

Combinations

Definition.

Each of the different groups or selections which can be formed by taking some or all of a number of objects, irrespective of their arrangements, is called a combination.

Suppose we want to select two out of three persons A, B and C.

We may choose AB or BC or AC.

Clearly, AB and BA represent the same selection or group but they give rise to different arrangements.

Clearly, in a group or selection, the order in which the objects are arranged is immaterial.

Notation: The number of all combinations of n things, taken r at a time is denoted by $C(n, r)$ or

$${}^n C_r \text{ or } \binom{n}{r}.$$

(1) **Difference between a permutation and combination :** (i) In a combination only selection is made whereas in a permutation not only a selection is made but also an arrangement in a definite order is considered.

(ii) In a combination, the ordering of the selected objects is immaterial whereas in a permutation, the ordering is essential. For example A, B and B, A are same as combination but different as permutations.

(iii) Practically to find the permutation of n different items, taken r at a time, we first select r items from n items and then arrange them. So usually the number of permutations exceeds the number of combinations.

(iv) Each combination corresponds to many permutations. For example, the six permutations ABC, ACB, BCA, BAC, CBA and CAB correspond to the same combination ABC.

Note: Generally we use the word 'arrangements' for permutations and word "selection" for combinations.