Book For

Railway Recruitment Board

Permutation and Combination

Q. 1 **How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?**

[A] 5

[B] 10

[C] 15

[D] 20

Answer Option [D]

Explanation:
Since each desired number is divisible by 5, so we must have 5 at the unit place. So, there is 1 way of doing it.
The tens place can now be filled by any of the remaining 5 digits (2, 3, 6, 7, 9). So, there are 5 ways of filling the tens place.
The hundreds place can now be filled by any of the remaining 4 digits. So, there are 4 ways of filling it.
∴ Required number of numbers = (1 x 5 x 4) = 20.

Q. 2 **From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?**

[A] 564

[B] 645

[C] 735

[D] 756

[E] None of these

Answer Option [D]

Explanation:
We may have (3 men and 2 women) or (4 men and 1 woman) or (5 men only).

∴ Required number of ways $= ({}^{7}C_3 \times {}^{6}C_2) + ({}^{7}C_4 \times {}^{6}C_1) + ({}^{7}C_5)$

$$= \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{6 \times 5}{2 \times 1}\right) + ({}^{7}C_3 \times {}^{6}C_1) + ({}^{7}C_2)$$

$$= 525 + \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times 6\right) + \left(\frac{7 \times 6}{2 \times 1}\right)$$

$= (525 + 210 + 21)$

$= 756.$

Q. 3 **How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed?**

[A] 40

[B] 400

[C] 5040

[D] 2520

Answer Option [C]

Explanation:
'LOGARITHMS' contains 10 different letters.

Required number of words = Number of arrangements of 10 letters, taking 4 at a time.

$= {}^{10}P_4$

$= (10 \times 9 \times 8 \times 7)$

= 5040.

Q. 4 **In how many ways a committee, consisting of 5 men and 6 women can be formed from 8 men and 10 women?**

[A] 266

[B] 5040

[C] 11760

[D] 86400

[E] None of these

Answer Option [C]

Explanation:

Required number of ways $= ({}^{8}C_5 \times {}^{10}C_6)$

$= ({}^{8}C_3 \times {}^{10}C_4)$

$= \left(\frac{8 \times 7 \times 6}{3 \times 2 \times 1} \times \frac{10 \times 9 \times 8 \times 7}{4 \times 3 \times 2 \times 1}\right)$

$= 11760.$

Q. 5 **In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?**

[A] 810

[B] 1440

[C] 2880

[D] 50400

[E] 5760

Answer Option [D]

Explanation:

In the word 'CORPORATION', we treat the vowels OOAIO as one letter.
Thus, we have CRPRTN (OOAIO).
This has 7 (6 + 1) letters of which R occurs 2 times and the rest are different.

Number of ways arranging these letters $= \frac{7!}{2!} = 2520.$

Now, 5 vowels in which O occurs 3 times and the rest are different, can be arranged in $\frac{5!}{3!} = 20$ ways.

$\therefore$ Required number of ways = (2520 x 20) = 50400.

Q. 6 **In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?**

[A] 63

[B] 90

[C] 126

[D] 45

[E] 135

Answer Option [A]

Explanation:

Required number of ways = $({}^{7}C_5 \times {}^{3}C_2) = ({}^{7}C_2 \times {}^{3}C_1) = \left(\frac{7 \times 6}{2 \times 1} \times 3\right) = 63.$

Q. 7 **A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?**

[A] 32

[B] 48

[C] 64

[D] 96

[E] None of these

Answer Option [C]

Explanation:

We may have(1 black and 2 non-black) or (2 black and 1 non-black) or (3 black).

$\therefore$ Required number of ways $= ({}^{3}C_1 \times {}^{6}C_2) + ({}^{3}C_2 \times {}^{6}C_1) + ({}^{3}C_3)$

$$= \left(3 \times \frac{6 \times 5}{2 \times 1}\right) + \left(\frac{3 \times 2}{2 \times 1} \times 6\right) + 1$$

$$= (45 + 18 + 1)$$

$$= 64.$$

Q. 8 **In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?**

[A] 120

[B] 720

[C] 4320

[D] 2160

[E] None of these

Answer Option [B]

Explanation:

The word 'OPTICAL' contains 7 different letters.
When the vowels OIA are always together, they can be supposed to form one letter.
Then, we have to arrange the letters PTCL (OIA).
Now, 5 letters can be arranged in 5! = 120 ways.
The vowels (OIA) can be arranged among themselves in 3! = 6 ways.
$\therefore$ Required number of ways = (120 x 6) = 720.

