1. **What is prior probability? Give an example.**

Solution - Prior probability shows the likelihood of an outcome in a given dataset. For example, in the mortgage case, P(Y|X) is called the conditional probability, which provides the probability of an outcome given the evidence, that is, when the value of X is known.

2. **What is posterior probability? Give an example.**

Solution - Posterior probability is a revised probability that takes into account new available information. For example, let there be two urns, urn A having 5 black balls and 10 red balls and urn B having 10 black balls and 5 red balls. Now if an urn is selected at random, the probability that urn A is chosen is 0.5.

3. **What is likelihood probability? Give an example.**

Solution - Likelihood probability, often referred to as the likelihood, is a fundamental concept in statistics and probability theory. It is a measure that indicates how well a statistical model or hypothesis explains the observed data.

Likelihood probability quantifies the plausibility of the observed data given a particular set of model parameters. It represents the probability of obtaining the observed data assuming that the model parameters are fixed and known.

4. **What is Naïve Bayes classifier? Why is it named so?**

Solution - The Naïve Bayes classifier is a supervised machine learning algorithm, which is used for classification tasks, like text classification. It is also part of a family of generative learning algorithms, meaning that it seeks to model the distribution of inputs of a given class or category.

Naive Bayes is called naive because it assumes that each input variable is independent.

5. **What is optimal Bayes classifier?**

Solution - Bayes Optimal Classifier is a probabilistic framework that finds the most probable prediction using the training data and space of hypotheses to make a prediction for a new data instance.

6. **Write any two features of Bayesian learning methods.**

Solution - Features of Bayesian learning methods:

– This provides a more flexible approach to learning than algorithms that eliminate a hypothesis if it is found to be inconsistent with any single example.

– a probability distribution over observed data for each possible hypothesis.

7. **Define the concept of consistent learners.**

Solution - A learner L using a hypothesis H and training data D is said to be a consistent learner if it always outputs a hypothesis with zero error on D whenever H contains such a hypothesis. By definition, a consistent learner must produce a hypothesis in the version space for H given D.

8. **Write any two strengths of Bayes classifier.**

Solution –

- It is simple and easy to implement.

- It doesn't require as much training data.
- It handles both continuous and discrete data.
- It is highly scalable with the number of predictors and data points.
- It is fast and can be used to make real-time predictions.

9. **Write any two weaknesses of Bayes classifier.**

Solution - Disadvantages of Using Naive Bayes Classifier

Zero probability problem: When we encounter words in the test data for a particular class that are not present in the training data, we might end up with zero class probabilities.

10. **Explain how Naïve Bayes classifier is used for**
1. **Text classification**

Solution - Naive Bayes text classifier is based on the Bayes's Theorem, which helps us compute the conditional probabilities of occurrence of two events based on the probabilities of occurrence of each individual event

2. **Spam filtering**

Solution - Naive Bayes classifiers work by correlating the use of tokens (typically words, or sometimes other things), with spam and non-spam e-mails and then using Bayes' theorem to calculate a probability that an email is or is not spam

3. **Market sentiment analysis**

Solution – Naive Bayes is a fairly simple group of probabilistic algorithms that, for sentiment analysis classification, assigns a probability that a given word or phrase should be considered positive or negative. Naive Bayes calculates words against each other.