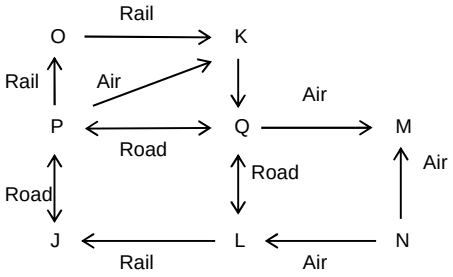
8. If tower Luna fails to send messages, then only tower Rod will fail in sending messages, whereas Tit and Net anyway cannot send messages. Choice (D)

9. Tower Hok can never send messages, if tower Dot is destroyed. Choice (C)

10. The message can be sent by exactly two other towers i.e., Dot to Hok in the order of Dot – Luna – Lot – Hok. Choice (B)

Solutions for questions 11 to 15:

The diagram as per the given data is as follows.



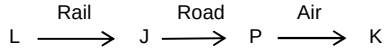
11. If a person wants to go from city O to city M, then he should not go via. Road. He can go from O to K to Q to M. Choice (A)

12. The longest route from L to K is either L – J –- P – O – K or L – Q – P – O – K, thus he has to pass through three cities. Choice (C)

13. If a person wants to go from J to L and he wants to use all the possible means of transports, then he can go in one way in the order of JPKQL. Choice (C)

14. City N is the only city which a person can never reach by any means of transport. Choice (C)

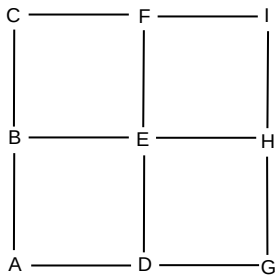
15. Cities L and K are the two cities, between which all the means of transport can be used, i.e., in the order of



Choice (B)

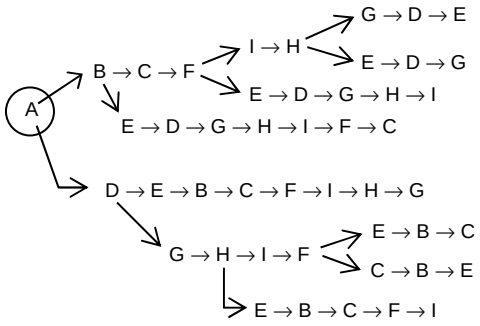
Solutions for questions 16 to 20:

The following diagram shows the network of roads to cities.



16. From E, a person can go to I in two ways (covering 20 km).
From A to E, there are two ways.
$\Rightarrow$ From A to I, through E, there are four ways.
Two more ways are available as shown below.
A - B - C - F - I.
A - D - G - H - I
Total number of ways is 6. Choice (B)

17. Following are the ways in which a person starts from A and visits all the cities.



Hence, there are 8 such ways. Choice (B)

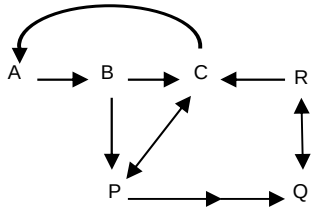
18. From F there are three ways to reach D.
From E there are three ways to reach D.
From A to E there are two ways, from A to F there are two ways.
By comparing the above ways we get that there are 8 ways in total. Choice (D)

19. 70 km
A - B - C - F - I - H - G - D or
A - B - C - F - I - H - E - D Choice (B)

20. There is no such possible way. Choice (D)

Solutions for questions 21 to 23:

From the description given, the following is the diagram representing various routes.



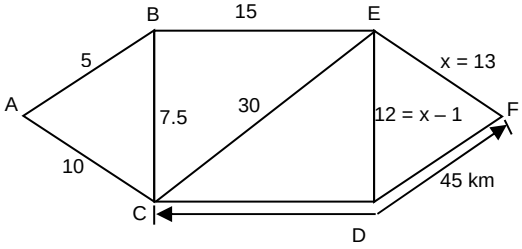
21. The routes are as follows:
1. ABPQRC (A to C)
2. BPQRCA (B to A)
3. PQRCAB (P to B)
4. QRCABP (Q to P)
5. RCABAPQ (R to Q)
6. CABPQR (C to R)
7. ABCPQR (A to R)

∴ There are 7 routes. Choice (D)

22. Cities with only one outgoing route are, A, Q. Choice (B)

23. The cities which have more number of incoming routes than outgoing routes are C and Q. Choice (C)

Solution for questions 24 to26:



Distance	Fare(₹)
Up to 10	30
11 - 20	₹ $\frac{1}{2}$ per km
≥ 21	₹ $\frac{2}{5}$ per km

$\rightarrow \left[80\% \text{ of } \frac{1}{2}\right]$

Let EF be x km, then DE will be (x – 1) km.

From (4)

F – D – C = ₹45		F – E – D = ₹37	
10 km	₹30	First 10 km	₹30
Next 10 km	5	Next 10 km	5
Next 25 km	10	Next 5 km	2
Distance = 45 km	₹45	25 km	₹37

Since, the route F – E – D is 25 km $\Rightarrow$ x + x – 1 = 25
or x = 13

From (5) the cost of travel from AB = AC = BC

Since distances are different between any two cities. It must be ₹30 or AB and BC < 10km and average of cost per km is ₹4.
$\Rightarrow$ the costs are ₹3 per km, ₹4 per km, ₹5 per km.
∴ AB and BC can be either 6 km or 7.5 km.

From (6) since the difference between ACDF and ABEF is maximum, implies AB = 6 km and BC = 7.5 km.

From (7) EC distance = 30 km.

24. Distance between B & C is 7.5 km Choice (C)

25. CD + DF = 45
Let CD = x km and DF = 45 – x
First 10 km = ₹30 for both since there is a difference of ₹2.5. So definitely the distances are greater than 10
Now, if both the distances are between 10 and 20 then sum would not be 45 km.
Case 1: One distance is (say x) less than a equal to 20 km and the other is greater than 20 km

$$\therefore \left[30+5+(25-x)\frac{2}{5}\right] \sim \left[30+5+(x-10)\frac{1}{2}\right] = 2$$

[∴ x = 20 and other distances = 45 – 20 = 25].
Case 2: Both the distances are greater than 20 km then,

$$\left[35+(x-20)\frac{2}{5}\right] \sim \left(35+(25-x)\frac{2}{5}\right)=2$$

$$\frac{2}{5}(x-45) = 2$$

x = 2(not possible)
∴ Option (A) is true.
From the above, the fares of CD could be ₹35 or ₹37 and the fare between E and C is ₹39.
∴ Option (B) is also true.
Option (C) is always false because route CE is the maximum distance.
The pairs of distances in which one distance is twice the other are (6, 12), (7.5, 15), (15, 30), (10, 20).
Therefore, option (D) is true. Choice (C)

26. The difference routes are :
(a) ACEF (b) ACEDF (c) ACBEDF
(d) ACBEF (e) ABCEF (f) ABECDF
(g) ABCEDF (h) ABCDEF (i) ACDEF
∴ There are nine ways. Choice (D)

Solutions for questions 27 to 30:

The given information can be tabulated as below:

	A	B	C	D	E	F	G
A		Air					Bus
B	Air		Bus		Bus		
C		Bus		Train		Train	
D			Train		Air	Bus	
E		Bus		Air		Bus	Ferry
F			Train	Bus	Bus		
G	Bus				Ferry		

27. The cities A and G are connected by bus, but not with any other city. Thus if the travel was by bus, then A cannot be visited. If the travel was by train, then only cities F, C and D can be visited, thus A cannot be visited. More than two cities cannot be on a route with using only air travel or ferry. Thus only city A cannot be visited. Choice (C)

28. To reach city A, either air or bus can be used,
Bus to A => G is visited last (ferry) => E is visited last.
E can be reached by air (from D) or bus (from F or B).
If air, then only three modes.
If bus, then E can be reached from D in only two other modes. Thus, still only three modes.

City A is reached by air => Ferry cannot be used. Thus maximum three modes are available. Choice (B)

29. If each mode is used only once, only five cities are in the route.
This can be achieved only when cities G, E, D, C and B are visited in the same order or in the reverse order.
D is the third city that is visited. Choice (A)

30. We have seen that only A and G are connected by bus, and they are not connected to other cities any land transport. Thus A and G could be the cities that are on an island. Choice (A)

Chapter – 10
(Deductions)

Exercise – 10(a)

Solutions for questions for 1 to 10:

1. (P) is wrong, as the first two premises are negative.
(Q) is correct, as the middle term is distributed and the conclusion is 'some dairies are novels', hence group Q is correct.
(R) is wrong, as the common term is not distributed.
(S) is correct, as the middle term 'hardworking' is distributed and the conclusion is – some teachers are intelligent.
Hence Q and S are correct. Choice (D)

2. (P) is wrong, as the common term is not distributed.
(Q) is correct, as the middle term 'magazines' is distributed and conclusion is 'some papers are good'.
(R) is correct, as the middle term 'yellow' is distributed. And conclusion is 'some pencils are not pens'.
(S) is wrong, as when one of the premise is particular then conclusion should be particular.
Hence Q and R are correct. Choice (C)

3. (P) is wrong, as the common term is not distributed.
(Q) is wrong, as the conclusion has to be 'some benches are not chairs'.
(R) is correct, as the common term 'tough' is distributed. And the conclusion is 'some men are puzzles'.
(S) is correct, as the common term 'perfect' is distributed and the conclusion is 'no man is woman'.
Hence R and S are correct. Choice (B)

4. (P) is wrong, as both the premises are particular.
(Q) is wrong, as the common term is not distributed.
(R) is correct, as the common term 'gold' is distributed. and the conclusion is 'some chairs shine'.
(S) is correct, as the common term 'black' is distributed and the conclusion is 'some shoes are not boots'.
Hence R and S are correct. Choice (C)

5. (P) is wrong, as both the premises are particular.
(Q) is wrong, as the common term is not distributed.
(R) is correct, as the common term 'spicy' is distributed and the conclusion is 'No curry is food'.
(S) is correct, as the common term 'handsome' is distributed and the conclusion is 'some dark are not tall'.
Hence R and S are correct. Choice (A)

6. (P) is wrong, as the conclusion should be some which are sour are not apples.
(Q) is correct, as the common term 'students' is distributed and the conclusion is 'all girls are naughty'.
(R) is correct, as 'rough' is the common term and is distributed and the conclusion is 'all boys are free'.
(S) is correct, as the common term 'clues' is distributed and the conclusion is 'some that are hard are not tricky'.
Hence Q, R and S are correct. Choice (D)

7. (P) is wrong, as when one of the premises is particular then the conclusion should be particular.
(Q) is wrong, as the conclusion has to be 'some long are not great'.
(R) is correct, as the common term 'pig' is distributed and the conclusion is 'no hen is a dog'.
(S) is wrong, as when one of the premises is negative then the conclusion should also be negative.
Hence only R is correct. Choice (C)

