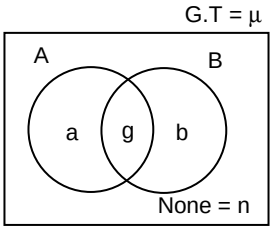
CHAPTER – 7

VENN DIAGRAMS

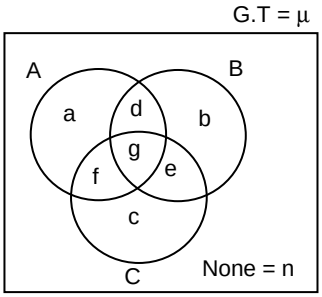
Venn Diagrams involving two variables:



In the above diagram, A and B represent two different sets and the various regions can be referred to as given below.

A = a + g ; B = b + g
Only A = a; Only B = b
Exactly one set = a + b
A and B = g ; Only A and B = g
Exactly two sets = g
At least one set = Exactly one + Exactly two = a + b + g = T
Grand Total (G.T = μ) = a + b + g + n = T + n
A + B = a + b + 2g = T + g
A or B = a + b + g = T
Does not belongs to A = b + n
Does not belongs to B = a + n

Venn Diagram with three variables:



Here A, B and C are three different sets and the various regions can be referred to as given below.

A = a + d + g + f ; Only A = a
B = b + d + g + e ; Only B = b
C = c + f + g + e ; Only C = c

Exactly one set = a + b + c ;

A and B = d + g ; B and also C = e + g ; C as well as A = f + g ;
Only A and B = d ; A and B but not C = d ;
Only B and C = e ; B and C but not A = e ;
Only C and A = f ; C and A but not B = f ;

Exactly two sets = d + e + f ;
A, B and C = All the three = Only A, B and C = g;
Exactly three sets = g ;
None among A, B and C = n ;

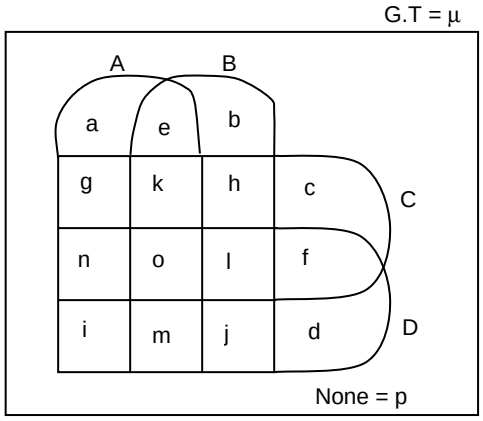
At least one set = Exactly one + Exactly two + Exactly three = a + b + c + d + e + f + g = μ – n
At least two sets = Exactly two + Exactly three
= d + e + f + g
At least three sets = Exactly three = g
At most one sets = Exactly one + None = a + b + c + n
At most two sets = Exactly two + Exactly one + None = d + e + f + a + b + c + n = μ – g

At most three sets = Exactly three + Exactly two + Exactly one + None = g + d + e + f + a + b + c + n = μ

A + B + C = a + b + c + 2(d + e + f) + 3g
= Exactly one + 2(Exactly two) + 3(Exactly three)
= (Exactly one + Exactly two + Exactly three) + Exactly two + 2 (Exactly three)
= At least one + Exactly two + 2(Exactly three)
= At least one + (Exactly two + Exactly three) + Exactly three = At least one + At least two + At least three

Does not belong to A = b + e + c + n
A or B or C = a + b + c + d + e + f + g = At least one.
A or B = a + b + d + e + f + g
A or B but not C = a + d + b
Neither A nor B = c + n
(A and B) or C = d + c + f + g + e
A and (B or C) = d + g + f

Venn diagram involving a four variables:



Here, A, B, C and D are four different sets and the various regions can be referred to as given below.
A = a + e + g + k + n + o + i + m ; Only A = a
B = b + e + h + k + l + o + j + m ; Only B = b
C = c + f + h + l + k + o + g + n; Only C = c
D = d + f + j + l + m + o + i + n ; Only D = d

Exactly one set = a + b + c + d

A and B = e + k + o + m ; Only A and B = e ;
A and C = g + k + o + n ; Only A and C = g ;
A and D = n + o + i + m ; Only A and D = i ;
B and C = k + h + o + l ; Only B and C = h ;
B and D = m + j + o + l ; Only B and D = j ;
C and D = n + o + l + f ; Only C and D = f ;

Exactly two sets = e + f + g + h + i + j

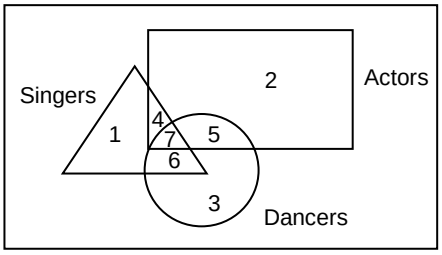
A, B and C = k + o ; Only A, B and C = k ;
B, C and D = l + o ; Only B, C and D = l ;
A, B and D = m + o ; Only A, B and D = m ;
A, C and D = n + o ; Only A, C and D = n;

Exactly three sets= k + l + m + n
A, B, C and D = All the four = Exactly four set = o;
None among A, B, C and D = p

Venn Diagrams are diagrammatic representation of sets, using geometrical figures like circles, triangles, rectangles, etc. Each geometrical figure represents a group as shown in the examples. The area common to two or more figures represent those elements which are common to two or more groups. There are various models in Venn Diagrams which we will discuss with examples.

