

**Permutation**

When you have to choose from a set of elements in a way that the order in which you choose is significant, we call it a permutation.

For instance, if I have to select two office-bearers in a club, where the first person I select becomes the President and the second Vice-President, such a selection is a permutation. This is so, because the order of selection matters.

**Formula for permutation**

If I require  $r$  elements from a total number of  $n$  elements and I know that it is a permutation, I can denote it as  ${}^n P_r$  which is given by the formula:

$${}^n P_r = \frac{n!}{(n-r)!}$$

**Combination**

When you have to choose from a set of elements in a way that the order in which you choose is not significant, we call it a combination.

For instance, if I have to select two office-bearers in a club, where they both become Vice-Presidents, such a selection is a combination. This is so, because the order of selection does not matter.

**Formula for combination**

If I require  $r$  elements from a total number of  $n$  elements and I know that it is a combination, I can denote it as  ${}^n C_r$  which is given by the formula:

$${}^n C_r = \frac{n!}{(n-r)!r!}$$

**Repetition**

In the case of permutations as well as combinations, once an element has been chosen, the same element cannot be chosen again.

For instance, if I have to choose two winners from amongst  $A$ ,  $B$ ,  $C$ ,  $D$  and  $E$ , I cannot say that the two winners are  $A$  and  $A$ .

**Technique for determining the number of ways something can be done with repetition**

If I am given a set of elements to choose from and I have to make a selection, one of the fundamental ways of doing so is by virtue of place values. For example, if I have to find out how many 4-digit numbers can be created using the digits 4, 5, 6, 7, 8, 9, such that the numbers are greater than 5000.

First, we determine that this is a situation where repetition is allowed, as two digits in the given four-digit number can have the same value. For instance, the number could be 5975.

Since there are four-digits, I can say that there are four places that I need to fill with values

<i>First Place</i>	<i>Second Place</i>	<i>Third Place</i>	<i>Fourth Place</i>
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