Solution

PERMUTATIONS AND COMBINATION MCQS

Class 11 - Mathematics

1.

(d) 9000

Explanation: Clearly, 0 cannot be placed at the thousands place.
So, this place can be filled in 9 ways.
Each of the hundreds, tens and units digits can be filled in 10 ways,
$\therefore$ required number of numbers $= (9 \times 10 \times 10 \times 10)$ = 9000.

2.

(b) 144

Explanation: We have there are 3 consonants and 3 vowels E, A and O.
Since no two vowels have to be together, the possible choice for vowels is the places marked as ‘X’. X M X C X T X, these vowels can be arranged in ${}^4P_3$ ways 3
consonants can be arranged in 3 ways.
Therefore, the required number of ways
= 3! $\times$ ${}^4P_3$
$= 6 \times \frac{4!}{1!}$
= 144 ways

3.

(b) 5! $\times$ 4!

Explanation: If there are n objects to be arranged in circular order the no. of permutations possible = (n - 1)!
First, we will make the 5 girls around the table and this can be done in (5 - 1)! = 4! = 24, different ways.
Now we have 5 places available between these girls and the 5 boys can be seated in these 5 available places in 5! = 120, different ways.
Hence the 5 boys and 5 girls can be arranged in 4! 5! = 23· 120 = 2880 ways.

4.

(c) 720

Explanation: Fixing T at the beginning and E at the end, the remaining 6 letters can be arranged in 6 places in 6 ! = 720 ways.
$\therefore$ required number of words = 720

5.

(d) 4536

Explanation: To form a four-digit number with distinct digits we can use any four digits from the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 without repetition.
Since 0 cannot come as the first digit of a four-digit number(then it will be a three-digit number) the first place can be filled by any of the 9 digits other than 0.
Now we have 9 more digits left and since repetition is not allowed the second place can be filled by any of these 9 digits.
Similarly the third and fourth can be filled by any of the 8 and 7 digits respectively.
Hence we get the four places can be filled together by 9 $\times$ 9 $\times$ 8 $\times$ 7 = 4536 different ways.

6. **(a)** 64

Explanation: Number of straight lines joining 12 points if we take 2 points at a time = ${}^{12}C_2$
= $\frac{12!}{2!10!}$ = 66
Number of straight lines joining 3 points if we take 2 points at a time = ${}^3C_2$ = 3
But, 3 collinear points, when joined in pairs, give only one line.
$\therefore$ Required number of straight lines = 66 - 3 + 1 = 64.

7.

(d) 6 !

Explanation: 6 boys can be arranged in a row in 6 ! ways.

8.

(b) 18

Explanation: Let us assume the 4 parallel lines given are horizontal.

Then we have the three parallel lines are vertical , since given they are intersecting with the set of 4 parallel lines

To make a parallelogram we need 2 horizontal and 2 vertical parallel lines

So reqired number of parallelogram $=^4 C_2 \quad .^3 C_2 \quad = 6.3 = 18$

9.

(d) C(6, 5)

Explanation: Since all the plus signs are identical, we have number of ways in which 5 plus signs can be arranged = 1.

Now we will have 6 empty slots between these 5 identical + signs

Hence the number of possible places of - sign = 6

Therefore the number of ways in which the 5 minus sign can take any of the possible 6 places = C(6, 5)

10.

(b) 7

Explanation: Consider a convex polygon which has n sides.

We have an inside polygon has n vertices. If you join every distinct pair of vertices you will get lines.

These lines account for the n sides of the polygon as well as for the diagonals

Then we have the number of diagonals = ${}^nC_2 - n = \frac{n(n-1)}{2} - n = \frac{n(n-3)}{2}$

But given number of diagonals = 2.number of sides

$\Rightarrow$ 2n = $\frac{n(n-3)}{2}$

$\Rightarrow$ 4n = n(n - 3)

$\Rightarrow$ n - 3 = 4

$\Rightarrow$ n = 7

11.

