

Class XI Mathematics

Combination: Theory

➤ Differences between Permutations and Combination

1. In combination only selection is made, whereas in permutation arrangement in definite order is considered after making the selection
2. In combination the order of selected objects is immaterial, whereas in permutation, the ordering is essential.

For example **AB** and **BA** are essentially same in combination, but different in permutation

3. Each combination corresponds to many permutations

For example, the six permutations: ABC, BCA, ACB, BAC, CBA, CAB all correspond to the same combination ABC

- #### ➤ Combination: The different **SELECTION** that can be made out of a given **n** number of things taking **r** at a time is given by

$$C(n, r) \text{ or } {}^nC_r = \frac{n!}{r!(n-r)!}$$

➤ Properties of $C(n, r)$ or nC_r

1. ${}^nC_r = {}^nC_{n-r}$

2. If **n** and **r** are non-negative integers, such that $r \leq n$, then

$${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$$

3. If **n** and **r** are non-negative integers, such that $1 \leq r \leq n$,

then ${}^nC_r = \frac{n}{r} ({}^{n-1}C_{r-1})$

4. If $1 \leq r \leq n$, then $n \cdot ({}^{n-1}C_{r-1}) = (n-r+1) {}^nC_{r-1}$

5. If ${}^nC_x = {}^nC_y \Rightarrow x = y$ or $x + y = n$