1. **Define the Bayesian interpretation of probability.**

* The Bayesian interpretation of probability views probability as a measure of the degree of belief or confidence in an event occurring, based on available evidence and prior knowledge. It's a subjective view where probabilities can be updated as new information becomes available, making it a fundamental concept in Bayesian statistics and decision theory.

1. **Define probability of a union of two events with equation.**

* The probability of the union of two events, denoted as P(A ∪ B), is defined by the equation:

P(A ∪ B) = P(A) + P(B) - P(A ∩ B)

It represents the probability that either event A or event B or both will occur.

1. **What is joint probability? What is its formula?**

* Joint probability is the probability of two or more events occurring together or simultaneously. The formula for joint probability for two events A and B is:

P(A and B) = P(A ∩ B)

In words, it's the probability that both event A and event B occur.

1. **What is chain rule of probability?**

* The chain rule of probability is a fundamental rule that allows you to calculate the probability of a series of events occurring one after the other. It's expressed as:

P(A and B) = P(A) \* P(B|A)

In words, it states that the probability of both event A and event B happening is equal to the probability of A happening, multiplied by the probability of B happening given that A has occurred. This rule can be extended to more than two events.

1. **What is conditional probability means? What is the formula of it?**

* Conditional probability is the probability of an event occurring given that another event has already occurred. It's denoted as P(A|B) and is calculated using the formula.

P(A|B) = P(A and B) / P(B)

In words, it represents the probability of event A occurring, given that event B has already occurred.

1. **What are continuous random variables?**

* Continuous random variables are variables that can take on an infinite number of possible values within a specified range or interval. They are typically associated with continuous probability distributions and can take any real value within their defined domain. Examples include measurements like height, weight, and time.

1. **What are Bernoulli distributions? What is the formula of it?**

* A Bernoulli distribution is a discrete probability distribution that models a random experiment with two possible outcomes: success (usually denoted as 1) and failure (usually denoted as 0). The probability mass function of the Bernoulli distribution is given by:

P(X = x) = p^x \* (1 - p)^(1-x)

Where:

P(X = x) is the probability that the random variable X takes on the value x (either 0 or 1).

p is the probability of success (1).

(1 - p) is the probability of failure (0).

The Bernoulli distribution is often used for modeling binary outcomes, such as the success or failure of a single trial in a random experiment.

1. **What is binomial distribution? What is the formula?**

* The binomial distribution is a discrete probability distribution that models the number of successes (usually denoted as "x") in a fixed number of independent Bernoulli trials. The formula for the probability mass function of the binomial distribution is:

P(X = x) = (n choose x) \* p^x \* (1 - p)^(n - x)

Where:

P(X = x) is the probability of getting x successes in n trials.

"n" is the number of trials.

"x" is the number of successes.

"p" is the probability of success on a single trial.

"(n choose x)" is the binomial coefficient, which represents the number of ways to choose x successes from n trials. It's calculated as "n! / (x!(n - x)!)" (read as "n choose x").

1. **What is Poisson distribution? What is the formula?**

* The Poisson distribution is a discrete probability distribution that models the number of events occurring in a fixed interval of time or space when the events are rare and random. The formula for the probability mass function of the Poisson distribution is:

P(X = x) = (e^(-λ) \* λ^x) / x!

Where:

P(X = x) is the probability of observing x events.

"λ" (lambda) is the average rate at which events occur in the given interval.

"e" is the base of the natural logarithm, approximately equal to 2.71828.

"x" is the number of events.

1. **Define covariance.**

* Covariance is a statistical measure that quantifies the degree to which two variables change together. It indicates whether they move in the same direction (positive covariance), in opposite directions (negative covariance), or independently (zero covariance).

1. **Define correlation**

* Correlation is a statistical measure that quantifies the strength and direction of the linear relationship between two variables. It provides a value between -1 and 1, where -1 indicates a perfect negative correlation, 1 indicates a perfect positive correlation, and 0 indicates no linear correlation.

1. **Define sampling with replacement. Give example.**

* Sampling with replacement is a sampling method in statistics where each item or observation selected from a population is returned to the population before the next selection. This means that the same item can be chosen more than once in the sampling process.

Example: If you have a bag of colored marbles (red, blue, and green) and you randomly select one, record its color, and then put it back in the bag before selecting the next one, you are sampling with replacement. This allows the same color to be chosen multiple times in different draws.

1. **What is sampling without replacement? Give example.**

* Sampling without replacement is a sampling method in statistics where each item or observation selected from a population is not returned to the population before the next selection. Once an item is chosen, it is not available for future selections.

Example: If you have a deck of playing cards and you draw one card from the deck, record its value, and then do not put it back in the deck before drawing the next card, you are sampling without replacement. This ensures that each card can only be selected once in the sampling process.

1. **What is hypothesis? Give example.**

* A hypothesis is a testable statement or educated guess that proposes a potential explanation for a phenomenon or observation. It serves as the basis for scientific investigation and research.

Example: Hypothesis in a scientific study - "Increased exposure to sunlight will lead to higher vitamin D levels in individuals." This hypothesis can be tested through an experiment to determine if there is a significant relationship between sunlight exposure and vitamin D levels.