(c) 7560

Explanation: There are 9 letters in all. Out of these A is repeated 4 times, L is repeated 2 times and the rest are different.

Required number of words $= \frac{9!}{(4!)\cdot(2!)}$ = 7560.

12.

(c) 252

Explanation: First we will find the number of three-digit numbers (i.e, numbers from 100 to 999) which can be formed using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 with repetition allowed.

Now we have the first place can be filled by any of the 9 digits other than 0 and since repetition is allowed the second and third can be filled by any of the ten digits.

Hence the total number of three-digit numbers will be = 9 $\times$ 10 $\times$ 10 = 900

Now we will consider the case that the number does not have the digit 5.

Now the first place can be filled by any of the 8 digits other than 0 and 5 and since repetition is allowed the second and third can be filled by any of the 9 digits other than 5.

Hence the total number of ways we can form a three digit number with out 5 will be = 8 $\times$ 9 $\times$ 9 = 648

Therefore the number of three-digit numbers with at least one 5 = 900 - 648 = 252

13.

(b) 6

Explanation: According to the question:

${}^nP_4 = 12 \times {}^nP_2$

$\Rightarrow \frac{n!}{(n-4)!} = 12 \times \frac{n!}{(n-2)!}$

$\Rightarrow \frac{(n-2)!}{(n-4)!} = 12$

$\Rightarrow$ (n - 2) (n - 3) = 4 $\times$ 3

$\Rightarrow$ n - 2 = 4

$\Rightarrow$ n = 6

14.

(b) 36000

Explanation: Total number of words formed by using all the 8 letters at a time = $^8P_8$ = 8! = 40320.

Number of words in which vowels are never together
= (total number of words) - (no. of words in which vowels are always together)
= (40320 - 4320) = 36000

15. **(a)** 24

Explanation: Four-digit numbers are to be formed from the digits 2, 3, 4, 7 without repetition

Therefore, the required 4-digit numbers = $^4P_4$ = 4! = $4 \times 3 \times 2 \times 1$ = 24.

16. **(a)** 231

Explanation: $^nC_{12} = ^nC_8$
$\Rightarrow$ n = 12 + 8 = 20 [$\because ^nC_x = ^nC_y \Rightarrow$ n = x + y or x = y]
Now,
$^{22}C_n = ^{22}C_{20}$
= $\frac{22}{2} \times \frac{21}{1}$
= 231.

17.

(d) 2880

Explanation: In a row of 9 seats, the 2nd, 4th, 6th and 8th are the even places.

These 4 places can be occupied by 4 women in $^4P_4$ ways = 24 ways

Remaining 5 places can be occupied by 5 men in $^5P_5$ ways = 120 ways.

$\therefore$ total number of seating arrangements $= (24 \times 120)$ = 2880

18.

(c) 1001

Explanation: When a particular player is always chosen, then we have to select 10 players out of 14.

$\therefore$ Required number of ways = $^{14}C_{10}$ = $^{14}C_4 = \frac{14 \times 13 \times 12 \times 11}{4 \times 3 \times 2 \times 1}$ = 1001.

19. **(a)** r + 1

Explanation:

We know that, $^nC_r + {^nC_{r+1}} = {^{n+1}C_{r+1}}$

$\therefore$ x = r + 1

20.

(d) 108

Explanation: if we fix 3 at unit place, then the total possible numbers =3!
If we fix 4, 5 and 6 at unit place, this is each case, total possible numbers are 3!
Therefore, Required sum of unit digits of all such numbers is
= $3 \times 3! + 4 \times 3! + 5 + 3! + 6 \times 3! = (3 + 4 + 5 + 6) \times 3!$
= $18 \times 3! = 18 \times 3 \times 2 \times 1 = 108$

21.

(b) 36

Explanation: The word APURBA is a 6 letter word consisting of 3 vowels that can be arranged in 3 alternate places, in = $\frac{3!}{2!}$ ways.