8. (P) is correct, as the common term 'beautiful' is distributed and the conclusion is 'all girls are soft'.
(Q) is correct, as the common term 'fast' is distributed and the conclusion is 'some deer are not lions'.
(R) is correct, as the common term plait is distributed and the conclusion is 'some black are long'.
(S) is correct, as the common term 'weird is distributed and the conclusion is 'some girls are dreams'.
Hence all are correct. Choice (D)

9. (P) is correct, as the common term 'good' is distributed and the conclusion is 'no curse is a blessing'.
(Q) is correct, as the common term 'trains' is distributed and the conclusion is some that are fast are quick.
(R) is wrong, as both the premises are particular.
(S) is wrong, as when one of the premises is particular, then conclusion should be particular.
Hence P and Q are correct. Choice (C)

10. (P) is wrong, as the conclusion should be 'some hot are not ice'.
(Q) is wrong, as the common term 'fly' is not distributed.
(R) is correct, as the common term 'director' is distributed and the conclusion is 'no producer is an actor'.
(S) is wrong, as the conclusion should be some powerful are not kings.
Hence only R is correct. Choice (D)

Solutions for questions 11 to 20:

11. (A) LPR: The middle term doctor is distributed. So the conclusion obtained is – some who are intelligent are surgeons or some surgeons are intelligent. Hence 1st option does not satisfy.
(B) MNQ: The middle term hardworking is distributed and hence the conclusion is all students are intelligent.
∴ Choice (B) logically follows.
(C) LMN: There are 4 terms hence no conclusion.
Choice (B)

12. (A) PQN: The option is wrong as we do not have a term called glitter in P and Q.
(B) LQM: The common term 'gems' is distributed and the conclusion when L and Q are combined is – some diamonds are not sapphires.
Hence choice (B) logically follows.
(C) PQR is wrong, as the conclusion should be some rubies are not sapphires.
(D) NPQ is wrong, as both the premises are particular.
Choice (B)

13. (A) MNQ: The middle term telegraph is distributed and the conclusion obtained is some mails are not telegraphs.
Hence choice (A) logically follows.
(B) LNR is wrong, when one of the premises is particular then the conclusion should also be particular.
(C) QPN is wrong, when one of the premises is negative then the conclusion is also negative.
(D) LMN is wrong, because of the same reason given above. Choice (A)

14. (A) LMQ is wrong, as when one of the premises is particular, then the conclusion should also be particular.
(B) LNR is correct, as the common term 'doors' is distributed and the conclusion is 'All keys are wood'.
When the above conclusion is true then some keys are wood is also true.
Hence (B) logically follows.
(C) NPR is wrong, because the conclusion has to be between doors and iron.
(D) MNR is wrong, as there are 4 terms. Choice (B)

15. (A) RNM is wrong, as both the premises are particular.
(B) LPQ is wrong, as there are 4 terms.
(C) MNR is wrong, as both the premises are particular.
(D) LQR is correct, as every rule is satisfied.
Choice (D)

16. (A) MNQ is wrong, as when one the premises is negative then the conclusion should also be negative.
(B) NQM is wrong, because of the same reason given above.
(C) LNR is correct, as every rule is satisfied.
Choice (C)

17. (A) NPR is correct, The common term is distributed and the conclusion drawn is 'no poet is an author'. Hence choice (A) logically follows.
(B) LRN is wrong, as there are only 2 terms.
(C) LPN is wrong, when one of the premises is negative, the conclusion should also be negative.
(D) PMQ is wrong, as when one of the premises is negative then the conclusion should also be negative.
Choice (A)

18. (A) LMR is wrong, as when one of the premises is negative then the conclusion should also be negative.
(B) NLQ is correct, as the common term 'year' is distributed and the conclusion drawn is – some leap years are good.
Hence choice (B) logically follows.
(C) PNR is wrong, as when one of the premises is negative then the conclusion should also be negative.
(D) PNL is wrong, as when one of the premises is negative then the conclusion should also be negative.
Choice (B)

19. (A) MNQ is wrong, as when one of the premises is negative then the conclusion should also be negative.
(B) QRP is wrong, as both the premises are particular.
(C) NLR is correct, as it does not violate any rule.
(D) PML is wrong, as both the premises are negative.
Choice (C)

20. (A) LRM is wrong, as both the premises are negative.
(B) PNQ is wrong, as both the premises are particular.
(C) NMP is wrong, as both the premises are particular.
Choice (D)

Solutions for questions 21 to 23:

21. A. As both the premises are particular, there can be no conclusion.
B. As the middle term 'situations' is not distributed, there can be no conclusion.
C. As both the premises are affirmative, the conclusion cannot be negative.
D. It is a valid conclusion as none of the rules is violated.
Choice (D)

22. A. As both the premises are affirmative, the conclusion cannot be negative.
B. As both the premises are particular, there cannot be a conclusion.
C. As one of the premises is negative, the conclusion cannot be affirmative.
D It is a valid conclusion as none of the rules is violated.
Choice (D)

23. A. As the term 'fervour' is not distributed in the premises, it cannot be distributed in the conclusion.
B. It is a valid conclusion as none of the rules is violated.
C. As both the premises are particular, there can be no conclusion.
D. As one of the premises is negative, the conclusion cannot be affirmative. Choice (B)

Solutions for questions 24 and 25:

Let the premises be:
All booths are a cabins _____(1)
Some dens are not cabins _____(2)
All hovels are booths _____(3)
From (3) and (1), it can be concluded that 'hovel is a cabin' ___(4)
From (2) and (4), it can be concluded that 'some dens are not hovels' _____(5)

24. Choice A contradicts the above conclusion.
Choice (A)

25. Given, few kraals are hovels ____ (6)
From (5) and (6), there is no conclusion but the following conclusions can be possible :
Few dens are not kraals.
Few kraals are not dens.
Few kraals are dens.
From (6) and (4), it can be concluded that few kraals are cabins. Choice (D)

Solutions for questions 26 and 27:

Let the premises be:
Changes are ideas ------- (1)
No idea is a fancy ------- (2)
Most fancies are images ------- (3)
From (1) and (2), it can be concluded that
No changes is a fancy ------- (4)
From (3) and (4), it can be concluded, few images are not changes ------- (5)

26. Only 'All images are changes' contradicts. Choice (D)

27. Change is an imagination ------- (6)
from (5) and (6), it can be concluded that
few imagination are not fancies.
Only choice B is definitely true. Choice (B)

Solutions for questions 28 to 30:

Let the premises be:
Acumen is acuteness ------- (1)
Ideas are acumen ------- (2)
Few comprehensions are not acuteness ------- (3)
From (1) and (2), we can conclude that
Idea is acuteness ------- (4)
From (4) and (3), we can conclude that
Few comprehensions are not ideas ------- (5)

28. Only choice (D) contradicts. Choice (D)

29. 'apprehension is an idea' ------- (6)
from (5) and (6), we can conclude that "few comprehensions are not apprehensions".
from (6) and (3), we can conclude that, apprehension is acuteness. Only choice (D) is not true. Choice (D)

30. 'grasp is comprehension' ------- (7)
from (3) and (7), there is no conclusion.
Only choice (D) is the correct choice Choice (D)

Exercise – 10(b)

Solutions for questions for 1 to 10:

1. (A) PML: By combining P and M or M and L we get a conclusion in particular.
Now when we combine P and L then we do not get a conclusion as the common term is not distributed.
(B) NPL: No combination would give a valid conclusion.
(C) PQL: No combination would give a valid conclusion.
(D) QNP: By combining N and P we get 'all rings are spheres'. Hence 'some rings are spheres' is correct
Hence the correct combination is NPQ.
Choice (D)

2. (A) PQR: Here no combination would give a conclusion.
(B) NQR: No combination gives a valid conclusion.
(C) LPN: By combining, L and P, the conclusion obtained is 'some false are truths'.
(D) MQR: There are more than 3 terms hence wrong.
Choice (C)

3. (A) PQM: No combination would give a valid conclusion.
(B) RNQ: No combination would give a valid conclusion.
(C) PRL: When P and R are combined we get the conclusion 'some teams are great'.
(D) MPN: No combination would give a valid conclusion.
Choice (C)

4. (A) NQL: By combining N and Q we get the conclusion 'some women are old'.
Hence choice (A) is logically related.
(B) PMR: No combination would give a valid conclusion.
(C) LNR: No combination would give a valid conclusion.
Choice (A)

5. (A) LMP: No combination is logically related.
(B) RPL: No rule is violated hence it is logically related.
(C) NQL: No rule is violated hence it is logically related.
Choice (D)

6. (A) NPM: No combination is logically related.
(B) NQL: No rule is violated hence it is logically related.
(C) MNR: No combination is logically related.
(D) PQL: No combination is logically related.
Choice (B)

7. (A) NQR: No combination is logically related.
(B) PRN: No combination is logically related.
(C) LNP: No combination is logically related.
(D) LNQ: No rule is violated hence it is logically related.
Choice (D)

8. (A) PNL: No combination is logically related.
(B) LPR: No rule is violated hence it is logically related.
(C) MPQ: No combination is logically related.
Choice (B)

9. (A) LMQ: No rule is violated hence it is logically related.
(B) NPR: No rule is violated hence it is logically related
(C) MNP: No combination is logically related.
Choice (D)

10. (A) LMR: No rule is violated hence it is logically related.
(B) LNP: No combination is logically related.
(C) PQN: No combination is logically related.
Choice (A)

Solutions for questions 11 to 13:

11. (A) bef – is correct, but in the order efb.
(B) bcd – is correct, but in the order cdb.
(C) fca – is correct in the same order.
(D) def – is incorrect as there are four terms.
Choice (C)

12. (A) adf – is not correct as all 3 statements are negative.
(B) def – is not correct as all 3 statement are negative.
(C) bcd – is not correct as there are more than 3 terms.
(D) bef – is correct in the same order. Choice (D)

13. (A) fed – is incorrect as all the three statements are negative.
(B) bcd – is incorrect as there are four terms.
(C) cde – is incorrect as the term 'Orange' is common to all the three statements.
(D) abc – is correct in the order ACB. Choice (D)

Solutions for questions 14 to 17:

14. (A) dca: It is not a valid option as there are four terms.
(B) ceb: It is not a valid option as the middle term is there in the conclusion.
(C) abd: It is not a valid option as one of the premises in negative but the conclusion is affirmative.
(D) eda: It is a valid option as none of the conditions is violated. Choice (D)

15. (A) abc : It is not a valid option as the middle term is not distributed.
(B) cdb : It is not a valid option as the middle term is not distributed.
(C) acb : It is a valid option as none of the conditions is violated.
(D) ace : It is not a valid option as the term that is not distributed in the premises is distributed in the conclusion. Choice (C)

16. (A) ade : It is not a valid option as the middle term is not distributed.
(B) abc : It is not a valid option as there are four terms.
(C) abe : It is not a valid option as there are four terms.
Choice (D)

17. (A) acb : It is a valid option as none of the conditions is violated.
(B) abc : It is not a valid option as both the premises are negative.
(C) ade : It is not a valid option as both the premises are negative.
(D) abe : It is not a valid option as both the premises are negative. Choice (A)

