**Probability, Permutation and combination**: -

**Definition:-**

* Probability: -Probability is a measure of the likelihood that a particular event will occur. It is expressed as a number between 0 and 1, where 0 indicates that the event will not occur, and 1 indicates that the event will occur. The probability of an event A is denoted by P(A).
* Permutation: - Permutation refers to the arrangement of objects in a specific order. In other words, it is the number of ways to arrange a set of distinct items.
* Combination: - Combination refers to the selection of objects from a group without considering the order in which they are arranged. It focuses on choosing a subset of items from a larger set.



**Permutation without repetition: -**

* Permutations without repetition involve arranging distinct items in a specific order without repeating any item.
* Eg: - If you have three different books (A, B, C) and want to arrange two of them on a shelf, the permutations without repetition would be AB, AC, BA, BC, CA, CB.
* Formula: - 

**Permutation with repetition: -**

* Permutations with repetition involve arranging items with the possibility of repeating some items.
* Eg: - If you have three different types of ice cream (vanilla, chocolate, strawberry) and want to create a three-scoop cone, allowing for repetition, the permutations with repetition would be VVV, VVC, VVS, VCV, VCC, ..., SSS.
* Formula: -



**Probability: -**

Probability is a measure of the likelihood that a particular event will occur. It is expressed as a number between 0 and 1, where 0 indicates that the event will not occur, and 1 indicates that the event will occur. The probability of an event A is denoted by P(A).

The basic principles of probability include:

1. **Probability Scale:**

* Probabilities range from 0 to 1, where 0 means impossible, 1 means certain, and values in between represent degrees of likelihood.

1. **Sample Space and Events:**

* The sample space (S) is the set of all possible outcomes of an experiment, and an event (A) is a subset of the sample space.
* 0≤*P*(*A*)≤1 for any event A.

1. **Mutually Exclusive Events: -**

* Mutually exclusive events are events that cannot occur at the same time. In other words, if one of the mutually exclusive events happens, the other(s) cannot. The occurrence of one event excludes the occurrence of the others.

1. **Union and Intersection in probability:** -

* Union (A ∪ B): The union of two events A and B, denoted as (A∪B), represents the event that at least one of the events A or B occurs.

Mathematically, P(A∪B) is the probability of either event A or event B or both occurring.

* Intersection(A∩B): The intersection of two events A and B, denoted as A∩B, represents the event that both A and B occur simultaneously.

Mathematically, P(A∩B) is the probability of both events A and B occurring.

1. **Complementary Probability**: The probability of the complement of an event A (not A) is given by P(not A)=1−P(A).
2. **Addition Rule**: For mutually exclusive events (events that cannot occur simultaneously), the probability of either event A or event B occurring is given by P(A or B)=P(A)+P(B).
3. **Multiplication Rule**: For independent events (events that do not influence each other), the probability of both events A and B occurring is given by (A and B) =P(A)×P(B).
4. **Conditional Probability**: The probability of an event A given that another event B has occurred is denoted by P(A∣B), and it is calculated as P(B)P(A and B).