PROBABILITY

Before we turn our focus to probability, it is important to understand some basic tools that form its essential building blocks.

One of the key things that you need to master is the idea of the two major counting principles – **permutations and combinations**. Knowing these two concepts will enable you to calculate the probability for a given scenario or events that you are interested in. We will start by understanding the concept of ‘permutations’.

# PERMUTATIONS:

A permutation is a way of arranging a select group of objects in such a way that the order is of significance. For example, when you arrange the top order batsmen of a cricket team, you use permutation to find all the possible orders in which they can be arranged. The following list shows some other examples where permutation is used to count the number of ways in which a particular sequence of events can occur:

* Finding all possible four-letter words that can be formed using the alphabets R, E, A and D
* Finding all possible ways in which the final league standings of the eight teams can be in an Indian Premier League (IPL) tournament.
* Finding all possible ways that a group of 10 people can be seated in a row in a cinema hall, and so on

Generally speaking, if there are **n** 'objects' that are to be arranged among **r** available 'spaces', then the number of ways in which this task can be completed is **n!/(n-r)!**. If there are **n** 'spaces' as well, then the number of ways would be just **n!**.

**n! = n\*(n-1)\*(n-2)....\*3\*2\*1**

Question 1: Find the number of ways in which the letters of the word ‘MOSAIC’ can be rearranged to form different six-letter words.

* 30
* 100
* 720
* 320

Question 2: Again, using the letters of the word ‘MOSAIC’, can you find out how many three-letter words can be formed?

* 100
* 300
* 130
* 120

# COMBINATIONS:

The second important counting principle that you need to be aware of is the method of using **combinations**. In the case of permutations, you had considered the 'order' to be an important factor. Now, in the case of combinations, you need not take the order into account while finding the number of ways to arrange a group of objects.

When you just have to **choose** some objects from a larger set and **the order is of no significance**, then the rule of counting that you use is called **combination**.

Some examples of combinations are as follows.

* The number of ways in which you can pick three letters from the word 'ONEPIECE'
* The number of ways a team can win three matches in a league of five matches.
* The number of ways in which you can choose 13 cards from a deck of 52 cards, and so on.

The formula for counting the number of ways to choose r objects out of a set of n objects is as follows:



HINT: A helpful hint here would be to **look for a keyword** in the given scenario to know which method is needed. If the problem requires you to **order/arrange** a group of objects, then you would most probably use the method of **permutations**. Else, if you are told to **pick/choose** a group of objects, then often you would be using the formula for **combinations**.