Venn Diagram Type – I:

In these kind of questions, there are many geometrical figures representing different groups. Let's discuss this type with the help of the following example.



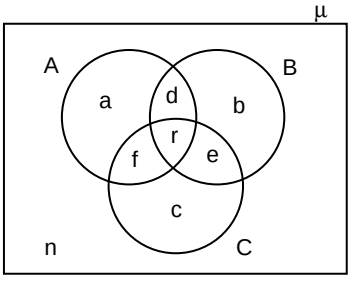
This diagram consists of three groups - Singers, Actors and Dancers, represented by a triangle, a rectangle and a circle respectively. There are seven regions represented by numbers from 1 to 7 where each region represents a different group.

Region 1 → represents only Singers
Region 2 → represents only Actors
Region 3 → represents only Dancers
Region 4 → represents only Singers and Actors
Region 5 → represents only Actors and Dancers
Region 6 → represents only Dancers and Singers
Region 7 → represents Singers, Actors and Dancers

Hence, the various areas, as shown, represent different groups, i.e., region 6 represents those Singers who are only Dancers, as region 6 is the intersection of the triangle and the circle, but not the square. You may be asked questions like "Which region represents Dancers who are only Singers?" The answer to this question, as explained above, will be region 6.

Venn Diagram Type II:

In this type, two, three or four different groups could be given with some elements common to two or more groups. Let us observe the diagram given below.



Here, A, B and C are three different groups, and the various regions can be explained as given below.
Only A = a
Only B = b
Only C = c
A and B only = d
B and C only = e
C and A only = f
All the three (A, B and C) = r
Both A and B = d + r
Both B and C = e + r
Both C and D = f + r
Neither A, nor B, nor C = n
A, B or C and none = μ
Also, $\mu = (A \cup B \cup C) + n$

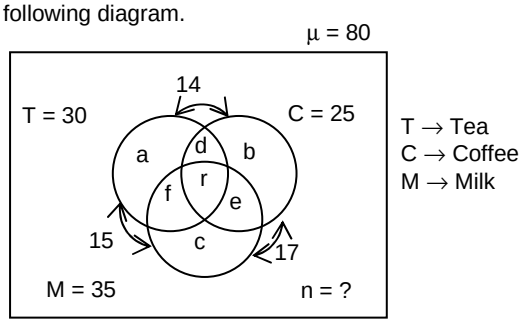
Here, the rectangle represents the sample space, which consists of three groups A, B and C, and also n, which is the number of people belonging to neither A, nor B, nor C.
Some more formulae are as given under:

(i) A' = (b + e + c) + n; where A' = A complement (not in A)
(ii) B' = (a + f + c) + n; where B' = B complement (not in B)
(iii) C' = (a + d + b) + n; where C' = C complement (not in C)
(iv) $A - B = A - (A \cap B)$
(v) $A \Delta B = (A - B) \cup (B - A)$
(vi) Number of people (or things) belonging to at least one out of the three groups = $A \cup B \cup C$
$= (a + b + c) + (d + e + f) + r$
↑ ↑ ↑
exactly one exactly two exactly three
(vii) $A + B + C = (A \cup B \cup C) + (d + e + f) + 2r$
$= (a + b + c) + 2(d + e + f) + 3r$

Examples:

1. In a class of 80 students, 30 students like tea, 35 students like milk and 25 students like coffee. It is also known that 15 students like both tea and milk, 17 students like both milk and coffee and 14 students like both tea and coffee, 9 students like tea, coffee as well as milk.

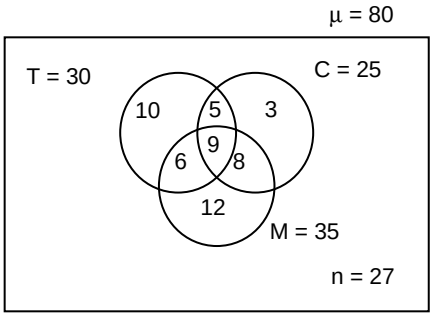
Sol: Based on the information given, we get the following diagram.



