BUSINESS STATISTICS & ANALYTICS

Unit 4

MBA/BBA/B.com /B.Tech /UGC Net

By

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•Probability is simply **how likely something is to happen**. Whenever we're unsure about the outcome of an event, we can talk about the probabilities of certain outcomes—how likely they are. The analysis of events governed by probability is called statistics.

Basic Probability Theory

Probability theory is **the mathematical framework that allows us to analyze chance events in a logically sound manner**. The probability of an event is a number indicating how likely that event will occur. This number is always between 0 and 1, where 0 indicates impossibility and 1 indicates certainty.

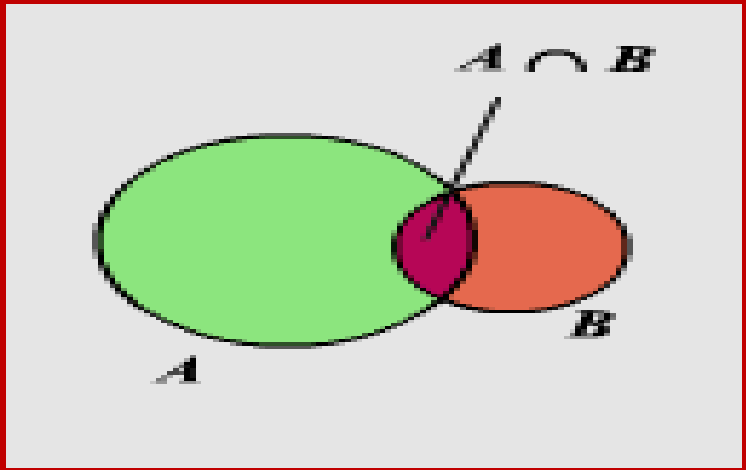
Addition and Multiplication Law

If AA and BB are two events in a probability experiment, then the probability that either one of the events will occur is:

$P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$

This can be represented in a Venn diagram as:

$P(A \cup B)=P(A)+P(B)-P(A \cap B)$



Addition Law

If you take out a single card from a regular pack of cards, what is probability that the card is either an ace or spade?

Let X be the event of picking an ace and Y be the event of picking a spade.

$$P(X) = \frac{4}{52}$$

$$P(Y) = \frac{13}{52}$$

The two events are not mutually exclusive, as there is one favorable outcome in which the card can be both an ace and spade.

$$P(X \text{ and } Y) = \frac{1}{52}$$

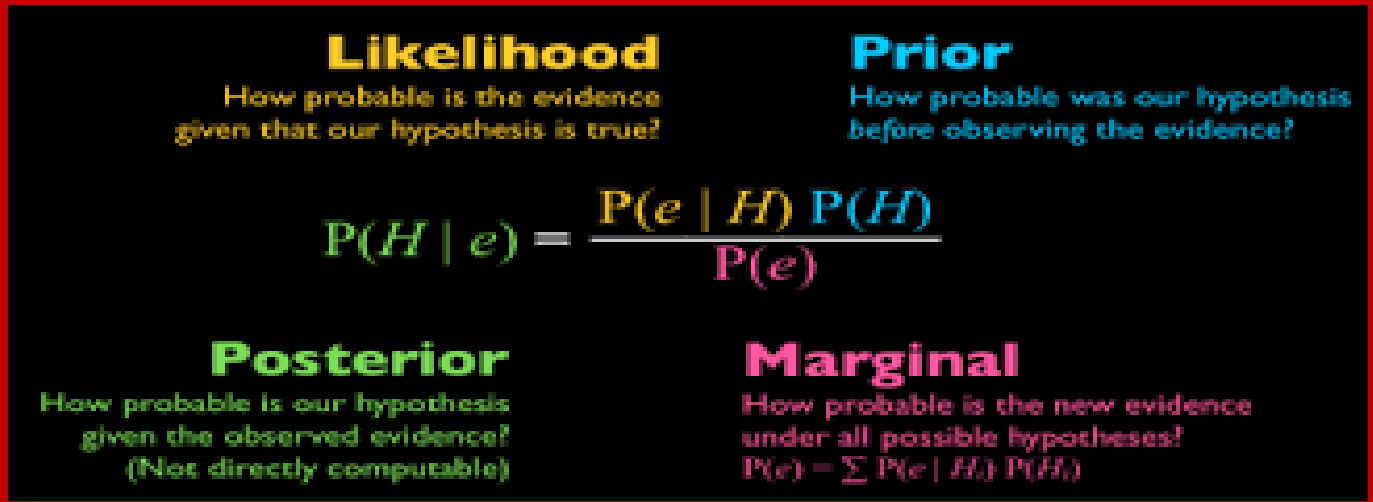
$$\begin{aligned} P(X \text{ or } Y) &= \frac{4}{52} + \frac{13}{52} - \frac{1}{52} \\ &= \frac{16}{52} \\ &= \frac{4}{13} \end{aligned}$$

Multiplication Law

According to the multiplication rule of probability, **the probability of occurrence of both the events A and B is equal to the product of the probability of B occurring and the conditional probability that event A occurring given that event B occurs**.

Baye's Theorem

Bayes' Theorem states that the conditional probability of an event, based on the occurrence of another event, is equal to the likelihood of the second event given the first event multiplied by the probability of the first event



Probability Theoretical Distributions

- **A random exponent is assumed as a model for theoretical distribution, and the probabilities are given by a function of the random variable is called probability function**. For example, if we toss a fair coin, the probability of getting a head is \frac{1}{2}.

Binomial distribution

Binomial distribution **summarizes the number of trials, or observations when each trial has the same probability of attaining one particular value**. The binomial distribution determines the probability of observing a specified number of successful outcomes in a specified number of trials.

Manufacturing company uses binomial distribution to detect the defective goods or items. In clinical trail binomial trial is used to detect the effectiveness of the drug. Moreover binomial trail is used in various field such as market research.

Poisson Distribution.

In statistics, a Poisson distribution is **a probability distribution that is used to show how many times an event is likely to occur over a specified period**. In other words, it is a count distribution.

Call centers use the Poisson distribution to model the number of expected calls per hour that they'll receive so they know how many call center reps to keep on staff. For example, suppose a given call center receives 10 calls per hour

A normal distribution is **the proper term for a probability bell curve**. In a normal distribution the mean is zero and the standard deviation is 1. It has zero skew and a kurtosis of 3.

Normal distributions are symmetrical, but not all symmetrical distributions are normal.

Normal distributions are important in statistics and are often used in the natural and social sciences **to represent real-valued random variables whose distributions are not known**. Their importance is partly due to the central limit theorem.