The remaining 3 consonants can be arranged in the remaining 3 places in 3! ways.

$\therefore$ Total number of words that can be formed = $\frac{3!}{2!} \times 3! = 18$

But this whole arrangement can be set-up in total two ways, i.e., either VCVCVC or CVCVCV

$\therefore$ Total number of words = $18 \times 2 = 36$

22. **(a)** 60

Explanation: Three persons can take 5 seats in $^5C_3$ ways.
Moreover, 3 persons can sit in 3! ways.
$\therefore$ Required number of ways = $^5C_3 \times 3!$ = 10×6 = 60

23.

(c) 5

Explanation: ${}^{n+1}C_3 = 2 \times {}^n C_2$

$\Rightarrow \frac{(n+1)!}{3!(n-2)!} = 2 \times \frac{n!}{2!(n-2)!}$

$\Rightarrow \frac{(n+1)n!}{3\times 2!(n-2)!} = 2 \times \frac{n!}{2!(n-2)!}$

$\Rightarrow$ n + 1 = 6

$\Rightarrow$ n = 5.

24.

(b) 20

Explanation: We have octagon is an eight sided polygon which has 8 vertices.

A diagonal is obtained by joining two points.

Thus the number of diagonals obtained by joining any two points out of 8 is given by

$8C_2 - 8 = \frac{8!}{2!(8-2)!} - 8 = \frac{1\times2\times3\times4\times5\times6\times7\times8}{1\times2\times1\times2\times3\times4\times5\times6} - 8 = \frac{7\times8}{1\times2} - 8$ = 28 - 8 = 20

25.

(c) 78

Explanation: 4 out of 13 players are bowlers.

In other words, 9 players are not bowlers.

A team of 11 is to be selected so as to include at least 2 bowlers.

$\therefore$ Number of ways = ${}^4C_2 \times {}^9 C_9 + {}^4 C_3 \times {}^9 C_8 + {}^4 C_4 \times {}^9 C_7$

= 6 + 36 + 36

= 78

26. **(a)** 5

Explanation: Consider 1! + 2! + 3! + 4! + 5! + ... + 200!

We know that 7! = $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$, which is divisible by 14

Now as 8! = $8 \times 7!$ it is also divisible by 14

Hence 9!, 10!, 11! ....14! are divisible by 14.

Thus we can conclude that the remainder obtained when we divide (1! + 2! + 3! + .. + 200!) by 14 will be same as the remainder obtained when we divide (1! + 2! + 3! + 4! + 5! + 6!) by 14.

Consider, 1! + 2! + 3! + 4! + 5! + 6! = 1 + 2 + 6 + 24 + 120 + 720 = 873

Now we have when 873 is divided by 14, the remainder is 5.

Thus, the remainder obtained when 1! + 2! + 3! + ... + 200! is divided by 14 is 5.

27.

(d) 496

Explanation: ${}^nC_{18} = {}^nC_{12}$

$\Rightarrow$ n = (18 + 12) = 30

$\therefore {}^{32}C_n = {}^{32}C_{30} = {}^{32}C_2 = \frac{32\times31}{2}$ = 496

28.

(b) 4464

Explanation: First, we will find the number of four-digit numbers that can be formed using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 with repetition.

The first place can be filled by any of the 9 digits other than 0, and the second, third and the fourth places each can be filled by any of the ten digits.

Hence, the total number of ways of forming a four-digit number = $9 \times 10 \times 10 \times 10$ = 9000

Now we will find the number of four-digit numbers in which n all the digits are distinct

The first place can be filled by any of the 9 digits other than 0, and the second place can be filled by any of the remaining 9 digits since repetition is not possible.

Similarly, third and the fourth places each can be filled by 8 and 7 digits respectively

Hence the total number of ways of forming a four-digit number with distinct digits b = $9 \times 9 \times 8 \times 7$

The total number of numbers from 1000 to 9999 (both inclusive) that do not have 4 different digits = 9000 - 4536 = 4464

29.