Now, r = 9 is given.
⇒ d = 14 – 9 = 5; e = 15 – 9 = 6; f = 17 – 9 = 8
Also,
a = 30 – (d + r + e)
= 30 – (5 + 9 + 6) = 10
b = 25 – (d + r + f)
= 25 – (5 + 9 + 8) = 3
c = 35 – (e + r + f)
= 35 – (6 + 9 + 8) = 12

Now, $T \cup C \cup M = a + b + c + d + e + f + r$
$= 10 + 13 + 12 + 6 + 8 + 5 + 9 = 53$
$\Rightarrow n = \mu - (T \cup C \cup M) = 80 - 53 = 27$

Hence, we can now get the following diagram from the above data.



Now, we can answer the questions of the following nature.

1. What is the total number of students who like neither tea nor coffee nor milk?

Sol: $n = \mu - (T \cup C \cup M) = 80 - 53 = 27$

2. How many students do not like Tea?

Sol: $T' = b + z + c + n = 3 + 8 + 12 + 27 = 50$

(or)

$T' = \mu - T = 80 - 30 = 50$

3. What is the value of T – C?

Sol: $(T - C) = a + f$
(i.e., the regions of A excluding B) $= 10 + 6 = 16$

4. What is the value of $C \Delta M$?

Sol: $C \Delta M = (C - M) \cup (M - C) = (b + d) + (f + c)$
$= (3 + 5) + (6 + 12) = 26$

5. What is the total number of students who like both tea and coffee but not milk?

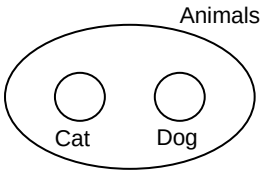
Sol: Number of students who like both tea and coffee but not milk = d = 5

Venn Diagram Type III:

In this type, Venn diagrams are used to establish relationship between the given groups. In other words, two or more groups are given and the Venn diagram, which most correctly establishes a relation between them, has to be chosen out of the various Venn diagrams given in the choices. Let us look at some of the examples given below.

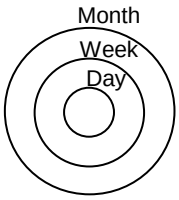
Examples:

1. Animals, Cat, Dog



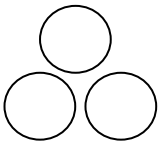
Here, in animals we have many species of which cat and dog are two different kinds of species, having nothing in common. So the above diagram is the most appropriate representation of the given groups.

2. Month, week, day



We know that day is a part of the week and week is a part of the month. So the above diagram is the most appropriate representation of the given groups.

3. Mars, Earth, Jupiter

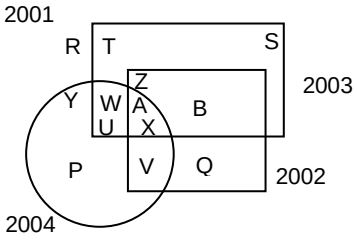


We know that Mars, Earth and Jupiter are three independent entities having nothing in common. So the above diagram is the most appropriate representation of the given groups.

Exercise – 7(a)

Directions for questions 1 to 5: These questions are based on the following figure.

In the following figure, 'Triangle' represents all the models of those bikes which are manufactured in the year 2001, 'Square' represents the models of the bikes manufactured in the year 2002, 'Rectangle' represents all the models of those bikes which were manufactured in the year 2003 whereas 'Circle' represents all the models of bikes manufactured in the year 2004.



1. Which of the following represents the bikes which are manufactured only in the years 2002 and 2003?
(A) S (B) B (C) V (D) T

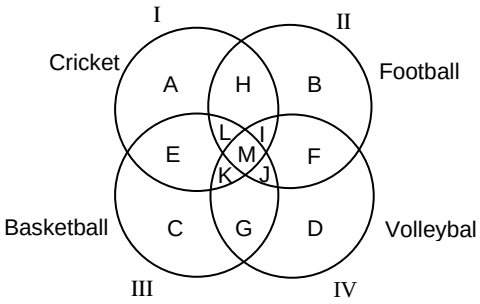
2. Which of the following represents the bikes which are manufactured in all the given four years?
(A) W (B) X (C) A (D) U

3. Which of the following represents the bikes which are manufactured only in the year 2003?
(A) S (B) Q (C) R (D) P

4. Which of the following represents the bikes which are manufactured only in the years 2001 and 2004?
(A) U, A and W (B) W
(C) W, A and Y (D) Y

5. Which of the following represents the bikes which are manufactured in 2001, 2002 and 2003 but not in 2004?
(A) A (B) U (C) X (D) Z

Directions for questions 6 to 10: These questions are based on the following diagram.



Circle I represents the students who play cricket.
Circle II represents the students who play football.
Circle III represents the students who play basketball.
Circle IV represents the students who play volleyball.