Solutions for questions 18 to 20:

18. Choice (A): Let us combine statements P and Q – as all the rules are satisfied we get, Some red are blue.
Now the above conclusion is combined with the statement T, as all rules are satisfied the conclusion is Some red are caps.
The above conclusion is the same as statement S.
∴ The group PQST is logically consistent.
In each of the other choices, there is one term which does not occur twice. Choice (A)

19. Choices (A) and (C): The term 'best' occurs only once. Hence the rules are not followed.
Choice (B): P and Q cannot be combined as both are particular.
P and R cannot be combined as the middle term is not distributed.
So let us combine statements T and S.
As all the rules are satisfied we get the conclusion, Some dolls are beautiful.
Now the above conclusion is combined with statement R.
As all rules are satisfied we get the conclusion, Some dolls are cute.
The above conclusion is the same as statement P.
Hence PRST is logically consistent. Choice (B)

20. Choice (A): There are three negative statements. Hence no conclusion.
Choice (B): The term 'powerful' occurs only once. Hence no conclusion.
Choice (C): Let us combine R and S as all the rules are satisfied we get, Some cruel are not bad.
The above conclusion is combined with statement T.
As all rules are satisfied we get the conclusion, Some cruel are not kings.
The above conclusion is the same as statement U.
Hence RSTU is logically consistent. Choice (C)

Solutions for questions 21 to 30:

21. From the choices,
A. from b and d, we can conclude that, "few tufts are combs", which is A.
B. is not a valid group as exactly one statement is negative.
C. is not a valid group as exactly one statement is negative.
D. Among b, c, f, b cannot be the conclusion of the other two as it is affirmative. As the term 'comb' is not distributed, f cannot be the conclusion. As 'tuft' is not distributed, c cannot be the conclusion.
Choice (A)

22. From the choices,
A. From c and f it can be concluded that, "few straps are not curbs", which is a.
B. is not a valid group as all the three statements are particular. For the same reason as above, (C) and (D) are also not possible. Choice (A)

23. From the choices,
A. Among c, d, e, as c is particular neither d nor e can be the conclusion. As both d and e are negative C cannot be the conclusion.
B. From f and e, it can be concluded that, "no desk is a deck", which is d.
C. is not a valid group as all the three statements are negative.
D. is not a valid group as all the three statements are negative. Choice (B)

24. From the choices,
A. is not a valid group as exactly one statement is negative.
B. is not a valid group as all the three statements are negative.
C. From a and b, we can conclude that, "some dogmatics are not dogmas". Which is c.
D. is not a valid group as all the three statements are particular. Choice (C)

25. From the choices,
A. is not a valid group as all the three statements are negative.
B. From c and a, we can conclude that, "no margin is limit", which is e
C. is not a valid group as exactly one statement is negative.
D. is not a valid group as exactly one statement is negative. Choice (B)

26. Choice A $\rightarrow$ There is only one negative statement.
Choice B $\rightarrow$ Here only e can be the conclusion but there the term 'protection' is distributed, which is not distributed in f.
Choice C $\rightarrow$ Does not violate any rule in the order cfb.
Choice (C)

27. Choice A $\rightarrow$ Only c can be the conclusion but the term 'professor' which is distributed in the conclusion is not distributed in the premise.
Choice B $\rightarrow$ Only f can be the conclusion, but here the term 'engineer' which is distributed in the conclusion is not distributed in the premise.
Choice (C) $\rightarrow$ Does not violate any rule in the order abf.
Choice (C)

28. Choice A $\rightarrow$ In any order if we take the statements, the term, which is not distributed in the premise is distributed in the conclusion.
Choice B $\rightarrow$ There are only two terms in the statements b and e.
Choice C $\rightarrow$ Does not violate any rule, in the order bcd.
Choice D $\rightarrow$ All the statements are particular.
Choice (C)

29. Choice A $\rightarrow$ There is only one negative statement.
Choice B $\rightarrow$ Does not violate any rule in the order bfd.
Choice C $\rightarrow$ All are particular statements.
Choice D $\rightarrow$ There are four terms. Choice (B)

30. Choice A $\rightarrow$ Does not violate any rule in the order efb.
Choice B $\rightarrow$ Does not violate any rule, in the same order.
Choice C $\rightarrow$ Does not violate any rule in the order cfd.
Choice (D)

Chapter – 11
(Connectives)

Exercise – 11(a)

Solutions for question 1:

In such types of questions it is better to mark the statements as p and q and then mark the answer.

1.

p
Either | the mouse is of Logitech make | or
q
| it is of HP make. |

Statement	Conclusions
p or q	(i) $\sim p \Rightarrow q$ (ii) $\sim q \Rightarrow p$

Let us check (i) $\sim p \Rightarrow q$
~p is "The mouse is not of Logitech make" and this statement is marked as c, whereas q is "it is of HP make" and this statement is marked as d. So
$\sim p \Rightarrow q$ is $c \Rightarrow d$, i.e. cd but this choice is not present.
So let us check (ii) $\sim q \Rightarrow p$
~q is "it is not of HP make", this statement is numbered as b, whereas P is "the mouse is of Logitech make" which is numbered as A, so $\sim q \Rightarrow p$ i.e. $b \Rightarrow a$ i.e. ba.
Choice (B)

Solutions for questions 2 to 10:

Questions 2 to 10: Each of these questions is similar to question number 1 and hence can be done in the same way as question number 1.

11.

p q
If | the leviathan is big | , then | the dinosaur is gentle. |

Statement
If p, then q

Conclusions
(i) $p \Rightarrow q$ (ii) $\sim q \Rightarrow \sim p$

Note: It is better to check the $\sim q \Rightarrow \sim p$ first. ~q is "the dinosaur is not gentle" which is marked as d, whereas ~p is "the leviathan is not big" which is marked as b. So $\sim q \Rightarrow \sim p$ is $d \Rightarrow b$ i.e. db. Choice (D)

Questions numbered 12 to 16 and 20: These questions can be solved in the same way as question number 11.

17.

q		p
The cheetah drinks coke	, only if	the bear drinks pepsi.

Statement:
q only if p or only if p, then q.

Conclusions:
(i) $q \Rightarrow p$ (ii) $\sim p \Rightarrow \sim q$
(Note) It is better to check $\sim p \Rightarrow \sim q$. ~p is "The bear does not drink pepsi", which is marked as c, whereas ~q of "The cheetah does not drink coke", which is marked as b. So $\sim p \Rightarrow \sim q$, i.e. $c \Rightarrow b$. But this is not present among the choices.

Let us check (i) $q \Rightarrow p$
Q is "The cheetah drank coke", which is marked as a, whereas P is "the bear drank pepsi", which is marked as d. So $q \Rightarrow p$, i.e. $a \Rightarrow d$, i.e. ad. Choice (D)

18.

	p		q
Unless	you catch the theif	,	the robbers will not stop.

Unless p, q is same as p or q
(i) $\sim p \Rightarrow q$ (ii) $\sim q \Rightarrow p$

~p is "you did not catch the thief", which is marked as c, whereas q is "the robberies will not stop", which is marked as d.

So $\sim p \Rightarrow q$, $c \Rightarrow d$. As cd is given, no need of checking the other one. Choice (A)

Question No. 19: This can be solved in the same way as question number 18.

Solutions for questions 21 to 25:

21. The statement is in statement of if P, then q or r.

The implications are,
(i) p and $\sim q \Rightarrow r$ (ii) p and $\sim r \Rightarrow q$
(iii) $\sim q$ and $\sim r \Rightarrow \sim p$

choice (B) is as implication (ii). Choice (B)

22. Statement: Whenever p, q or r.
Implications:
(i) $p \Rightarrow q$ or r (ii) $\sim q \,\&\, \sim r \Rightarrow \sim p$
(iii) $p \,\&\, \sim q \Rightarrow r$ (iv) $p \,\&\, \sim r \Rightarrow q$
Choice (B) is an implication (ii). Choice (B)

23. The statement is in the form of if p or q, then r.
The implications of the above statements are
(i) p or $q \Rightarrow r$ (ii) $p \Rightarrow r$
(iii) $q \Rightarrow r$ (iv) $\sim r \Rightarrow \sim p$ and $\sim q$
Choice (D)

24. Statement is in the form of whenever p, q or r.
Implications:
(i) $p \Rightarrow q$ or r (ii) $\sim q \,\&\, \sim r \Rightarrow -p$
(iii) $p \,\&\, \sim q \Rightarrow r$ (iv) $p \,\&\, \sim r \Rightarrow q$

Choice (A) & (C) are an implication (ii) and (iii).
Choice (D)

25. The statement is in the form of unless p then q and r.
Implications:
(i) $\sim p \Rightarrow q$ and r (ii) $\sim q$ or $\sim r \Rightarrow p$
(iii) $\sim q \,\&\, r \Rightarrow p$ (iv) $q \,\&\, \sim r \Rightarrow p$
(v) $\sim q$ and $\sim r \Rightarrow p$

Choice (B) & (C) are an implication (ii) and (iii).
Choice (D)

Solutions for questions 26 to 30:

26. Divya eats sweets = q
if
she is not hungry = p.
Statement:q, if p.
Negation: p and q, or ~ q and p
i.e., divya ate sweets though she was not hungry.
Choice (D)

27. The statement is in the form of q, whenever p.
Negation: p and ~ q or ~ q and p.
i.e., England bats first and India did not won the match.
Choice (C)

28. The statement: is in the form of either p or q.
Negation: ~ p and ~ q.
i.e., the question was not wrong and the answer was not right. Choice (B)

29. The statements: is in the form of r, only if p and q.
Negation: r and ~ p or ~ q" or "~.q or –p".
The man went to bank and he neither needed money nor required to update pass book.
Choice (B)

30. The statement is in the form of q, unless p.
Negation: ~ p and ~ q or ~q and ~p
The strike did not continue. Also there was no hike in the salary of the employees. Choice (D)

Exercise – 11(b)

Solutions for questions 1 and 2:

1.

	p		q
If	it is a holiday	, then	I will go for a picnic

	r
or	I will visit my Uncle's house.

Statement
If p, then q or r

Conclusions
(i) $p \Rightarrow q$ or r (ii) $\sim q \,\&\, \sim r \Rightarrow \sim p$
(iii) $p \,\&\, \sim q \Rightarrow r$ (iv) $p \,\&\, \sim r \Rightarrow q$

Conclusions:
(i) It is a holiday, that means I will go for a picnic or I will visit my uncle's house.
(ii) I did not go for a picnic and I did not visit my uncle's house, that means it was not a holiday.
(iii) It was a holiday but I did not go for a picnic, means that I visited my uncle's house.
(iv) It is a holiday but I did not visit my uncle's house, means that I went for picnic.

But only statement (ii) is represented in choice (C).
Choice (C)

2.

p

Whenever [my mom scolds me,] I either

q r

[hide behind my dad] or [complain to my grandma.]