(b) 12

Explanation: r - 6 + 3r + 1 = 43 [$\because {}^nC_x = {}^nC_y \Rightarrow$ n = x + y or x = y]

$\Rightarrow$ 4r - 5 = 43

$\Rightarrow$ 4r = 48

$\Rightarrow$ r = 12.

30.

(d) 116

Explanation: Number of triangles obtained from 10 points $= {}^{10}C_3 = \frac{10\times9\times8}{3\times2\times1} = 120$

Number of triangles obtained from 4 points = ${}^4C_3$ = ${}^4C_1$ = 4.

But, these 4 points being collinear will give no triangle,

$\therefore$ Required number of triangles = (120 - 4) = 116.

31.

(c) 2m = n(n - 1)

Explanation: ${}^mC_1 = {}^nC_2$

$\Rightarrow \frac{m!}{1!(m-1)!} = \frac{n!}{2!(n-2)!}$

$\Rightarrow \frac{m(m-1)!}{(m-1)!} = \frac{n(n-1)(n-2)!}{2(n-2)!}$

$\Rightarrow$ 2m = n(n - 1).

32.

(b) 64

Explanation: $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$

$\Rightarrow \frac{8\times7}{8\times7\times(6!)} + \frac{8}{8\times(7!)} = \frac{x}{8!}$

$\Rightarrow \frac{56}{8!} + \frac{8}{8!} = \frac{x}{8!}$

$\Rightarrow$ x = 56 + 8 = 64

33.

(c) 60

Explanation: When E and I have 3 letters in between, which are possible in 1 way whereas other 3 letters are arranged in 3!,

So, the number of arrangements = 1 $\times$ 3! = 6

Thus, total number of arrangements = 24 + 18 + 12 + 6 = 60

34.

(b) 52

Explanation: Numbers with 0 at units place $= (5 \times 4 \times 1) = 20$

Numbers with 2 at units place $= (4 \times 4 \times 1) = 16$

Numbers with 4 at units place $= (4 \times 4 \times 1) = 16$

Total numbers = (20 + 16 + 16) = 52

35.

(d) 60 $\times$ 5!

Explanation: As, it is required that, two particular persons A and B there are always two persons so, let us consider this arrangement be “A $\times$ B” and consider it as a single object.

So, we are left with, 4 persons and an object, i.e. total 5 objects.

Now, this 5 objects can be arranged in 5! ways.

Again, the two ‘×’ are to be filled with 2 persons from 6 persons, this can be done in ${}^6P_2$ = 30 ways.

Two persons ‘A’ and ‘B’ can be arranged in 2! = 2 ways.

So, the total number of different ways in which 8 persons can stand in a row so that between two particular persons A and B there are always two persons, is = 5! $\times$ 30 $\times$ 2

= 5! $\times$ 60

36.

(d) 420

Explanation: He may select:

i. (3 out of 7 from A) and (5 out of 5 from B) or
ii. (4 out of 7 from A) and (4 out of 5 from B) or
iii. (5 out of 7 from A) and (3 out of 5 from B).

The number of ways of these selections are:

i. ${}^7C_3 \times^5 C_5 = (35 \times 1)$ = 35
ii. ${}^7C_4 \times^5 C_4 = (35 \times 5)$ = 175
iii. ${}^7\mathrm{C}_5 \times^5 \mathrm{C}_3 = (21 \times 10)$ = 210.

$\therefore$ Required number of ways = (35 + 175 + 210) = 420.

37.

(c) $8 \times 9!$

Explanation: The number of ways in which 10 books may be arranged = 10 !

Number of ways in which 10 books may be arranged with two particular books together $= (2 \times 9!)$

Required number of ways in which 2 particular books are never together

$= (10!) - (2 \times 9!) = (10 \times 9!) - (2 \times 9!) = (8 \times 9!)$

38.

