Couting Sample Points

- The fundamental rule of counting, referred as multiplicaⁿ rule → If an operaⁿ can be performed in n_1 ways, and for each of these ways a second operation can be formed in n_2 ways. Then these two operaⁿs can be performed in $\boxed{n_1 \times n_2}$ ways.
- The generalized multiplicaⁿ rule covering k operations → If an opⁿ can be performed in n_1 ways, then those in n_2 ways and so on, then the sequence of operations can be performed in $\boxed{n_1 \times n_2 \times \ldots n_k}$ ways.
- A permutaⁿ is defined as an arrangement of all or a part of a set of objects.
- For any non-negative integer n, n-factorial is defined as —

$$\boxed{n! = n(n-1) \ldots (2)(1)} \quad , \quad 0! = 1$$

- The no. of permutations of n objects is $\boxed{n!}$

- The no. of permutations of n distinct objects taken r at a time is

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

- Permutations that occur by arranging objects in a circle are c/d circular permutations. The no. of permutaⁿˢ of n objects arranged in a circle is $\boxed{(n-1)!}$

- The no. of distinct permutaⁿ of n things which n_1 of 1 type, then n_2 of next type is →

$$\boxed{\frac{n!}{n_1!\, n_2! \ldots n_k!}}$$

- Often, we are concerned with the no. of ways of partitioning as a set of n objects into r subsets c/d cells.

- The no. of ways of partitioning a set of n objects into r cells with n_1 in 1st cell as so on.

$$\boxed{{}^{n}C_{n_1, n_2 \ldots n_r} = \frac{n!}{n_1!\, n_2! \ldots n_r!}}$$

$$n_1 + n_2 + \ldots n_r = n$$

- Sometimes, we are interested in the no. of ways of selecting r objects from n w/o any order. These selections are c/d combinations.
- The no. of combinaⁿ of n distinct objects taken r at a time is –

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