Statement:
Whenever p, then q or r is same as If p, then q or r.

Conclusions:
(i) $p \Rightarrow q$ or r
(ii) $\sim q \,\&\, \sim r \Rightarrow \sim p$
(iii) $p \,\&\, \sim q \Rightarrow r$
(iv) $p \,\&\, \sim r \Rightarrow q$

Conclusions:
(i) My mom scolded me, so I hid behind my dad or I complained to my grandma.
(ii) I did not hide behind my dad and I did not complain to my grandma, that means my mom did not scold me.
(iii) My mom scolded me but I still did not hide behind my dad, means I complained to my grandma.
(iv) My mom scolded me but I did not complain to my grandma, means that I hid behind my dad.

Choice (B)

Questions numbered 3 and 7: These questions can be solved in the same way as questions numbered 1 and 2 are solved.

4.

p q

If [it is very hot outside,] then [I will carry on onion with me

r

and [I will return home by lunch time.]

Statement
If p, then q and r

Conclusions
(i) $p \Rightarrow q$ and r (ii) $\sim q$ or $\sim r \Rightarrow \sim p$
(iii) $\sim q \,\&\, r \Rightarrow \sim p$ (iv) $q \,\&\, \sim r \Rightarrow \sim p$
(v) $\sim q \,\&\, \sim r \Rightarrow \sim p$

Conclusions:
(i) It is very hot outside, that means I will carry an onion with me and I will return home by lunch time.
(ii) I will not carry an onion with me or I will not return home by lunch time, that means it is not very hot outside.
(iii) I will not carry on an onion with me but I will return home by lunch time, means it is very hot outside.
(iv) I will carry an onion with me but I will not return home by lunch time, means it is not very hot outside.
(v) I will not carry an onion with me and I will not return home by lunch time, means it is not very hot outside.

Choice (A)

Question 5: This can be solved in the same way as question 4 is solved.

6.

p q

If [tea is not hot], then [I will not go to school]

r

nor [will I have dinner.]

Statement:
If p, then q and r
Note: "nor" is same as "and".
So question 26 is similar to question 24.

Choice (D)

8.

p

Unless [we win the Assembly elections,]

q

[we will lose the Rajya Sabha elections] and

r

[the presidential elections.]

Statements
Unless p, q and r

Conclusions
(i) $\sim p \Rightarrow q$ and r (ii) $\sim q$ or $\sim r \Rightarrow p$
(iii) $\sim q \,\&\, r \Rightarrow p$ (iv) $q \,\&\, \sim r \Rightarrow p$
(v) $\sim q \,\&\, \sim r \Rightarrow p$

Conclusions

(i) We did not win the Assembly elections, means that we lost the Rajya Sabha elections and the Presidential elections.
(ii) We did not lose the Rajya Sabha elections or we did not lose the Presidential elections, means that we won the Assembly elections.
(iii) We did not lose the Rajya Sabha elections but lost the Presidential elections, means that we won the Assembly elections.
(iv) We lost the Rajya Sabha elections but did not lose the Presidential elections, means that we won the Assembly elections.
(v) We did not lose the Rajya Sabha elections and did not lose the Presidential elections, means that we won the Assembly elections.

Choice (D)

Questions 9 and 10: These questions can be solved in the same way as question 8 is solved.

Solutions for questions 11 to 13:

11.

q

[Harish will get through the only interview] if

p

[he is thorough with the basics.]

Implications:

(i) $p \Rightarrow q$ (ii) $\sim q \Rightarrow \sim p$

Choice (C) follows (ii). Choice (C)

12.

q

[Either Pak or China attacks India,] only if

p

[India supports Russia and USA.]

Implications:

(i) $q \Rightarrow p$ (ii) $\sim p \Rightarrow \sim q$

The first choice follows the first implication.

Choice (A)

13.

q

[I will neither talk to you nor play with you,] unless

p

[you apologize to me.]

Implications:

(i) $\sim p \Rightarrow q$
(ii) $\sim q \Rightarrow p$

Choice (A) follows (ii). Choice (A)

Solutions for questions 14 and 15:

14. The given statement is of the form, p or q i.e.

Either [Rajeev is a genius] (p) or [he cheated in the exam.] (q)

The possible implications are:

(i) $\sim p \Rightarrow q$
(ii) $\sim q \Rightarrow p$
i.e. ca or db Choice (D)

15. The given statement is of the form, unless p, then q i.e.

Unless [the politician took money] (p), [he is not good enough.] (q)

The possible implications are:

(i) $\sim p \Rightarrow q$
(ii) $\sim q = p$
i.e. cb and da Choice (D)

Solutions for questions 16 to 20:

16. [Sravan will go to the movie,] (q) if [his parents are not with him] (p)

Statement : q, if p
Negation : p and ~q i.e., Sravan's parents are not with him and he did not go to the movie. Choice (C)

17. [Ramesh works very hard] (q) whenever [there is an exam] (p)

Statement : q, whenever p
Negation : p and ~q i.e.
There is an exam and Ramesh did not work hard.
Choice (C)

18. Either [it is a Flying Saucer] (q) or [the person is not telling the truth] (p)

Statement : Either p or q
Negation : ~p and ~q i.e.
It is not a Flying Saucer and the person is telling the truth.
Choice (B)

19. [Sachin scores a century] (q), unless [he is paired with the Captain] (p)

Statement : p unless q
Negation : ~p and ~q i.e.,
Sachin did not score a century and he is not paired with the Captain. Choice (D)

20. [Bond will buy the car] (q) only if [it is the costliest] (p), [fastest] (r)

Statement: p only if (q and r) i.e., $p \Rightarrow q$ and r
Negation: p and ~(q and r) $\Rightarrow$ p and (~q or ~r)

i.e., Bond bought the car and it is not the costliest or it is not the fastest. Choice (B)

Solutions for questions 21 to 23:

21. The statement is in the form of if p, then q.
The implications are
(i) $p \Rightarrow q$
(ii) $\sim q \Rightarrow \sim p$
it can be ac or db. Choice (D)

22. The statement is in the form of q, only if p.

Implications:
(i) $q \Rightarrow p$
(ii) $\sim p \Rightarrow \sim q$

it can be ac or db Choice (D)

23. The statement: whenever p, then q.

Implications:
(i) $p \Rightarrow q$
(ii) $\sim q \Rightarrow \sim p$

It can be ac or db. Choice (A)

Solutions for questions 24 and 25:

24. The chief guest will come on time = q
if
the fog does not affect the flight timings = p.
The implications of above statements are
(i) $p \Rightarrow q$
(ii) $\sim q \Rightarrow \sim p$
Only if
the chief guest comes = q
then the meeting be started = r.
The implications of above statements are
(i) $r \Rightarrow q$
(ii) $\sim q \Rightarrow \sim r$
implications with respect to q is not possible here.
Choice (D)

25. Unless
the coding is done = p
the software project cannot be completed = q.
The implications of above statements are
(i) $\sim p \Rightarrow q$
(ii) $\sim q \Rightarrow p$
If
the company does not meet the project completion dead line = q,
the team working on it employees will be fired = r.
The implications of above statements are
(iii) $q \Rightarrow r$
(iv) $\sim r \Rightarrow \sim q$

the given statement is "the team working on the project are not fired "$\Rightarrow$ ~ r.

From (iv) ~ r $\Rightarrow$ ~ q and from (ii) ~ q $\Rightarrow$ p

i.e., ~ r $\Rightarrow$ p "the coding is done". Choice (A)

Solutions for questions 26 to 30:

26. The statement is in the form of if p, then q.
Negation:p and ~ q or ~ q and p. Choice (C)

27. The responsibility is higher = p
but it is manageable = q.
Statement: p and q.
Negation: "~ p or ~ q" or "~q or ~p". Choice (A)

28. unless
Ravi practices the study material = p
he cannot pass in the qualifying exam = q.
Statement: unless p, q.
Negation: ~ p and ~ q or ~q and ~p. Choice (B)

29. Meena either
reads the novel=p
or
watches the movie=q.
Statement:either p or q.
Negation: ~ p and ~ q or ~q and ~p. Choice (D)

30. Unless
party gets the majority=p
it cannot form a government=q.
Statement:unless p, q.
Negation: ~ p and ~ q or ~q and ~p. Choice (B)

Chapter – 12
(All areas)

Exercise – 12(a)

Solutions for questions 1 to 15:

1. It is given that 3 persons sit on chairs and 3 sit on benches. A and D sit on benches and B and F sit on the same type of furniture, so B and F are on chairs. As it is given that C cannot sit on the same type of furniture as B and F are sitting, so E, B and F will occupy the three chairs.
If all the given data is considered, then the seating arrangement can be as follows.

Chairs	**B F E**
Benches	A D C

Hence, Choice (C) Choice (C)

2. It is given that A is greater than C and less than E. B is greater than D but not less than E, that means B may be greater than or equal to E. So, the order of greater to smaller, can be as follows:

1	2	3	4	5
B	E	A	C	-
E	A	C	-	-

Position of D is not clear, but it is less than B. B can be the greatest or B and E may be equal. Among the choices, either B or E is the greatest. Choice (D)

3. The network is as follows
B > C, D > B or E which can be drawn as
D > B > C
E can be placed anywhere after D. But in any case B takes the problem before C and now E sends it to B. So B sends it to C so that C sends it to A. So the network is as follows
D > E > B > C > A. Choice (B)

4. Let us denote the conditions in a short form P ≠ B and D, S ≠ A and C. Hence, the children that can go to school are shown below as per the given conditions

Schools –	A	B	C	D
Children –	P,Q,R	Q,R,S	P,Q,R	Q,R,S

Both Q and R can go to any school as per the possibilities shown above.

Alternative solution:
In the question, some constraints are given for P & S, whereas there are no constraints for Q & R. So by observation, Q & R can go to any of the schools.
Choice (D)

5. Let us use the first letter of every name. It is given that A and B are children, C and D are men, E, F and G are women.

Now, only A sits between G and E,
i.e., in order of GAE or EAG, whereas C and D have only one child between them. So B must be the child between C and D and the order can be CBD or DBC. E sits to the immediate left of C. So the order is GAECBD.
Hence F must be at the extreme right end of the row, as no two females are together and the final order is as follows.