(c) 64

Explanation: We have, a coin has Head and Tail (H, T)

$\therefore$ When a coin is tossed 6 times, then the

Possible outcome = 2^6 = 64

39.

(b) 816

Explanation: r + r - 10 = 20 [$\because {}^nC_x =^n C_y \Rightarrow$ n = x + y or x = y]

$\Rightarrow$ 2r - 10 = 20

$\Rightarrow$ 2r = 30

$\Rightarrow$ r = 15

Now,

${}^{18}C_r =^{18} C_{15}$

$\therefore {}^{18}C_{15} =^{18} C_3$

$\therefore {}^{18}C_3$ = $\frac{18}{3} \times \frac{17}{2} \times 16$ = 816.

40.

(b) 120

Explanation: Keeping EN together and considering it as one letter, we have to arrange 5 letters at 5 places.

This can be done in ${}^5P_5$ = 5 ! = 120 ways.

41.

(b) 70

Explanation: We have 38808 = $2^3 3^2 7^2 11^1$

To form factors we have to do selections from a lot of 2's, 3's, 7's and 11's and multiply them together.

Number of ways of selecting any number of 2's from a lot of 3 identical 2's = 4(select 0, select 1, select 2, select 3)

Number of ways of selecting any number of 3's from a lot of 2 identical 3's = 3(select 0, select 1, select 2)

Number of ways of selecting any number of 7's from a lot of 2 identical 7's = 3(select 0, select 1, select 2)

Number of ways of selecting any number of 11's from a lot of 1 identical 11's = 2(select 0, select 1)

Hence we get the total number of ways of selecting factors = 4 $\times$ 3 $\times$ 3 $\times$ 2 = 72

Hence the number of factors other than 1 and n = 72 - 2 = 70

42.

(b) 11760

Explanation: We have to select 2 posts out of 7 SC and 3 posts out of 16.

Required number of ways $= ({}^7C_2 \times^{16} C_3) = \left(\frac{7 \times 6}{2} \times \frac{16 \times 15 \times 14}{3 \times 2 \times 1}\right)$ = 11760.

43.

(c) $\frac{52!}{4!(13!)^4}$

Explanation: If 4n things are to form 4 equal groups then the numbers of ways are $\frac{4n!}{(n!)^4.4!}$

Hence number of ways to divide 52 cards to form 4 groups of 13 cards each = $\frac{(52)!}{4!(13!)^4}$

44.

(b) 11

Explanation: We have an n sided polygon has n vertices. If you join every distinct pair of vertices you will get lines. These lines account for the n sides of the polygon as well as for the diagonals.

So the number of diagonals is given by ${}^nC_2 - n = \frac{n(n-1)}{2} - n = \frac{n(n-3)}{2}$

But number of diagonals = 44

$\Rightarrow$ 44 = $\frac{n(n-3)}{2}$

$\Rightarrow$ 88 = n(n - 3)

$\Rightarrow$ n^2 - 3n - 88 = 0

$\Rightarrow$ (n - 11)(n + 8) = 0

$\Rightarrow$ n = 11, -8

Since n cannot be negative, we get n = 11

45.

(d) 60

Explanation: There are in all 5 letters out of which there are 2P, 1A, 1L and IE

$\therefore$ required number of ways $= \frac{5!}{(2!)(1!)(1!)(1!)}$ = 60.

46.

(c) 20

Explanation: Let us arrange the white balls (shown by W) and leave a space in between every pair as shown below.

X W X W X W X W X W X

Now, 3 black balls may be arranged in 6 places in ${}^6C_3$ ways = $\frac{6\times5\times4}{3\times2\times1} = 20$.

47.

(d) 420

Explanation: There are 7 digits 1, 2, 3, 2, 3, 3, 4, in which the number 2 is repeating twice and the number 3 is repeating thrice.

