**Concepts of Probability-**

Probability theory encompasses several fundamental concepts that are crucial for understanding and working with probabilities. Here are some key concepts in probability theory:

1. Sample Space: The sample space, denoted by Ω, is the set of all possible outcomes of an experiment or random event. It represents the entire range of possible outcomes.
2. Event: An event is a subset of the sample space, representing a particular outcome or a collection of outcomes of interest. Events can be simple (consisting of a single outcome) or compound (consisting of multiple outcomes).
3. Probability: Probability is a numerical measure that quantifies the likelihood of an event occurring. It is denoted by P(A), where A is an event. Probability values range from 0 (impossibility) to 1 (certainty). The probability of an event A is calculated based on the relative frequency of its occurrence in repeated experiments or by using mathematical models.
4. Probability Distribution: A probability distribution describes the probabilities of different outcomes in the sample space. It specifies the likelihood of each event occurring. Common types of probability distributions include the uniform distribution, binomial distribution, normal distribution, and Poisson distribution.
5. Conditional Probability: Conditional probability measures the likelihood of an event A occurring given that another event B has already occurred. It is denoted by P(A|B) and is calculated as the probability of the joint occurrence of events A and B divided by the probability of event B.
6. Independence: Two events A and B are considered independent if the occurrence (or non-occurrence) of one does not affect the probability of the other. Mathematically, events A and B are independent if and only if P(A ∩ B) = P(A) \* P(B).
7. Complementary Events: The complementary event of an event A, denoted as A', is the event that consists of all outcomes in the sample space that are not in A. The probability of the complementary event is given by P(A') = 1 - P(A).
8. Union and Intersection: The union of two events A and B, denoted by A ∪ B, is the event that contains all outcomes that are in either A or B. The intersection of two events A and B, denoted by A ∩ B, is the event that contains outcomes that are in both A and B.
9. Expected Value: The expected value, also known as the mean or average, is a measure of the central tendency of a random variable. It represents the long-term average value that can be expected over a large number of trials or repetitions of an experiment.
10. Law of Large Numbers: The law of large numbers states that as the number of trials or repetitions of an experiment increases, the observed frequencies of events converge to their true probabilities. In other words, the more times an experiment is repeated, the closer the relative frequencies of events approach their expected probabilities.

These concepts form the foundation of probability theory and are essential for analyzing and predicting outcomes in uncertain or random situations. They enable probabilistic reasoning, statistical inference, and decision-making under uncertainty.