6. Which of the following represents the students who play all the four games?
(A) J (B) K (C) M (D) I

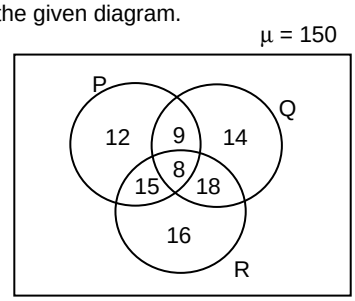
7. Which of the following represents the students who play both cricket and football but not any other game?
(A) A and B (B) A, H and B
(C) H (D) A, H, I, M and B

8. Which of the following represents the students who play volleyball but not any other game?
(A) J, F G and D (B) M, J, F, G and D
(C) J, F and D (D) D

9. Which of the following represents the students who play only football or only basketball?
(A) C and B (B) M
(C) C, J and B (D) M and B

10. Which of the following represents the students who do not play football or volleyball?
(A) A and C (B) A, G and C
(C) A, E, H, C and D (D) A, E and C

Directions for questions 11 to 15: These questions are based on the given diagram.



11. How many elements are there in Q' (complement of Q)?
(A) 100 (B) 49 (C) 101 (D) 50

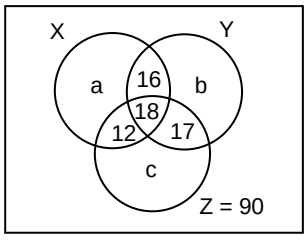
12. How many elements are there in $P' \cap Q' \cap R'$?
(A) 35 (B) 8 (C) 58 (D) 48

13. How many elements are there in R?
(A) 16 (B) 57 (C) 41 (D) 8

14. How many elements are there in $P \cap (Q \cup R)$?
(A) 32 (B) 48 (C) 54 (D) 44

15. Which of the following sets has the least number of elements?
(A) $P \cap Q$ only (B) $P \cap Q \cap R$
(C) $Q \cap R$ only (D) $R \cap P$ only

Directions for questions 16 to 20: These questions are based on the following diagram.



16. If the number of elements in X is two-thirds of the elements in Z, then the value of 'a' is?
(A) 10 (B) 12 (C) 14 (D) 16

17. If the number of elements in Y and Z are in the ratio 4 : 5 then the value of b is
(A) 18 (B) 13 (C) 17 (D) 21

18. What is the value of $(X' \cap Y' \cap Z')$?
(A) 20 (B) 15
(C) 12 (D) Cannot be determined

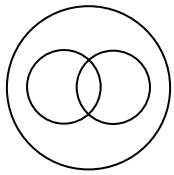
19. If the number of elements in each of the sets X, Y and Z are equal then the value of $(X \cup Y \cup Z)$ is
(A) 189 (B) 129 (C) 138 (D) 199

20. If the number of elements which belong to neither X nor Y nor Z is equal to p, then the number of elements in the X' (complement of X) is
(A) p + a + 40 (B) p + b + 40
(C) p + b + 60 (D) p + a + 60

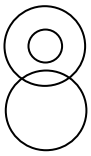
Directions for questions 21 to 25: These questions are based on the following diagrams.

In each question a group of words is given which is related to one of the four given diagrams. Observe the diagrams carefully and mark the number of that figure as your answer which you feel would best fit into the group of words given in each question.

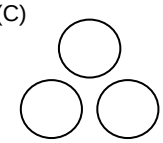
(A)



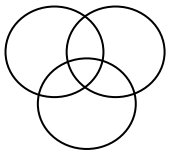
(B)



(C)



(D)



21. Blue, Red, Green

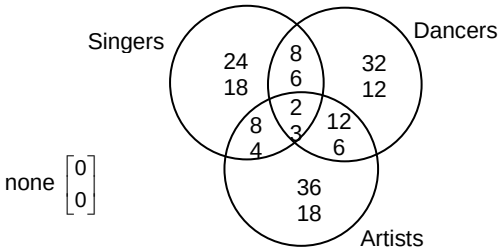
22. Players, Students, Actors

23. Odd numbers, Prime numbers, Odd multiples of nine

24. Natural numbers, Even natural numbers, Prime numbers

25. Europe, Asia, Africa

Directions for questions 26 to 30: These questions are based on the diagram given below. In this diagram, the number on the top gives the number of males and the number below it is the number of females. i.e. $\begin{bmatrix}24\\18\end{bmatrix}$ means there are 24 males and 18 females.



26. How many female singers are also dancers?
(A) 9 (B) 6 (C) 14 (D) 22

27. How many dancers are artists?
(A) 18 (B) 12 (C) 6 (D) 23

28. How many females are not singers?
(A) 24 (B) 39 (C) 36 (D) 45

29. How many male artists are singers?
(A) 9 (B) 10 (C) 8 (D) 23

30. How many female dancers are also singers as well as artists?
(A) 1 (B) 3 (C) 2 (D) 6

Exercise – 7(b)

Directions for questions 1 to 5: Read the following data and then answer the questions given below.

In a class, 72 students drink only tea, 50% of the students drink coffee, 25% of the students drink both tea and coffee and 5% of the students drink neither tea nor coffee.

