**PERMUTATIONS AND COMBINATIONS**

**Difference between permutation and combination**  
  
**What is permutation?**  
**Permutation:**The various ways of arranging a given number of things by taking some or all at a time are all called as permutations.

**In permutation, objects are to be arranged in particular order. It is denoted by nP ror P(n, r).**  
**Example:**Arrange the given 3 numbers 1, 2, 3 by taking two at a time.  
Now these numbers can be arranged in 6 different ways**: (12, 21, 13, 31, 23, 32).**

Here,  
12 and 21, 13 and 31 or 23 and 32 do not mean the same, because here order of numbers is important.

**What is combination?**  
**Combination:**Each of different groups or selections formed by taking some or all number of objects is called a combination.  
Combination is used in different cases which include team/group/committee.  
**In combination, objects are selected randomly and here order of objects doesn’t matter.** It is denoted by**nC ror C (n, r)**  
**Example:**If we have to select two girls out of 3 girls X, Y, Z, then find the number of combinations possible.  
Now only two girls are to be selected and arranged. Hence, this is possible in 3 different ways: **(XY, YZ, XZ,).**  
Here,  
You cannot make a combination as XY and YX, because these combinations mean the same.

**Factorial n!:**It is the product of all positive integers less than or equal to n.  
Example: 4! = 4 × 3 × 2 × 1 = 24

**Important Formulae:**  
  
**1)**nCn = nC0 = 1

**2)**nCn – 1 = nC1 = n

**3)**nCr = n Cn –r **4)**0! = 1

**5)**n! = n (n – 1)!

|  |  |
| --- | --- |
| **6)** nPr = | n! |
| (n-r)! |
| **7)** nCr = | n! |
|  |
|  | r! (n-r)! |

**Types of Questions**

**Type 1: Permutation**

1. Find the value of 50P2
2. Find the number of ways the letters of the word ‘RUBBER can be arranged?
3. Find in how many different ways, the letters of the word ‘LEADING’ can be arranged in such way that the vowels always come together?

**Type 2: Combination**

1. Find the value of 20C17
2. Out of 5 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?
3. A bag contains 2 white marbles, 3 black marbles and 4 red marbles. Find in how many ways, 3 marbles can be drawn, so that at least one black marble is included in each draw?

**PRACTICE QUESTIONS**

1. 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?
2. In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?
3. 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?
4. How many ways can the letters of the word “ORANGE” be arranged, in such a way that O and A are always together?
5. How many ways can the letters of the word “ORANGE” be arranged, in such a way that O and A are never together?
6. Find the permutation and combination given n = 8 and r = 5.
7. **How many 3-letter words can be formed using the letters from the word “FABLE”?**
8. **How many ways are there to arrange the letters in the word “MISSISSIPPI”?**