"Counting Sample Points"

1) Rule of Multiplication:

If a compound experiment consists of two experiments such that the first experiment has exactly m distinct outcomes and if correspondingly there are exactly n distinct outcomes of 2nd experiment, then the compound experiment has exactly $\boxed{m \times n}$ outcomes.

Example:

tossing a coin has 2 outcomes and rolling a dice has exactly 6 outcomes, therefor compound experiment has exactly

$2 \times 6 = 12$ possible outcomes.

And if there are more than 2 experiments (say, K experiments), then total number of Sample points will be:

$$n(s) = n_1 \times n_2 \times n_3 \times \cdots \times n_k.$$

2) Permutation:

A permutation is any ordered subset from a set of n distinct objects. The number of permutations of r objects, selected in a ==definite order== from n distinct objects is denoted by ^nP_r. $\left(\begin{array}{c}\text{Dependent}\\\text{Case}\end{array}\right)$

Example:

from a class of 64 students, In how many ways first three positions can be chosen as 1st position, 2nd position and 3rd position.

Sol:-

$$\underline{\quad\quad} \times \underline{\quad\quad} \times \underline{\quad\quad}$$

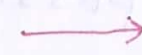| Note :-		multiply	intersection
1)	And	$\longrightarrow \times \longrightarrow$	$\cap$
2)	Or	$\longrightarrow + \longrightarrow$ Add	$\cup$ Union

$$\underline{\;64\;} \times \underline{\;63\;} \times \underline{\;62\;}$$

$$= 249,984$$

Same as:

i.e; $^{64}P_3 = 249,984$

Practice:: A club consists of 15 members. In how many ways can the three officers; president, vice-president and secretary, be chosen?

Sol:-

$$\underline{} \times \underline{} \times \underline{}$$

or

$$^{15}P_3 = 2730$$

_____

3) Combination:

A combination is any subset of r objects, selected without regard to their order, from a set of n distinct objects. The total number of such combinations is denoted by ^nC_r. (Independent Case)

Example:

From a class of 64 students, In how many ways any of three students can be chosen?

★ Groups

Sol:-

$$^{64}C_3 = 41,664.$$

③

Practice: A club consists of 15 members. In how many ways can a committee of three members be selected?

Sol:-

$$15C_3 = 455$$