1. What is the total strength of the class?
(A) 160 (B) 180 (C) 140 (D) 120

2. How many of the students drink only tea or only coffee?
(A) 113 (B) 112 (C) 114 (D) 128

3. How many of the students drink neither tea nor coffee?
(A) 7 (B) 5 (C) 8 (D) 12

4. How many of the students drink only coffee?
(A) 29 (B) 38 (C) 49 (D) 40

5. How many of them drink at least one of the two?
(A) 153 (B) 144 (C) 128 (D) 152

Directions for questions 6 to 10: Read the data given below and then answer the following questions.

80 people in a colony were surveyed and it was found that for every 6 people who read 'The Hindu', there are 4 people who read 'Times of India'. For every 9 people who read 'The Hindu' there are 3 people who read both of them. Further, the number of people who read both of them is same as those who read neither of them.

6. How many people read only 'Times of India'?
(A) 12 (B) 18 (C) 16 (D) 24

7. How many people read 'The Hindu' and 'Times of India'?
(A) 12 (B) 14 (C) 15 (D) 16

8. How many people read only 'The Hindu'?
(A) 28 (B) 32 (C) 33 (D) 36

9. If 12.5% of the people who read both of them stop reading 'The Hindu', then what percentage of the total number of people read The Hindu"?
(A) 57.5% (B) 55% (C) 48% (D) 59%

10. If half of the people who read only 'The Hindu' stop reading it and start reading 'Times of India', then what is the ratio of the number of people reading 'The Hindu' to those reading 'Times of India'?
(A) 3 : 2 (B) 1 : 2 (C) 9 : 4 (D) 2 : 3

Directions for questions 11 to 15: Study the following data and the table to answer the questions given below.

The following table gives the statistics of 180 students in a class in which each plays either carroms or chess or both. Due to some problem while entering the data, some vital information is lost. The following table shows the remaining data.

	Carroms	Chess	Both	Total
Boys	70			
Girls				
Total		110		180

The Information available is :
(i) The number of boys in the class is 40 more than the number of girls.
(ii) $22\frac{2}{9}\%$ of the total number of students play both the games.
(iii) None of the girls plays both the games.

11. How many girls play only chess?
(A) 28 (B) 30 (C) 17 (D) 18

12. How many students play both chess and carroms?
(A) 30 (B) 33 (C) 40 (D) 36

13. How many boys play only chess?
(A) 40 (B) 128 (C) 32 (D) 35

14. How many students do not play both the games?
(A) 120 (B) 140 (C) 150 (D) 170

15. How many students play carroms?
(A) 120 (B) 140 (C) 125 (D) 110

Directions for questions 16 to 20: Read the data given below and then answer the questions that follow.

Within a group of 240 employees of a company, it is known that 100 speak English, 110 speak Hindi and 140 speak Telugu. It is also known that 30 speak both English and Hindi, 50 speak both Hindi and Telugu, 50 speak both Telugu and English, while 20 speak English, Hindi as well as Telugu.

16. How many of them speak only Hindi?
(A) 30 (B) 50 (C) 20 (D) 80

17. How many of them speak both Hindi and Telugu but not English?
(A) 30 (B) 20 (C) 50 (D) 60

18. How many of them speak exactly one language?
(A) 120 (B) 180 (C) 150 (D) 240

19. How many of them speak neither English nor Hindi?
(A) 40 (B) 60 (C) 30 (D) 50

20. How many of them speak either English or Telugu?
(A) 120 (B) 140 (C) 180 (D) 190

Directions for questions 21 to 25: These questions are based on the data given below.

According to the data obtained from a club, 100 people come for swimming, 85 come for tennis and 65 come for aerobics. For every 10 people who come for swimming, there are 3 people who come for aerobics and tennis. For every 17 people who come for tennis, there are 7 people who come for swimming and aerobics. For every 13 people who come for aerobics, there are 9 people who come for tennis and swimming. 20 people come for tennis, swimming and aerobics, while 15 people come for none of the three.

21. The total number of persons who come to the club is
(A) 150 (B) 175 (C) 155 (D) 180

22. How many members come only for swimming?
(A) 20 (B) 30 (C) 40 (D) 45

23. How many members come for both tennis and aerobics but not swimming?
(A) 8 (B) 7 (C) 9 (D) 10

24. How many members come for neither tennis nor swimming?
(A) 45 (B) 40 (C) 36 (D) 35

25. How many members come for at least one of the three given activities?
(A) 160 (B) 150 (C) 120 (D) 180

Directions for questions 26 to 30: These questions are based on the data given below.

In a library maintained by a student, there are books on different subjects. It was found that 35 books are on sports, 45 books are on business and 15 books are on current affairs. 14 books are on at least two subjects among sports, business and current affairs. 3 books have sports, business as well as current affairs in them. Every book in the library is assumed to contain at least one of sports, business or current affairs in them.