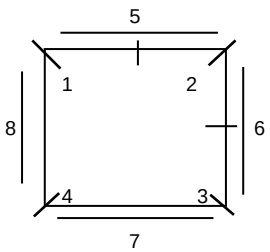
	Ch ↓		Ch ↓			
G ↓	A	E ↓	C ↓	B	D ↓	F ↓
Fe		Fe	Ma		Ma	Fe

Ch = Children
Fe = Female
Ma = Male in the above table
So G (Ganga) is at the extreme left end of the row.
Choice (A)

6. One lawyer and two doctors are already selected, hence two more persons have to be selected from those remaining. Now to make the selection of required five, the two engineers must be selected. Choice (B)

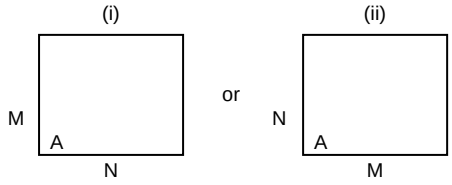
7. The number of five rupee notes and ten-rupee notes is not given, but there are four twenty-rupee notes along with some five rupee notes and some ten-rupee notes which are distributed among three students. As there are four twenty-rupee notes, one will get at least two twenty-rupee notes. Hence, the least amount one will have is forty rupees. Hence, total amount is 120.
₹20 × 4 notes
₹5 × 2 notes
₹10 × 3 notes
Hence, there are nine notes. Choice (C)

8. Four friends M, N, O and P are sitting at four tables placed in the form of a square. A, B, C and D sit in the corner places. The grid formed is as shown below.

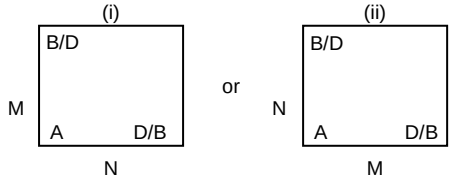


Now A, B, C and D will sit in positions 1, 2, 3, and 4 whereas M, N, O and P will sit in positions 5, 6, 7 and 8 not necessarily in that order.

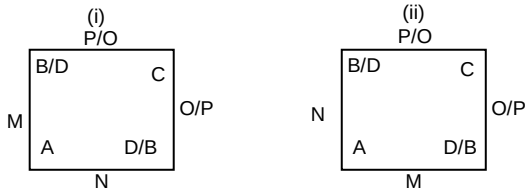
A sits at the corner between M and N as shown below.



Now B and D are opposite to each other so it will be as follows.

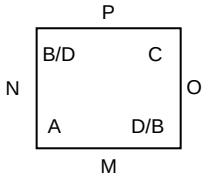


C sits between O and P, so the positions are as follows.



As P is to the immediate left of N, the arrangement will be as follows.

Final arrangement



All the pairs in all the choices are opposite to each other except M and O. Choice (D)

9. A, B, C are three films. P, Q, R are three theatres. Each theatre exhibits all the three films. The following things are already known.

Theatre	P	Q	R
I slot	–	B	–
II slot	–	–	–
III slot	C	–	–

Q exhibits B in slot I.
P exhibits C in slot III. P must exhibit A in the first slot. R must exhibit C in the first slot.
Hence, the order must be as follows.

Theatres

Slots	P	Q	R
I	A	B	C
II	B	C	A
III	C	A	B

So, P must screen A in slot I. Otherwise, the order will not be perfect. P, Q, R have to screen A, B, C in slot I in that order only.
Choice (A) is FALSE. R exhibits A in the 2nd slot is TRUE.
Choice (B) and (D) are also FALSE. Choice (C)

10. Let us write the conditions in short - (1), Jagat's house is Green and the shortest of all. As (2), Munni's house is shorter than Lavanya's house and Lavanya's house is neither Blue nor White, but the building in which Lavanya's house is located is taller than the building in which Rishi's house is. Lavanya's house may be Red or Orange. As (3), the colour of one building starts with the same letter as its colour. So it must be Rishi and Red. Rishi's house is the 2nd tallest building of all. In terms of heights of the building, we know that Lavanya's building is taller than that of Rishi, which is the 2nd tallest. So, Lavanya's house is the tallest building. As Rishi's house is Red, Lavanya's house is Orange and is the tallest building. Choice (C)

11. There are 6 pencils, 6 pens and 6 books.
Each boy gets at least one of the three items. So, let us assume that

	Boy 1	Boy 2	Boy 3	Total
Pens	3	2	1	6
Pencils	2	3	2	7
Books	1	1	3	5
Total	6	6	6	18

Grand Total = 6 + 6 + 6 = 18
There are many other ways of distribution like:

	Boy 1	Boy 2	Boy 3
Pens	1	2	3
Pencils	1	1	4
Books	3	1	1

In none of these ways except the first case, the conditions are

(i) The totals are the same.
(ii) The number of pens, pencils, books that each boy gets is not the same, shall be violated. So choice (D) is TRUE.

According to Choice (D) the distribution must be as follows.

	Boy 1	Boy 2	Boy 3	Total
Pens	1	2	3	6
Pencils	2	3	1	6
Books	3	1	2	6
Total	6	6	6	18

Alternate way of getting the answer through choices
Choice (A) Number of pencils = Number of pens = Number of books = 2 is not possible as their numbers cannot be the same.
For the same reason, Choice (B) is wrong.
Each boy cannot get 3 pens as there are only 6 pens. So, choice (C) is also wrong. Choice (D)

12. Let us analyse the complete data

Volley Ball	Basket Ball	Foot Ball	Hand Ball
P Q	V W	R S	T U

All sit for a photo session, means that they are facing us. So right implies our left and left implies our right. T is to the immediate right of W i.e. TW. Either P or Q are 5th from the left end of the row

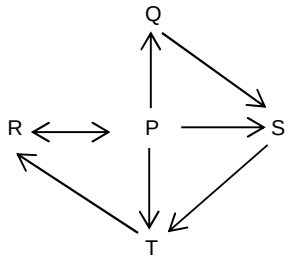
i.e. _ _ _ P/Q _ _ _ _ .
Right end 1 2 3 4 5 6 7 8 left end

But P is at one of the extremes, so Q alone is in seat number 4. No one is to the left of R, so R is in seat number 8. Hence U must be in seat number 5 as there are two people between R and U, but T and W are not between R and U so they must be in seats 2 and 3 in any order. So the arrangement is as follows.

P	T/W	W/T	Q	U	S/V	V/S	R
1	2	3	4	5	6	7	8

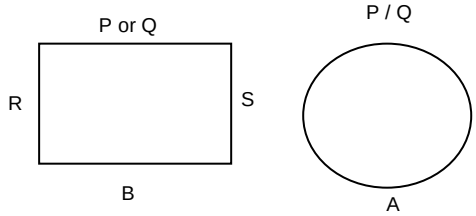
The number of persons sitting between U and P is three. R and Q also have three persons sitting between them. Choice (D)

13. If we consider the data carefully, then we get the following diagram.



Now if P wants to send his file to R then he can send it in four possible ways as listed below starting from P through R.
(i) PR
(ii) PTR
(iii) PSTR
(iv) PQSTR Choice (C)

14. A, B, C, D and P, Q, R, S are eight persons sitting four each at two tables — one is a round table and the other is square shaped. P and Q do not sit at the same table.
A and B do not sit at the same table.
B sits between R and S at the square table



A must be at the round table as B is at the square table. If P is at the round table, Q is at the square table and opposite B or if P is at the square table opposite B, then Q must be at the round table as P and Q do not sit at the same table.
So, either P or Q can be opposite B. Choice (C)

15. Ishan gets more marks than Kailash i.e. I > K and Jaikee gets less marks than Ganesh i.e. G > J, whereas Hitesh also gets more marks than Kailash and Jaikee i.e, H > J and H > G so H > K. So, either Jaikee or Kailash can get the lowest marks of all. Choice (D)

Solutions for questions 16 to 19:

Let us analyse the data. It is given that P, Q, R, S and T stand in a row in such a way that R stands next to neither P nor T, whereas P and T have three persons between them. So, the arrangement can be as follows
⇒

i	P – R – T
	or
ii	T – R – P

whereas Q and S are in the vacant seats. (in any order)

16. R is at the exact middle of the row. Choice (D)

17. As it is clear that the order of the people as they stand is P – R – T (or) T – R – P with Q and S in the gaps. The extreme ends are occupied by P and T. Choice (D)

18. As P stands at the extreme left, the order is as follows.

1	2	3	4	5
P		R		T

If S is in space 2 and Q is in space 4, and there is no one between P and S and also between Q and T. If S is in space 4 and Q is in space 2, and there will be 2 people between P and S and also between Q and T.
Choice (D)

19. If T stands to the immediate right of S, then the order of arrangement is PQRST. So P must be at the extreme left only. Choice (B)

Solutions for questions 20 to 23:

Let the names of the six persons be represented by A, B, C, D, E and F.
Age: (i) B > F > D > A (from 1)
(oldest) (youngest)
(ii) B > C > E (from 4)
Height: (i) A > B > C (from 1)
(ii) D > F > A (from 3)
(iii) C > E (from 4)
⇒ D > F > A > B > C > E
Weight: (i) B > D (from 1)
(ii) C > F > E (from 2)
(iii) A is the heaviest person. (from 3)
(iv) A > D > C (from 4)
⇒ A > B > D > C > F > E

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

20. Dheeraj is the tallest person. Choice (A)

21. Andrews is the youngest person but in choice (C), it can be observed that Elantra is being mentioned as the youngest person. (which is incorrect) All the other options satisfy the given conditions. Choice (C)

22. Dheeraj is the only person heavier as well as taller than Florence. Since, Dheeraj is not older than Florence, this means that no single person is ranked higher than Florence in all of the three parameters i.e. age, height and weight.
Choice (B)

23. Elantra would be ranked 2nd or 3rd in age, since at most two persons are older than Elantra.
Since Christopher is older than Elantra, Elantra cannot be ranked 2nd.
∴She is ranked 3rd.
Thus we get that Florence is ranked 4th while Dheeraj is ranked 5th.
Thus, only one person i.e. Andrews is younger than Dheeraj. Choice (B)

Solutions for questions 24 to 27:

(1) Orange ⇒ – (Watermelon)
Watermelon ⇒ – (Orange) (– implies not selected)
(2) Banana ⇒ Apple
– (Apple) ⇒ – (Banana)
Apple ⇒ Banana
– (Banana) ⇒ – (Apple)
(3) Watermelon ⇒ Papaya
– (Papaya) ⇒ – (Watermelon)
Papaya ⇒ Watermelon
– (Watermelon) ⇒ – (Papaya)
(4) Exactly one of Mango and Blackberry is selected.

24. Orange ⇒ –(Watermelon)
–(Watermelon) ⇒ – Papaya
Here, Watermelon and Papaya are not selected.
Also, exactly one out Mango and Blackberry is not selected.
If Apple is not selected, then Banana is not selected. Thus a total of 5 fruits will not be selected. Since, six fruits are to be selected, this implies Apple must be selected.
Choice (A)

25. The following fruits are not selected.
(i) Guava (ii) Grapes
(iii) Exactly one of Mango and Blackberry
(iv) Exactly one of Orange and Watermelon.
(v) Exactly one of Orange and Papaya.
Thus, Apple, Banana, Watermelon are definitely selected.
Choice (D)

26. If Apple is selected, Banana, should be selected which is not the case in choice (C). Choice (C)

27. Choice (A)
If Orange is selected, then Watermelon must not be selected.
If Watermelon is not selected then Papaya is not selected.
If Mango is selected then Blackberry is not selected.
Fruits which are not selected:
(i) Watermelon
(ii) Papaya
(iii) Blackberry
(iv) either Grapes or Guavas.

