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

Solution - Bayesian probability is an interpretation of the concept of probability, in which, instead of frequency or propensity of some phenomenon, probability is interpreted as reasonable expectation representing a state of knowledge or as quantification of a personal belief

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

Solution - P(A or B) = P(A) + P(B). The chance of any (one or more) of two or more events occurring is called the union of the events. The probability of the union of disjoint events is the sum of their individual probabilities.

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

Solution - The term joint probability refers to a statistical measure that calculates the likelihood of two events occurring together and at the same point in time. Put simply, a joint probability is the probability of event Y occurring while event X occurs.

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

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

Solution - The chain rule, or general product rule, calculates any component of the joint distribution of a set of random variables using only conditional probabilities. This probability theory is used as a foundation for backpropagation and in creating Bayesian networks.

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

Solution - Conditional probability is defined as the likelihood of an event or outcome occurring, based on the occurrence of a previous event or outcome.

If A and B are two events in a sample space S, then the conditional probability of A given B is defined as $P(A|B)=P(A\cap B)P(B)$, when $P(B)>0$.

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

Solution - A random variable X is continuous if possible values comprise either a single interval on the number line or a union of disjoint intervals.

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

Solution - Bernoulli distribution is a discrete probability distribution. It describes the probability of achieving a “success” or “failure” from a Bernoulli trial. A Bernoulli trial is an event that has only two possible outcomes (success or failure).

Bernoulli distribution is a discrete probability distribution where the Bernoulli random variable can have only 0 or 1 as the outcome. p is the probability of success and 1 - p is the probability of failure. The mean of a Bernoulli distribution is E[X] = p and the variance, Var[X] = p(1-p).

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

Solution -The binomial distribution is a type of probability distribution in statistics that has two possible outcomes. In probability theory, the binomial distribution comes with two parameters n and p.

$P(x) = nCx \cdot px\ (1 - p)n-x$

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

Solution - The Poisson distribution is a discrete distribution that measures the probability of a given number of events happening in a specified time period.

The formula for the Poisson distribution function is given by: $f(x) = (e^{-\lambda} \lambda x)/x!$

10. **Define covariance.**

Solution - Covariance measures the direction of the relationship between two variables. A positive covariance means that both variables tend to be high or low at the same time. A negative covariance means that when one variable is high, the other tends to be low.

11. **Define correlation**

Solution - Correlation is a statistical measure (expressed as a number) that describes the size and direction of a relationship between two or more variables.

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

Solution - Sampling with replacement can be defined as random sampling that allows sampling units to occur more than once. Sampling with replacement consists of. A sampling unit (like a glass bead or a row of data) being randomly drawn from a population (like a jar of beads or a dataset)

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

Solution - Sampling without replacement, in which a subset of the observations are selected randomly, and once an observation is selected it cannot be selected again. sampling with replacement, in which a subset of observations are selected randomly, and an observation may be selected more than once.

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

Solution - A hypothesis in a scientific context, is a testable statement about the relationship between two or more variables or a proposed explanation for some observed phenomenon.

A few examples of simple hypotheses:

"Students who eat breakfast will perform better on a math exam than students who do not eat breakfast."