Hence the number of 7 digit numbers which can be formed = $\frac{7!}{2!3!} = \frac{1\times2\times3\times4\times5\times6\times7}{1\times2\times1\times2\times3}$ = 420

48.

(b) 210

Explanation: ${}^7p_3 = \frac{7!}{(7-3)!} = \frac{7\times6\times5\times(4!)}{4!}$ = 210.

49.

(d) 40320

Explanation: The word LAUGHTER consists of 8 letters which are all distinct.

Hence the required number of arrangements = ${}^8P_8 = 8!$ = 40320

50.

(d) 40

Explanation: Number of line segments formed by joining pairs of points out of 10

$= {}^{10}C_2 = \frac{10\times9}{2} = 45$

Number of line segments formed by joining pairs of 4 points $= {}^4C_2 = \frac{4\times3}{2} = 6$

But, these points being collinear give only one line

$\therefore$ Required number of line segments = (45 - 6 + 1) = 40

51. **(a)** 12

Explanation: All S's can be placed either at even places or at odd places, i.e. in 2 ways.

The remaining letters can be placed at the remaining places in 3!, i.e. in 6 ways.

$\therefore$ Total number of ways = 6 $\times$ 2 = 12

52.

(c) 12

Explanation: ${}^nC_3$ = 220

$\Rightarrow \frac{n(n-1)(n-2)}{6}$ = 220

$\Rightarrow$ n(n - 1) (n - 2) = 1320

$\Rightarrow$ n = 12 $[\because 12 \times 11 \times 10 = 1320]$

53. **(a)** 720

Explanation: Thousands place can be filled by any of the 6 nonzero digits.
So, there are 6 ways to fill this place.
Hundreds place can be filled by any of the remaining 6 digits.
So, there are 6 ways to fill this place.
Tens place can be filled by any of the remaining 5 digits.
So, there are 5 ways to fill this place.
Units place can be filled by any of the remaining 4 digits.
So, there are 4 ways to fill this place.
Required number of numbers $= (6 \times 6 \times 5 \times 4)$ = 720

54.

(d) 666660

Explanation: First we will fix anyone digit in a fixed position. Then we have the remaining 4 digits can be arranged in 4! different ways.
Which means each of the five digits can appear in each of the five places in 4! times.
Hence the sum of the digits in each position is 4!(1 + 3 + 5 + 7 + 9)
Now to find the sum of these numbers formed we have to consider the place values for these digits
So the sum of all the numbers which can be formed by using the digits 1, 3, 5, 7, 9 = 25 $\times$ 4! $\times$ (1 + 10 + 100 + 1000 + 10000)
= 25 $\times$ 4! $\times$ 11111 = 666660

55.

(c) 9

Explanation: ${}^{n-1}P_3 \quad : \quad {}^nP_4 \quad = 1 : 9$

$$\Rightarrow \frac{(n-1)!}{(n-1-3)!} : \frac{n!}{(n-4)!} = 1 : 9$$

$$\Rightarrow \frac{(n-1)!}{(n-4)!} \times \frac{(n-4)!}{n!} = \frac{1}{9}$$

$$\Rightarrow \frac{(n-1)!}{n!} = \frac{1}{9}$$

$$\Rightarrow \frac{(n-1)!}{n(n-1)!} = \frac{1}{9}$$

$$\Rightarrow \frac{1}{n} = \frac{1}{9}$$

$$\Rightarrow n = 9$$

56.

(d) 120

Explanation: Number of commottes that can be formed = ${}^6C_3 \times {}^4C_2$

= $\frac{6!}{3!3!} \times \frac{4!}{2!2!}$

= $\frac{6\times5\times4}{3\times2} \times \frac{4\times3}{2}$

= 120.

57. **(a)** 1260

Explanation: Total number of discs = 9
Out of which red-4, yellow -3 and green -2 are of the same kind.
Hence required number of permutations =$\frac{9!}{4!.3!.2!} = \frac{5\times6\times7\times8\times9}{1\times2\times3\times1\times2}$ = 1260

58.