Hence, Orange, Mango, Banana and Apple are selected.
Two out of Grapes, Guava and Pineapple are selected.
Choice (B)
– (Watermelon) $\Rightarrow$ – (Papaya)
– (Blackberry) $\Rightarrow$ Mango
Fourth fruit to be selected could be Grapes or Guavas or Oranges or Pineapple.
Choice (C)
If Apple is not selected, then Banana is not selected.
– (Apple) $\Rightarrow$ – (Banana)
– (Blackberry) $\Rightarrow$ Mango
Watermelon must be selected (otherwise Papaya will not be selected and then five fruits won't be selected.
Hence, Watermelon is selected and Orange is not selected.
Thus, choice (C) confirms the selection of fruits.
Choice (C)

Solutions for questions 28 to 30:

28. Here case (i) and case (iv) will prevail.
First way
Binod $\rightarrow$ (I, T)
Amitabh $\rightarrow$ (J, S, R, Z)
Second way
Binod $\rightarrow$ (I, J)
Amitabh $\rightarrow$ (T, S, R, Z)
There are two ways. Choice (A)

29. Amitabh $\rightarrow$ (J), Binod $\rightarrow$ (S)
First way
Amitabh $\rightarrow$ (J, I, R, Z)
Binod $\rightarrow$ (T, S)
Second way
Amitabh $\rightarrow$ (J, I)
Binod $\rightarrow$ (T, S, R, Z)
There are two ways. Choice (A)

30. It can be observed that in (A), Jeetendra should not be with Tapan;
in (B), Shahrukh should not be with Irfan.
Choice (C) does not violate any condition. Choice (C)

Exercise – 12(b)

Solutions for questions 1 to 15:

1. The Green box has the maximum number of chocolates out of 10. Red box has the least number of chocolates and each box has at least one chocolate and no two boxes have same number of chocolates. So the possible combination of chocolates can only be of 7, 2 and 1 i.e., green box will have seven chocolates in it, the blue box will have two chocolates in it and the red box will have one chocolate in it.

The boxes and Toys must be as follows:		
Green Box	Blue Box	Red Box
Blue Toy	Red Toy	Green Toy
Red Toy	Green Toy	Blue Toy

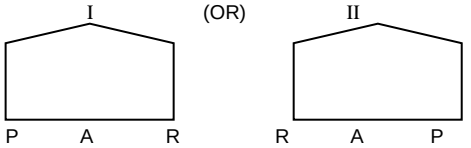
Choice (D)

2. Let us write all the given conditions in short.
S is of White colour.
P is of Green colour.
T is not a pen of Red colour.
T is the costliest of all pens. So T – – – –
Q is costlier than the Green pen, i.e., Q > P
Q is cheaper than the pen of Yellow colour Yellow > Q i.e. Yellow > Q > P
Yellow coloured pen is cheaper than white pen and T is the costliest. $\therefore$ The order is

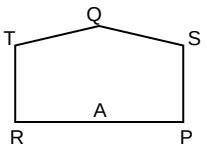
T	S	R	Q	P
Blue	White	Yellow	Orange	Green
or			or	
Orange			Blue	
P is Green.			or	
Choice (A) is TRUE			Red	
Choice (B) is TRUE				
Choice (C) is FALSE				
Choice (D) is TRUE.				

Choice (C)

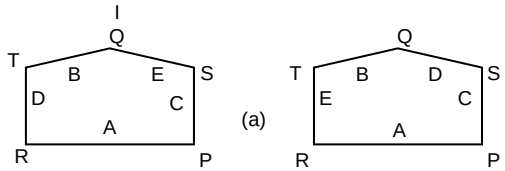
3. A is along the side joining the corners P and R as shown below.



But S is to the immediate right of P, and R is between P and T. So, arrangement I is not possible.

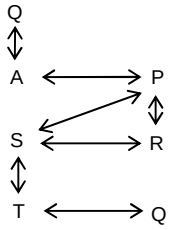


Chair B is along QT. D and E are on either side of B. So, again two arrangements are possible.



So chair C has only P and S at its adjacent corners.
Choice (D)

4. Let us draw the diagram.



There are 6 places and $^6C_2$ ways to connect them i.e., 15 ways. Given pairs are 7. Therefore 8 more are required. So, the pairs which are still to be connected are AS, TR, RQ, AR, AT, PT, PQ and SQ i.e., 8 pairs, which is not present among the choices. Choice (D)

5. The executive wears a shirt of different colour and trousers of a different colour on four days and of the same colour on one day i.e. Blue shirt and Blue trousers. He wears a Green shirt and Black trousers on Tuesday. On Friday, he wears a White and Orange combination. On Thursdays he wears a Red shirt. On Wednesday, he wears Silver coloured trousers. So, as per the data it is derived that

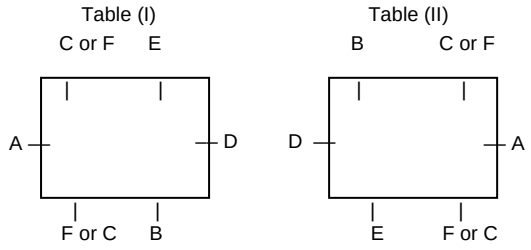
Monday —
Tuesday — Green shirt, Black trousers
Friday — White shirt, Orange trousers
Thursday — Red shirt –
Wednesday — Silver coloured trousers

So only on Mondays he can wear Blue shirt and Blue trousers. Choice (B)

6. In terms of heights, it is known that
Raj is taller than Anil, i.e. Raj > Anil, who is shorter than Raman i.e. Raman > Anil. So Anil is shorter than both Raj and Raman whereas in terms of cleverness, Anil is the cleverest of all. Raj is cleverer than Raman. Venu is cleverer than Raj but less cleverer than Sunil.
Anil > Sunil > Venu > Raj > Raman
Choice (A) states that Venu is shorter than Anil. It may be true or may not be true.
Choice (B) states that Raman is cleverer than Raj. It is false.
Choice (C) states that Sunil is the 2nd tallest. It is true.
Choice (D) states that Anil is the only person cleverer than Sunil. It is true. Choice (B)

7. The carton of Computer is to the immediate left of the carton of Fridge, so these must be in the order of Computer, Fridge. The carton of the Music system is kept at the left extreme end with one carton between it and the TV carton. i.e. Music system – TV, Computer, Fridge must be the order with the blank space occupied by the carton of Radio. Therefore, the carton of Computer is to the immediate right of the carton of TV. Choice (B)

8. Bittu sits to the immediate left of Dinesh and opposite Eshan. Dinesh is alone in a chair on one side. Charli and Farhan are opposite each other.
The arrangement is as follows:
Let us use the first letters of all the names in the diagrams.



In any case Anuj must be opposite Dinesh. Choice (A)

9. Inspection of B is not followed by inspection of C and inspection of A is not followed by inspection of E. So in choices (A), (B) and (C) the above condition (s) is (are) violated. D, C, B, E, A is one of the correct routes of his inspection. Choice (D)

10. It is given that R is taller than only four persons so R must be at the 3rd place.

1	2	3	4	5	6	7
		R				

Further it is given that P is < Q, but > T, T > U but < V, V < Q, Q < S. That means Q > P > T > U; V > T > U; Q > V; and S > Q. So final arrangement is as follows.

S > Q > P > T >U but Q > V and V > T
So T may be anywhere between the order of Q and T.
So either V is taller than P or shorter than P. But S is the tallest.

1	2	3	4	5	6	7
S	Q	R	V	P	T	U
S	Q	R	P	V	T	U

Choice (C)

11. A, B and C are the three theatres. There are 9 kinds of films – Romance, Thriller, Documentary, Drama, Horror, Children, Nature, Adventure and Cartoon. Each theatre exhibits only 3 different kinds of films.
1. Documentary film and children's film should be exhibited by the same theatre.
2. Romance and adventure films are exhibited by different theaters and Nature film is not exhibited by those theatres.
3. An adventure film follows a cartoon film.
4. A Romance film precedes a horror film.

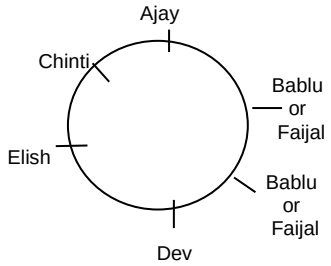
Film combinations are as follows:

	Sets		
	I	II	III
Films	Documentary film Children's film Nature film	Romance film Horror Film	Cartoon film Adventure film

Thriller and Drama may go into set II or set III, each into one set. So, Thriller, Horror and Romance can be screened together. Cartoon, Adventure and Drama can be screened together. Children, Nature and Documentary can be screened together. Thriller, Drama and Horror cannot be screened together as a Romance film should precede a horror film. Choice (D)

12. Each one of the five rooms A, B, C, D and E is occupied by exactly one of the five persons P, Q, R, S and T. A does not have Q or T. So, A may have any one of P, R and S in it, whereas B may have P or S (or) Room C may have P or S. So, Room A must have R in it. Choice (C)

13. Ajay is opposite Dev.
Chinti is to the immediate right of Ajay and next to Elish. So the arrangement is as follows:



Bablu and Faijal are not opposite each other. So choice (D) is false. Choice (D)

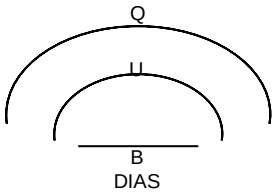
14. A, B, C, D and E are five apartments. Each pair has a path between them. The pairs may be AB, AC, AD, AE, BC, BD, BE, CD, CE, DE. So, there are altogether 10 paths.
i.e. $^5C_2 = \frac{5\times4}{2\times1} = 10$. Choice (B)

15. It is clear that Doctor is not from Hotel or Club, Engineer is from Hotel. So Lawyer must be from club. So, the combination is as follows.

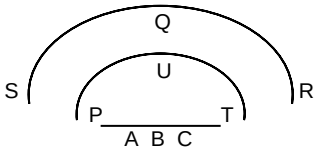
Engineer – Hotel
Doctor – Theatre
Lawyer – Club
So, Lawyer has not come from Theatre or Hotel.
Choice (A)

Solutions for questions 16 to 18:

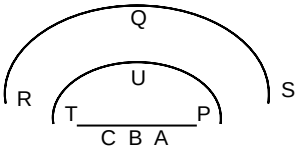
The entire seating arrangement will look like as follows.