Q. 9 **In how many ways can the letters of the word 'LEADER' be arranged?**

[A] 72

[B] 144

[C] 360

[D] 720

[E] None of these

Answer Option [C]

Explanation:
The word 'LEADER' contains 6 letters, namely 1L, 2E, 1A, 1D and 1R.

$\therefore$ Required number of ways = $\frac{6!}{(1!)(2!)(1!)(1!)(1!)}$ = 360.

Q. 10 **In how many different ways can the letters of the word 'DETAIL' be arranged in such a way that the vowels occupy only the odd positions?**

[A] 32

[B] 48

[C] 36

[D] 60

[E] 120

Answer Option [C]

Explanation:
There are 6 letters in the given word, out of which there are 3 vowels and 3 consonants.
Let us mark these positions as under:
(1) (2) (3) (4) (5) (6)
Now, 3 vowels can be placed at any of the three places out 4, marked 1, 3, 5.
Number of ways of arranging the vowels = ${}^3P_3 = 3! = 6$.
Also, the 3 consonants can be arranged at the remaining 3 positions.
Number of ways of these arrangements = ${}^3P_3 = 3! = 6$.
Total number of ways = (6 x 6) = 36.

Q. 11 **In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?**

[A] 159

[B] 194

[C] 205

[D] 209

[E] None of these

Answer Option [D]

Explanation:
We may have (1 boy and 3 girls) or (2 boys and 2 girls) or (3 boys and 1 girl) or (4 boys).

$\therefore$ Required number of ways $= ({}^6C_1 \times {}^4C_3) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_4)$

$= ({}^6C_1 \times {}^4C_1) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_2)$

$= (6 \times 4) + \left(\frac{6 \times 5}{2 \times 1} \times \frac{4 \times 3}{2 \times 1}\right) + \left(\frac{6 \times 5 \times 4}{3 \times 2 \times 1} \times 4\right) + \left(\frac{6 \times 5}{2 \times 1}\right)$

$= (24 + 90 + 80 + 15)$

= 209.

Q. 12 **In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?**

[A] 360

[B] 480

[C] 720

[D] 5040

[E] None of these

Answer Option [C]

Explanation:
The word 'LEADING' has 7 different letters.
When the vowels EAI are always together, they can be supposed to form one letter.
Then, we have to arrange the letters LNDG (EAI).
Now, 5 (4 + 1 = 5) letters can be arranged in 5! = 120 ways.
The vowels (EAI) can be arranged among themselves in 3! = 6 ways.
∴ Required number of ways = (120 x 6) = 720.

Q. 13 **In how many different ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together?**

[A] 10080

[B] 4989600

[C] 120960

[D] None of these

Answer Option [C]

Explanation:
In the word 'MATHEMATICS', we treat the vowels AEAI as one letter.
Thus, we have MTHMTCS (AEAI).
Now, we have to arrange 8 letters, out of which M occurs twice, T occurs twice and the rest are different.
∴ Number of ways of arranging these letters = $\frac{8!}{(2!)(2!)}$ = 10080.

Now, AEAI has 4 letters in which A occurs 2 times and the rest are different.
Number of ways of arranging these letters = $\frac{4!}{2!}$ = 12.

∴ Required number of words = (10080 x 12) = 120960.

Q. 14 **Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?**

[A] 210

[B] 1050

[C] 25200

[D] 21400

[E] None of these

Answer Option [C]

Explanation:

Number of ways of selecting (3 consonants out of 7) and (2 vowels out of 4)

$= ({}^{7}C_3 \times {}^{4}C_2)$

$= \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{4 \times 3}{2 \times 1} \right)$

$= 210.$

Number of groups, each having 3 consonants and 2 vowels = 210.

Each group contains 5 letters.

Number of ways of arranging 5 letters among themselves $= 5!$

$= 5 \times 4 \times 3 \times 2 \times 1$

$= 120.$

$\therefore$ Required number of ways = (210 x 120) = 25200.