Permutation and Combination

Important Tips & Tricks:

Factorial

The continued product of first 'n' natural numbers is called the 'n factorial' and is denoted by

\[ n! = 1 \times 2 \times 3 \times 4 \times \ldots \ldots \times (n-1) \times n \]

Ex : 4! = 1 \times 2 \times 3 \times 4

1. nPr = \frac{n!}{(n-r)!}

2. nPn = n!

3. nP1 = n

1. nCr = \frac{n!}{(r! \times (n-r)!)}

2. nC1 = n

3. nC0 = 1 = nCn

4. nCr = nCn-r

5. nCr = \frac{nPr}{r!}

The number of all permutations of n distinct items or objects taken 'r' at a time is \( n(n-1)(n-2)\ldots \ldots \ldots (n-(r-1)) = n^P_r \)

The number of all permutations of n distinct objects taken all at a time is n!
• The number of ways of selecting $r$ items or objects from a group of $n$ distinct items or objects is

\[ \binom{n}{r} = \frac{n!}{(n-r)!r!} \]

• If there are $n$ subjects of which $p_1$ are alike of one kind; $p_2$ are alike of another kind; $p_3$ are alike of third kind and so on and $p_r$ are alike of $r^{th}$ kind, such that $\left(p_1 + p_2 + \ldots + p_r\right) = n$.

Then, number of permutations of these $n$ objects is

\[ \frac{n!}{(p_1!)(p_2!)(p_3!)\ldots(p_r!)} \]

• The number of all combinations of $n$ things, taken $r$ at a time is:

\[ \binom{n}{r} = \frac{n!}{(r!)(n-r)!} = \frac{n(n-1)(n-2)\ldots \text{to } r \text{ factors}}{r!} \]