Q sits behind U, who is opposite B on the dais.
R is at one end of the second semicircular table.
P and R are not at the same semicircular table.
So P must be with U, and S sits behind P, who faces A.
Hence, the arrangement will be as shown below.
Arrangement I



Arrangement II

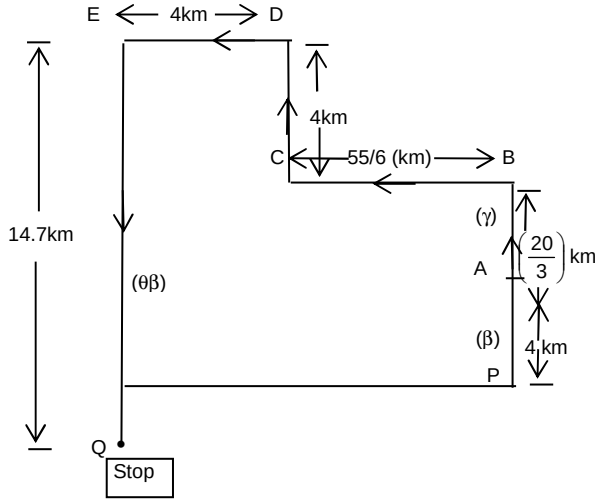


16. C faces T. Choice (A)

17. S, Q, R are at the second table.
P, U, T are at the first Table. Choice (A)

18. The order of A, B, C on the dais is not clear from the data.
Only thing known is B is in the middle seat on the dais.
Choice (D)

Solutions for questions19 to 22:



Instructions	Time (in hrs)	Distance (in km)
β	(40/60) = 2/3	(40/60) (6) = 4
γ	(50/60) = 5/6	(5/6) (8) = 20/3
$\theta\alpha$	(110/60) = 11/6	(11/6) (5) = 55/6
$\in\beta$	(40/60) = 2/3	(2/3) (6) = 4
$\theta\gamma$	0.5	(0.5) (8) = 4
$\theta\beta$	2.45	(2.45) (6) = 14.7

19. The forward vertical distance covered by the robot

$= 4 + \frac{20}{3} + 4$

= 4 + 6.66 + 4 = 14.66 km.
The vertical distance covered by the robot in backward direction = 14.7 km.
The forward and backward vertical distances are almost equal.
Hence, the shortest distance between P and Q is the horizontal distance

i.e., $4 + \frac{55}{6}$ = 4 + 9.1 = 13.1 km.

i.e., approximately 13 km. Choice (A)

20. Total distance (in km) travelled by the robot in the first 90 minutes = 4 + 20/3 = 32/3
Total distance (in km) travelled by the Robot in the next 10 minutes = (10/60) (5) = 5/6

Average speed = $\left(\frac{32}{3} + \frac{5}{6}\right) \times \frac{60}{100}$ = 6.9 kmph

Choice (B)

21. Overall approximate average speed (in kmph)

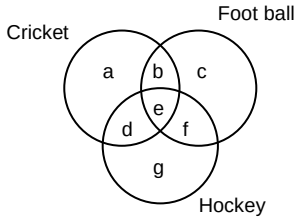
$= \frac{4 + \left(\frac{20}{3}\right) + \left(\frac{55}{6}\right) + 4 + 4 + 14.7}{\left(\frac{417}{60}\right)}$

$= \frac{4+6.67+9.17+4+4+14.7}{6.95} = 6.12 \cong 6$

Choice (C)

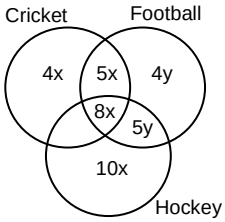
22. From the diagram, travel towards Q is exactly in opposite direction of the starting direction. Hence, the initial direction is East. Choice (B)

Solutions for questions 23 to 26:



(i) $b = \frac{1}{2} g$
$\Rightarrow b : g = 1 : 2$
(ii) $a = e/2$
(iii) $c : f = 4 : 5$
(iv) $g : a = 5 : 2$
$\Rightarrow 4b = 5a \Rightarrow b = 1.25a$

Let g = 10x, then



23. Given a = c i.e. 4x = 4y
$\Rightarrow x = y = k$
$d = \frac{1}{9}(36k) = 4k$
$N = 40\ k$
$\frac{N}{a} = \frac{40k}{4k} = \frac{10}{1}$ Choice (A)

24. b is a perfect cube.
since a = 4b/5
'b' must be divisible by 5, possible values of b = 125, 1000.
If b = 1000 then a = 800
$\Rightarrow$ N > 2000 (which is not possible)
Hence b < 1000
Thus, we are left with only one possible solution of b = 125.
$\Rightarrow$ a = 100. Choice (B)

25. g is a perfect square and g is divisible by 5 as well as 2.
Possible values of g = 100, 400, 900,…… and equivalent values of b, a, …..

	g	b	a	e
(i)	100	50	40	80
(ii)	400	200	160	320
(iii)	900	450	360	720
(iv)	1600	800	640	

In case (iii) g + b + a + e > 2000. So, $e \neq 720$.

Choice (B)

26. Using sol. (37) case (ii) prevails where, g = 400.

Choice (C)

Solutions for questions 27 to 30:

If M had 9 apples, then he would not have asked the question because no one else could have more than 9 apples.
Thus, M had 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 apples.
If N had 1 apple, then he would have said, 'No'. But his answer was not "No".
Hence, N had 2 to 8 apples.
Similarly, it can be deducted, that O had 3 to 8 apples.
P had 4 to 8 apples.
Q had 5 to 8 apples.
R had 6 to 8 apples.

Person	Range of numbers
M	1 to 8
N	2 to 8
O	3 to 8
P	4 to 8
Q	5 to 8
R	6 to 8

Minimum number of apples possessed by M through R = 1 + 2 + …..6 = 21
Thus, S had exactly one apple

(Person)	(Number of apples)
M	1
N	2
O	3
P	4
Q	5
R	6
S	1

	22

27. R had the maximum number of apples. Choice (A)

28. Both M and S had exactly one apple each. Choice (D)

29. Q had exactly 5 apples. Choice (D)

30. Number of apples with O and P = 7. Choice (A)

Exercise – 12(c)

Solutions for questions 1 to 4:

Each mill has a different down time and each mill has at least four hours of up time in a day. Thus, maximum downtime for any mill is 5 hours so that it has up time of one hour for six hours.

From the given information, the difference (in hours) between the two different up times of each mill are tabulated as below:

Mill	Difference in hours between the known up-times.	Possible frequency of up-times (Every n^{th} hour)
P	20 hours	2^{nd}, 4^{th}, 5^{th}
Q	44 hours	2^{nd},4^{th}
R	48 hours	2^{nd}, 3^{rd}, 4^{th}, 6^{th}
S	42 hours	2^{nd}, 3^{rd}, 6^{th}
T	21 hours	3^{rd}

Every mill has a different downtime implies the possible downtimes are 1, 2, 3, 4 and 5 hours.
Thus mill T runs every 3^{rd} hour $\Rightarrow$ downtime = 2 hours.
Only P can run every 5^{th} hour $\Rightarrow$down time = 4 hours.

Thus possible down times for the mills are as follows:

Mill	Possible frequency of up-times (Every n^{th} hour)	
P	5^{th}	
Q	2^{nd},4^{th}	
R	2^{nd}, 4^{th}, 6^{th}	
S	2^{nd}, 6^{th}	
T	3^{rd}	

1. Either R or S can have highest capacity based on the possibility that both can have highest downtime.
Choice (D)

2. The second highest downtime is four hours. Mill P has the downtime of four hours. Choice (A)

3. If R is not of the lowest downtime but lesser than that of implies R runs every 4^{th} hour.
Thus, downtime of mill R is three hours. Choice (C)

4. If R has greater downtime than mill S, then mill S has to run every 2^{nd} hour. The only possibility is Q has to run every 4^{th} hour and R has to run every 6^{th} hour.
The frequencies of the mills P, Q, R, S and T will be once every 5^{th}, 4^{th}, 6^{th}, 2^{nd} and 3^{rd} hours respectively.

The same pattern repeats every 60 hours (LCM of 2,3,4,5 and 6). For this pattern to repeat in the first five hours of a shift, it repeats every 120 hours (LCM of 2, 3, 4, 5, 6 and 8) = once every 5 days but only in the third shift. Hence the pattern repeating in the first five hours of the day is not possible. Choice (D)

Solutions for questions 5 to 8:

The given information can be tabulated as below:

[Note: The subscript under the circuit name (A, B and C) is to differentiate the two tours in the same circuit that start on different days of the week.]

Day	Tour package	
	First day	Last day
Sunday	D	D, B
Monday	D	D
Tuesday	D	D, A_m, C_q
Wednesday	D, A_m, C_p	D, A_n
Thursday	D, A_n, B_x	D
Friday	D, B_y	D
Saturday	D, C_q	D, B_x, C_p

The subscript under the circuit name differentiates the two tours in the same circuit that start on different days.

5. Circuit A starts on two days, hence two cases arise:

Case (a)		Case (b)
A (Wednesday to Tuesday) 7 days.	A (Wednesday to Tuesday (7 days)	A (Thursday to Wednesday) 7 days
D Wednesday. (1 day)	C (Wednesday to Saturday) 4 days	B (Thursday to Saturday) 3 days
B (Thursday to Saturday) 3 days	D (Sunday) 1 day	D (Sunday) 1 day
Wait 3 days	Wait 3 days	Wait 2 days
C (Wednesday to Saturday) 4 days	B (Thursday to Saturday) 3 days	C (Wednesday to Saturday) 3 days
18 days	18 days	17 days

Alternate solution:

Starting with circuit A, it is clear that after taking two tours, one has to definitely wait (Wait period is from Sunday to Tuesday). This wait can be minimized if the daily trip is planned in one of these three days. Further, the tour after the wait has to be A or C which starts on a Wednesday. Since, we are starting with A, the last tour has to be C (for minimum wait). Because A ends on Tuesday or Wednesday, D shall not be immediately after A, thus in the order A, B, D and C, with A starting on Thursday, the tour can be completed in 17 days.
Choice (B)

6. If we observe the given information, out of all the tours that end and start on two consecutive days, all the tours are available between Tuesday and Thursday. C ends on Tuesday, A starts on Wednesday, which ends on Tuesday, D ends on Wednesday and B starts on Thursday. Hence, the tour shall start with C_q which starts on a Saturday. Choice (A)

7. Only on a Monday, tourists of only one tour come to the office (either start or end the tour). Choice (C)

8. A(Wednesday – Tuesday) + B(Thursday – Saturday) + D (Monday) + C (Wednesday – Saturday).
The tour shall start on a Wednesday. Choice (D)

Solutions for questions 9 to 12:

The kid receives ₹5 per day, $\Rightarrow$ earns ₹35 per week, but earns a maximum of ₹25 in the first five days. Implies spends a maximum of ₹25 in the first five days $\Rightarrow$ purchases only two items in the first week.

The amount available by next Monday is the sum of savings during first five days and amount earned during weekend.
The kid earns ₹10 on weekend which is available for next Monday. Thus from the second week onwards, he can purchase all the items at least once.
Amount available on second Monday will be among ₹15, or ₹20 or ₹10.
Whatever items the kid purchases in the first week, the total amount the kid can spend up to the second week is income of the first week and first five days of the second week. i.e., ₹35 + ₹25 = ₹60.
By repeating the purchase of three items twice, the kid purchases all the items twice.