(c) 1080

Explanation: Since we have to form a four-digit number using the digits 0, 2, 3, 5, 8, 9, we can fill the first place by any of the five digits given other than zero.
Now since the digits can be repeated the second, third and fourth places can be filled by any of the six given digits.

Hence the four places can be filled together in 5 $\times$ 6 $\times$ 6 $\times$ 6 = 1080 different ways
Therefore the number of four-digit numbers which can be formed using the given digits = 1080

59.

(b) 144

Explanation: Total number of letters in the 'ARTICLE' is 7 out which A, E, I are vowels and R, T, C, L are consonants
Given that vowels occupy even place
$\therefore$ possible arrangement can be shown as below
C, V, C, V, C, V, C i.e.on 2nd, 4th and 6th places

Thus, number of arrangement = $^3P_3$ = 3! = 6 ways

Now consonants can be placed at 1, 3, 5 and 7th place

$\therefore$ Number of arrangement = $^4P_4$ = 4! = 24

Thereforethe total number of arrangements = 6 $\times$ 24 = 144

60.

(b) 35

Explanation: Since all the plus signs are identical, we have the number of ways in which 6 plus signs can be arranged = 1.
Now we will have 7 empty slots between these 6 identical + signs
Hence the number of possible places of - sign = 7
Therefore the number of ways in which the 4 minus sign can take any of the possible 7 places = $^7C_4 = \frac{7!}{4!(7-4)!} = \frac{5.6.7}{1.2.3} = 35$

61.

(c) 63

Explanation: There are three multiple choice question, each has four possible answers. Thus, the total number of possible answers will be 4 $\times$ 4 $\times$ 4 = 64. Out of these possible answer only one will be correct and therefore, the number of ways in which a student can fail to get correct answer is 64 - 1 = 63.

62.

(d) 94

Explanation: According to the question , we can state,
We have, Number of men = 4
Number of women = 6
We are given that the committee includes 2 men and exactly twice as many women as men.

Thus, the possible selection can be 2 men and 4 women and 3 men and 6 women.

Therefore,the number of committee = $^4C_2 \times {}^6C_4 + {}^4C_3 \times {}^6C_6$

= 6 $\times$ 15 + 4 $\times$ 1 = 90 + 4 = 94

63.

(d) 900

Explanation: The hundreds place can be filled by any of the 9 non zero digits.
So, there are 9 ways of filling this place. The tens place can be filled by any of the 10 digits.
So, there are 10 ways of filling it.
The units place can be filled by any of the 10 digits. So, there are 10 ways of filling it.
$\therefore$ total number of 3-digit numbers $= (9 \times 10 \times 10)$ = 900

64.

(b) $^{12}C_8 - ^{10}C_6$

Explanation: A host lady can invite 8 out of 12 people in $^{12}C_8$ ways.
Two out of these 12 people do not want to attend the party together.
$\therefore$ Number of ways = $^{12}C_8 - {}^{10}C_6$.

65.

(d) 24

Explanation: $^nC_p = {}^nC_q$

$\Rightarrow$ p + q = n

$\therefore {}^nC_{10} = {}^nC_{14}$
$\Rightarrow$ n = (10 + 14) = 24

66.

(c) 12
Explanation: $\frac{1}{2}n(n-3) = 54$
$\Rightarrow$ n(n - 3) = 108
$\Rightarrow n^2 - 3n - 108 = 0$
$\Rightarrow n^2 - 12n + 9n - 108 = 0$
$\Rightarrow$ n (n -12) + 9 (n -12) = 0
$\Rightarrow$ (n - 12) (n + 9) = 0
$\Rightarrow$ n = 12. as n cannot take negative values.