26. How many books are there which contain information regarding only one subject?
(A) 58 (B) 64 (C) 60 (D) 62

27. What are the total number of books in his library?
(A) 78 (B) 72 (C) 68 (D) 80

28. How many books contained information regarding exactly two subjects?
(A) 7 (B) 10 (C) 9 (D) 11

29. How many books are there which contain information regarding at most two subjects?
(A) 11 (B) 64 (C) 72 (D) 75

30. If the number of books on only sports is equal to 26, then how many books are there in the library, which are on both business and current affairs but not sports?
(A) 5 (B) 3 (C) 2 (D) 8

Exercise – 7(c)

Directions for questions 1 to 4: These questions are based on the following data.

A survey was conducted among 600 bicycle owners. It was found that 200 people had Hero Ranger, 250 people had BSA SLR and 300 people had Atlas MTB bicycles with them. Seventy of them had exactly 2 out of the 3 brands of bicycles. Each owns at least one of the three brands mentioned above.

1. How many people had all the three brands?
(A) 70 (B) 80 (C) 60 (D) 40

2. If 16 owners had only BSA SLR and Atlas MTB with them, then how many people have only Hero Ranger with them?
(A) 54 (B) 72 (C) 98 (D) 106

3. If 160 people had only BSA SLR cycles, then how many have only Atlas MTB and Hero Ranger with them?
(A) 10 (B) 20 (C) 30 (D) 50

4. How many owners have only one brand of cycle with them?
(A) 70 (B) 200 (C) 490 (D) 250

Directions for questions 5 to 8: These questions are based on the following data.

Out of a group of 315 students who went to Mumbai, 125 visited Essel World, 140 visited Lumbini Garden and 160 visited Film Nagar. Twenty Five of them visited all the three places while 200 visited exactly one of the three places. The number of students who visited exactly 2 out of the three places is five times as many as those who have not visited any of the places.

5. How many did not visit any of the three places?
(A) 75 (B) 25 (C) 125 (D) 15

6. How many students visited not more than one place?
(A) 200 (B) 180 (C) 250 (D) 215

7. If the number of students who visited at least one of the two places, Lumbini Gardens and Film Nagar is 255, then how many students visited only Essel World?
(A) 45 (B) 25 (C) 125 (D) 75

8. If the number of students who visited at least one of the two places, Lumbini Gardens and Film Nagar is 255, then how many students visited only one of the two places, Lumbini Gardens and Film Nagar (and not any of the other two places)?
(A) 215 (B) 125 (C) 155 (D) 175

Directions for questions 9 to 11: These questions are based on the following data.

In a class of 100 students, 50 students passed in Mathematics and 70 passed in English. 5 students failed in both Mathematics and English.

9. How many students passed in both the subjects?
(A) 25 (B) 50 (C) 70 (D) 5

10. How many students passed in exactly one of the two subjects?
(A) 5 (B) 15 (C) 95 (D) 70

11. How many students failed in at least one subject?
(A) 95 (B) 50 (C) 30 (D) 75

Directions for questions 12 to 16: These questions are based on the following data.

A survey was conducted among 300 Room air conditioner owners. It was found that 125 people had Carrier Aircon, 145 people had Voltas and 90 people had Fedders Lloyd air conditioners with them. Thirty two of them had exactly two out of the three brands of air conditioners.

12. How many had all three brands of air conditioners?
(A) 28 (B) 14 (C) 21 (D) 35

13. If six owners had only Voltas and Fedders Lloyd air conditioners with them, then how many have only Carrier Aircon with them?
(A) 125 (B) 65 (C) 45 (D) 85

14. If 110 owners had only Voltas air conditioners, then how many have only Carrier Aircon and Fedders Lloyd with them?
(A) 11 (B) 17 (C) 8 (D) 23

15. How many of the owners have exactly one brand of air conditioners?
(A) 300 (B) 196 (C) 228 (D) 254

16. If ten of the owners having only Carrier Aircon now buy Voltas also; and 5 of the owners who had only Voltas and Fedders Lloyd now buy Carrier Aircon also, then how many have at least two out of the three brands of air conditioners?
(A) 19 (B) 61 (C) 68 (D) 56

Directions for questions 17 to 20: Study the following table and answer the questions that follow it.

Age Group	Number of Magazine Readers						Total including non-readers	
	BW		BT		Both			
	Male	Female	Male	Female	Male	Female	Male	Female
< 15 years	145	65	155	65	50	30	260	115
15 - 34 years	175	125	105	85	40	50	265	190
≥ 35 years	115	135	120	100	35	45	215	195

17. How many people less than 35 years read neither of the 2 magazines?
(A) 40 (B) 80 (C) 120 (D) 160

18. How many males in 15 - 34 years age group do not read any of the 2 magazines?
(A) 15 (B) 45 (C) 75 (D) 25

19. Approximately, what percentage of the BT readers, are above 15 years of age?
(A) 75% (B) 45% (C) 65% (D) 80%

20. What percentage of females, who read neither BT nor BW, are below 15 years of age?
(A) 30% (B) 60%
(C) 40% (D) 20%

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

Out of a group of 245 pilgrims, 105 visited Badrinath, 95 visited Kedarnath and 95 visited Somnath. Fifteen of them visited all three shrines, while 190 visited exactly one of the three shrines. The number of pilgrims who visited exactly two out of the three shrines is three times as many as those who have not visited any one of the three shrines.