Starting the second week, in n weeks the kid purchases all the items at least n times and at most (n + k) times.
In order for the purchases to make a pattern,
n (35) = (n + k) (30)
$\Rightarrow$ n = 6k.
$\Rightarrow$ for every 6 weeks, (k = 1), all the items would be purchased seven times.
Pastry = P = ₹15
Samosa = S = ₹10
Chocolate = C = ₹5

Week	Balance +income Weekday	Expenses	Weekend Income	Balance	Purchases
	A	B	C	A – B + C	
1	0+25	15+5 5 + 10	10	15 10 + 10 = 20	C, S
2	20 +25	15+5+10+15	10	0 + 10 = 10	P,C,S, P
3	10+25	5+10+15+5	10	0+10 = 10	C,S,P,C
4	10+25	10+15+5	10	5+10 = 15	S,P,C
5	15+25	10+15+5+10	10	0+10 = 10	S,P,C,S
6	10+25	15+5+10	10	5+10 = 15	P,C,S
7	15+25	15+5+10	10	10+10 = 20	P,C,S
8	20+25	15+5+10+15	10	0+10	P,C,S,P

9. From the above, given data is sufficient to determine that the pattern of the purchases is repetitive. Hence only II is true. Choice (B)

10. From the table, the maximum savings available on any Monday is ₹20, plus he would receive a pocket money of ₹5, thus the maximum amount available on any Monday = ₹25. Choice (C)

11. Given that the kid makes a purchase as soon as he accumulates sufficient money to make his next purchase as per the defined conditions.
With the new condition, the possible combinations in the five days of the week, for the kid to purchase the four items Chocolate (C), Fruit (F), Samosa (S) and Pastry (P) is:
F/C, S/P, C/F, __, P/S (No purchase on Thursday).
Only (D) is definitely true. Choice (D)

12. In the third week, opening balance = ₹10. Earns ₹25 during the five week days. Spends ₹35 during five days. And earns ₹10 during weekend.

The kid starts with a balance of ₹10 every week. The maximum amount the kid has on any Monday is ₹15.
Choice (A)

Solutions for questions 13 to 16:

Let us represent the persons name with A, B, C, D and E and also the fields to which each book belongs to A, B, C, D and E.

Person	Book
A	D/E
B	Criminology
C	Biotechnology
D	A/E
E	D/A

13. Annie exchanges with Dan and Dan exchanges with Engel so the book possessed by Annie goes to Engel. Hence, Annie purchased book related to Economics.
Don Purchased book related to Architecture and Engel purchased book related to Demographic. Choice (A)

14. Statement (A) is true.
Statement (B) is true.
Statement (C) is true.
Statement (D) is not necessarily true. Choice (D)

15. Condition (A) Annie and Engel books were interchanged. There can be two possibilities with this condition with Annie taking books related to Demography or Architecture.

Condition (B) states that neither Annie nor Engel possess books related to economics.

Since Annie and Engel did not get book related to economics that means Dan possessed the book related to economics, Annie passed the book related to Architecture and Engel possessed the book related to demographics.
Choice (B)

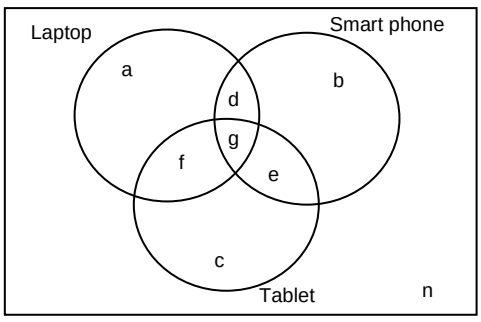
16. As condition (d) is not violated, the interchange was between any two among Annie, Dan and Engel. From the above table, and the possibility of interchange between any two among the three, six cases arise as shown below. The statements which are consistent in each of the case are listed accordingly.

Statements consistent			
	Interchange between		
Person = Book	A and D	D and E	A and E
A = D E = A D = E	a, d	a, b, c	b
A = E E = D D = A	b, d	a	a, b, c

From above table, in various cases pairs of statements ab, ac, ad, bc and bd are consistent simultaneously while only statements c and d are not consistent simultaneously in any case. Choice (C)

Solutions for questions 17 to 21:

The data given for 2015 can be represented as



From (2) and (3), there is no one who owned laptop and tablet only and ten households own all the three. (∴ g = 10)

From (1), exactly one (a + b + c) = 30 and exactly two (d + e + f) = 20. Hence, n = 15.

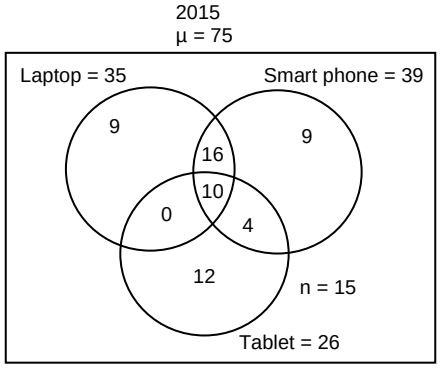
From (4), a = b = (g – 1) = 9. Hence, c = 12
Since f = 0, d + e = 20.
If e = k, then d = 20 – k

From (8), the number of households owning tablet must be an even number since f = 0, c = 12 and g = 10, e should also be even.

Lets us say e = 2k, then d = 20 – 2k

From (8), the number of households owning laptops increased by 60%. Hence it should be a multiple of 5 in 2015.

Thus, the conditions that the number of house holds that own laptop should be a multiple of 5 and the number of house holds owning tablets is an even number is possible only when k 2 or 7. If k = 2, the value for 2015 would be as follows.

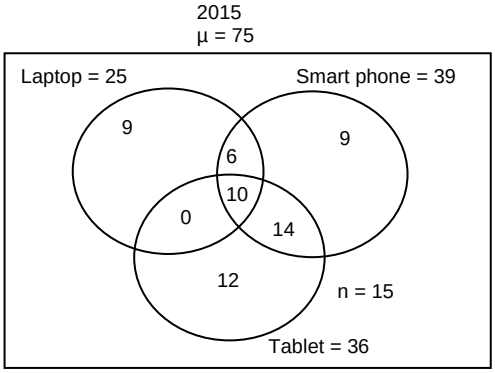


From (5), (6) and (7) for 2016
g = 30, exactly one (a + b + c) = 30 and exactly two (d + e + f) = 15. Hence, n = 0.

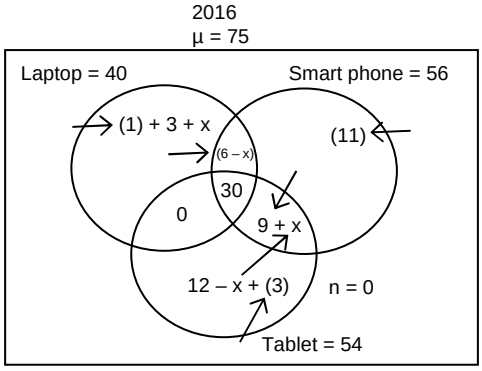
It is given that no one purchased more than one device.

Hence, the entire 20 i.e., exactly two of 2015 shifted to g in 2016. From (a), all those who owned only smart phone (9) of 2015 purchased tablets. Hence, 'e' for 2016 is atleast 9. Hence 'd' for 2016 should be atleast 6, comes from a of 2015. But the number of households owning laptop should be 160% of 35 i.e., 56. It means 17 should be added from a, which is not possible. Thus k cannot be 2. k must be 7.

Thus, the diagrams for 2015 and 2016 are as follows.



The arrows indicate the moment of households between regions.



The maximum value that 'x' can take is six.

17. The number of people owning laptops or tablets = 75 – (9 + 15) = 51. Ans: (51)

18. The increase/decrease in the number of smart phone owners is 17. Ans: (17)

19. The increase in the households that own only smart phones is 2. Ans: (2)

20. Only laptop and smart phone ~ tablet and smart phone in 2015 = 24 – 6 = 18
In 2016 = 39 + x – 6 + x = 33 + 2x.
$\Rightarrow$ minimum = 33
maximum = 45
it is definitely higher in 2016. Ans: (2016)

21. From the venn diagram, 6 – x + x = 6
$\therefore$ 6 households Ans: (6)

Solutions for questions 22 to 25:

22. A. $29 = 4 + 25 = (2 \times 2) + (2 \times 10) + (1 \times 5)$
Therefore possible
B. $31 = 6 + 25 = (3 \times 2) + (2 \times 10) + (1 \times 5)$
Therefore, possible
C. 47 = 40 + 7 or 35 + 12
Neither of which are possible. Choice (C)

23. X score 33 $\Rightarrow$ 25 + 8 = (1× 10) + (3 × 5) + (4 × 2) or $= (2 \times 10) + (1 \times 5) + (4 \times 2)$
All choices except (B) is not necessarily true.
Choice (B)

24. Max marks can be obtained as follows:

	Part I	Part II	Total
Rahul/Beena	3×2	4×10	46
Beena/Rahul	3×2	$3 \times 10 + 1 \times 5$	41

Minimum possible marks

	Part I	Part II	Total
Johan/Bijaya	5×2	2×5	20
Bijaya/Johan	4×2	3×5	23

Maximum difference = 87 – 43 = 44. Choice (D)

25. By scoring positive marks in six questions, each of U and V must score two marks each in two questions of part I. In the remaining four questions, a score of 10 or 5 or 2 is possible. For different marks possible for any of the questions, the difference in marks would be in multiples of ± (10 – 5) or ± (5 – 2) i.e., difference of ± 5 or ± 3 will be seen in their totals. To obtain minimum difference of '1', we have to check if the difference of 1 = + 5 – 3 – 3 or – 5 + 3 + 3 is possible.
The possible marks obtained by U and V in the remaining four questions are

	Case I	Case II	
U	(10 + 5 + 5 + 5)	10 + 5 + 2 + 2	15
V	(10 + 10 + 2 + 2)	(5 + 5 + 5 + 5)	18
difference	1	1	

The difference is 1. Choice (A)

Solutions for questions 26 to 30:

It is given that there are 24 textbooks distributed in four racks. Each rack containing a distinct even number of textbooks. From (2) and (3) it can be concluded that the number of books of Marketing = 12, HR = 6, Operations = 4 and Systems = 2. It is also given that the number of textbooks in each rack remained the same even after misplacement.

From (3), marketing rack has four textbooks from operations rack and the rest are from marketing rack only.

From (4) in HR rack, two books are of HR and the rest four are from a different rack. These textbooks have to be from marketing rack as systems rack has only two textbooks. This implies that the four books from HR rack are placed in operations rack. Thus, the present position is as follows.

Marketing: Marketing-8 and Operations-4
Operations: HR-4
HR: HR-2 and Marketing-4
Systems: Systems-2

26. None of the books related to operations was placed in Human resource. Ans (0)

27. Two textbooks related to systems were placed correctly. Ans: (2)

28. Four of the books related to Human Resource were in operating rack. Ans: (4)

29. Text books from systems rack are in system rack only. Choice (C)

30. No text book belonging to operations rack is placed in system rack. Ans: (0)