67. **(a)** 25200
Explanation: Number of ways of selecting 3 consonants out of 7 and 2 vowels out of 4
$= \left({}^7C_3 \times {}^4C_2\right) = \left(\frac{7\times6\times5}{3\times2\times1} \times \frac{4\times3}{2\times1}\right)$ = 210.
Now, 5 letters can be arranged among themselves in 5 ! ways = 120 ways.
Required number of words = (210 $\times$ 120) = 25200

68. **(a)** 2^{10}
Explanation: You can either choose true or false, therefore for 10 questions you will have 2^{10} possibilities.

69.

(d) ${}^{(m+n+k)}C_3 - {}^mC_3 - {}^nC_3 - {}^kC_3$
Explanation: Here, we know that the total number of points are (m + n + k) which must give ${}^{(m+n+k)}C_3$ number of triangles but m points on l_1 taking 3 points at a time gives ${}^mC_3$ combinations which produce no triangle. Similarly, ${}^nC_3$ and ${}^kC_3$ number of triangles can not be formed. Thus, the required number of triangles is ${}^{(m+n+k)}C_3 - {}^mC_3 - {}^nC_3 - {}^kC_3$.

70.

(c) 72
Explanation: We have, 6 objects {B}, {H}, {A}, {R}, {A}, {T} and there are 2 A's.
So, the words can be formed out of the letters of the word ‘BHARAT’ taking 3 at a time can be done in 2 ways:
Case-1: When all the letters are distinct.
We have, 5 distinct letters, out of which taking three at a time, the number of words that can be formed = ${}^5P_3$
$= \frac{5!}{(5-3)!}$
$= \frac{5!}{2!}$ = 60
Case-2: When 2 A’s are selected.
So, we have, 2A’s and 1 letter is to select out of the 4 distinct letters, which can be done in = ${}^4P_1$
$= \frac{4!}{(4-1)!}$
$= \frac{4!}{3!}$ = 4 ways.
Now, the 3 letters can be arranged among themselves, but there are 2 A’s, so the number of ways in which arrangement can be done is
$= \frac{3!}{2!}$ = 3
So, in this case, the total number of words that can be formed = 4 $\times$ 3 = 12
The number of arrangements of the letters of the word BHARAT taking 3 at a time is = (60 + 12) = 72

71.

(c) 20
Explanation: No. of diagonals in a polygon of n sides = $\frac{1}{2}n(n-3)$,
Put n = 8, we get 20.

72.

(d) $\frac{n-r+1}{r}$

Explanation: $\frac{{}^nC_r}{{}^nC_{r-1}} = \frac{n!}{(r!)\times(n-r)!} \times \frac{(r-1)!\times(n-r+1)!}{n!}$
$= \frac{(r-1)!\times(n-r+1)\times(n-r)!}{r\cdot(r-1)!\times(n-r)!} = \frac{(n-r+1)}{r}$

73.

(b) 156

Explanation: We need at least three points to draw a circle that passes through them.

Now, number of circles formed out of 11 points by taking three points at a time = ${}^{11}C_3$ = 165

Number of circles formed out of 5 points by taking three points at a time = ${}^5C_3$ = 10

It is given that 5 points lie on one circle.

∴ Required number of circle = 165 - 10 + 1 = 156

74.

(c) 3600

Explanation: Out of 6 periods, 5 may be arranged for 5 subjects in ${}^6P_5$ ways.

Remaining 1 period may be arranged for any one of the five subjects in ${}^5P_1$ ways,

∴ required number of ways $= \left({}^6P_5 \times {}^5P_1\right) = (6 \times 5 \times 4 \times 3 \times 2 \times 5)$ = 3600

75.

(d) 3^{12} - 1

Explanation: Since a student can solve each question in 3 different ways - either he can attempt the first alternative or the second alternative or he can leave it unanswered.

Hence the number of ways in which a student can attempt one or more of the 12 given questions = 3^{12}

Now we can consider a case that the student leaves all the 12 given questions unanswered.

The number of ways, in which a student can select one or more questions out of 12 each having an alternative = 3^{12} - 1