21. How many pilgrims have not visited any one of the three shrines?
(A) 20 (B) 10 (C) 15 (D) 25

22. How many pilgrims visited not more than one shrine?
(A) 50 (B) 100 (C) 150 (D) 200

23. If the number of pilgrims who have visited at least one of the two shrines Kedarnath and Somnath is 165, then how many pilgrims visited only Kedarnath and Somnath?
(A) 20 (B) 30 (C) 10 (D) 15

24. If 180 pilgrims visited at least one of the two shrines Kedarnath or Badrinath, then how many pilgrims visited only Somnath?
(A) 55 (B) 40 (C) 35 (D) 60

25. If there is nobody who visited only Badrinath and Somnath, then how many people visited only Kedarnath?
(A) 90 (B) 80 (C) 70 (D) 50

Directions for questions 26 to 30: These questions are based on the following information.

A survey was conducted among a group of football fans to know how many of them like the football teams Barcelona, Liverpool, Real Madrid, Manchester United and Bayern Munich.

(i) Fifty seven out of the 125 fans who like Real Madrid also like Manchester United.
(ii) Ten fans like exactly three clubs. Ten fans like only Liverpool.
(iv) It is known that no one who likes Barcelona likes Real Madrid or Manchester United.
(v) The number of fans who like Bayern Munich and Barcelona is the same as those who like only Real Madrid and Manchester United and four more than those who like Barcelona and Liverpool.
(vi) The number of fans who like Bayern Munich and Manchester United is the same as that who like only Liverpool and Real Madrid, which in turn is one third of those who like only Real Madrid.
(vii) The number of fans who like Barcelona, Bayern Munich, Manchester United and Liverpool are 112, 75, 88 and 92 respectively.
(viii) No one who likes Bayern Munich likes Liverpool or Real Madrid.

26. How many like exactly two clubs?
(A) 183 (B) 152 (C) 137 (D) 154

27. How many like only Bayern Munich or only Barcelona?
(A) 45 (B) 51
(C) 33 (D) Cannot be determined

28. How many like the club Manchester United but not Liverpool?
(A) 66 (B) 72 (C) 81 (D) 71

29. How many like exactly one club?
(A) 102 (B) 94 (C) 123 (D) 96

30. Among the Barcelona fans, how many like at least two more clubs?
(A) 90 (B) 57 (C) 64 (D) None

Exercise – 7(d)

Directions for questions 1 to 4: These questions are based on the following data.

In a class, 30% of the students gave their names to participate in the NSS and 75% to participate in the NCC. Three students participate in neither of these two and six students wanted to participate in both.

1. How many students are there in the class?
(A) 100 (B) 75 (C) 60 (D) 80

2. What percentage of students wants to participate only in the NSS?
(A) 30% (B) 25% (C) 15% (D) 20%

3. What percentage of students wants to participate in only one programme – either NSS or NCC?
(A) 85% (B) 90% (C) 75% (D) 20%

4. How many students want to participate in at least one programme?
(A) 97 (B) 87 (C) 147 (D) 57

Directions for questions 5 to 9: These questions are based on the following data.

In a college library, four different business newspapers – Economic Times, Business Standard, Business Line and Financial Express are available. All students visit the library regularly but 20% of them do not read any business newspaper.

The four newspapers given in the above order are read by 230, 180, 180 and 220 students respectively. The number of students reading exactly 2 newspapers for any two newspapers is 20. There are 30 students who read all the four newspapers but there is nobody who reads exactly three out of the four newspapers.

5. How many students read exactly two newspapers?
(A) 120 (B) 150 (C) 80 (D) 90

6. How many students read exactly one newspaper?
(A) 600 (B) 450 (C) 750 (D) 350

7. How many students do not read any newspaper at all?
(A) 75 (B) 100 (C) 225 (D) 150

8. What percentage of the people reading Business Standard also read at least one other newspaper?
(A) 35% (B) 55% (C) 50% (D) 65%

9. If all the students in the college including those who do not read any newspaper read at least one newspaper, (out of the four newspapers above) which he is not reading at present, then what is the least number of students reading all the four newspapers?
(A) 60 (B) 25 (C) 15 (D) 30

Directions for questions 10 to 16: These questions are based on the following data.

A survey of 300 respondents showed that 135 of them read Business India, 125 read Business Today and 115 read Business World. Further, 42 of the respondents read Business India and Business Today, 48 read Business Today and Business World, 43 read Business India and Business World and 30 of the respondents read all the three magazines.

10. How many respondents read exactly one magazine?
(A) 375 (B) 199 (C) 272 (D) 123

11. How many respondents read exactly two magazines?
(A) 30 (B) 75 (C) 65 (D) 43

12. How many respondents read Business India or Business World?
(A) 199 (B) 272 (C) 56 (D) 207

13. How many respondents read neither Business World nor Business Today?
(A) 108 (B) 80 (C) 126 (D) 148

14. If seven of the respondents who were previously reading only Business India now start reading a second magazine also and five of the respondents who were previously reading only Business India now stop even that, then how many respondents read Business India now?
(A) 75 (B) 132 (C) 142 (D) 130

15. If 15 respondents who were reading Business India stop reading Business India and instead start reading Business Today, then what is the maximum number of respondents who will now be reading only Business India?
(A) 120 (B) 65 (C) 78 (D) 93

16. If 16 of the respondents who were reading Business Today stop reading Business Today and instead start reading Business World, then what is the maximum number of respondents who will now be reading Business India and Business World?
(A) 59 (B) 55 (C) 75 (D) 63

Directions for questions 17 to 20: These questions are based on the following data.

In a school, 60% of the students passed in English and 25% of the students who passed in English passed in the foreign language also, whereas $66^2/_3\%$ of the students who passed in the foreign language failed in English. Twenty students failed in both English and the foreign language.

17. What is the total strength of the school?
(A) 250 (B) 150 (C) 200 (D) 100

18. What percent of the students passed in exactly one of the two subjects – English and the foreign language?
(A) 15% (B) 65% (C) 45% (D) 75%

19. The students who failed in exactly one subject are allowed to take a re-exam and it was found that the number of students who passed in both the subjects increased by 20%. What is the least value for the percentage of students in the school who pass only in English?
(A) 42% (B) 46% (C) 34% (D) 28%

20. All the students who failed in one or more subjects are given grace marks and it was found that the number of students passing in exactly one subject went up by 4 and the number of students who failed in both the subjects dropped by 40%. What percent of the school now pass in both subjects?
(A) 40% (B) 15% (C) 12% (D) 17%

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

In a colony, a survey was conducted regarding the ownership of three different types of vehicles – car, scooter and bicycle.

- The number of residents owning all three vehicles is the same as those owning none.
- The number of residents owning any two out of the three vehicles is the same as those owning any other two which in turn is the same as those owning none of the three.
- The number of residents owning scooters alone is the same as those owning cars alone and each in turn is twice those owning bicycles alone.
- Half the number of residents who own a bicycle also own at least one of the other two vehicles.

21. If the number of residents who own only bicycles is 150, then what is the total number of residents in the colony?
(A) 500 (B) 1000
(C) 750 (D) 1250

22. What percentage of the residents, who own a car, also own at least another vehicle?

(A) $66\frac{2}{3}\%$ (B) $13\frac{2}{3}\%$

(C) $28\frac{4}{7}\%$ (D) $33\frac{1}{3}\%$

23. If 15 residents do not own any of the three vehicles, then how many residents are there in the colony?
(A) 100 (B) 200 (C) 300 (D) 400

24. What percentage of the colony residents own exactly one type of vehicle?
(A) 15% (B) 25% (C) 55% (D) 75%

25. What percentage of the residents own a scooter or a car but not a bicycle?
(A) 65% (B) 55% (C) 75% (D) 45%

Directions for questions 26 to 30: These questions are based on the following data.

There are three trade unions Viram, Vishram and Be-kam and three thousand six hundred workers in a company. Becoming a member of a trade union is optional. A worker can be a member of more than one of the three trade unions also.

There are 500 workers who are members of at least two trade unions while Vishram has 1400 members. There are 100 workers who are members of only Viram and Be-kam, whereas 200 Vishram members also are Be-kam members; 550 workers are members of only Be-kam where as 20% of Viram members are members of exactly one more union. An eighth of all the workers in the company are members of exactly two unions.

26. How many workers are members of all the three unions?
(A) 150 (B) 75 (C) 50 (D) 100

27. How many workers are not members of any union?
(A) 100 (B) 200 (C) 300 (D) 400

28. How many workers are members of only Viram or only Be-kam?
(A) 3200 (B) 2700 (C) 1400 (D) 1700

29. If 10 workers give up their Be-kam membership and take up Vishram membership, then how many workers will now have membership of all the three unions?
(A) 40 (B) 50 (C) 60 (D) 45

30. How many workers are members of Vishram but not members of Be-kam?
(A) 400 (B) 800 (C) 1200 (D) 1600

Key

Exercise – 7(a)

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

Exercise – 7(b)

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

Exercise – 7(c)

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

Exercise – 7(d)

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