Class 10th

Mathematics

Probability

Introduction to Probability:

Probability

The branch of mathematics that measures the uncertainty of the occurrence of an event using numbers is called probability. The chance that an event will or will not occur is expressed on a scale ranging from 0 to 1.

It can also be represented as a percentage, where 0% denotes an impossible event and 100 % implies a certain event.

Event and outcome

An **Outcome** is a result of a random experiment. For example, when we roll a dice getting six

is an outcome.

An **Event** is a set of outcomes. For example: when we roll a dice the probability of getting a number less than four is an event.

Experimental Probability

Experimental probability can be applied to any event associated with an experiment that is repeated a large number of times.

A trial is when the experiment is performed once. It is also known as empirical probability.

Experimental or empirical probability: $P(E) = \frac{Number\ of\ trials\ in\ which\ the\ event\ happened}{Total\ number\ of\ trials}$

Theoretical Probability:

- In the theoretical approach, we predict the results without performing the experiment actually. The other name of theoretical probability is classical probability.

Theoretical Probability

$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of all possible outcomes of the experiment}}$$

Here we assume that the outcomes of the experiment are **equally likely**.

Elementary Event :

An event having only **one outcome** of the experiment is called an **elementary event**. Example: Take the experiment of tossing a coin n number of times. One trial of this experiment has two possible outcomes: Heads(H) or Tails(T).

So for an individual toss, it has only one outcome, i.e., Heads or Tails.

Sum of Probabilities :

The sum of the probabilities of all the elementary events of an experiment is one. Example : take the coin tossing experiment. P(Heads) + P(Tails) = $=\frac{1}{2}+\frac{1}{2}=1$.

Impossible event :

An event that has **no chance of occurring** is called an **Impossible event,** i.e. P(E) = 0.

E.g: Probability of getting a 8 on a roll of a die is 0. As 8 can never be an outcome of this trial.

Sure event :

An event that has a 100% probability of occurrence is called a sure event. The probability of occurrence of a sure event is one.

Example: What is the probability that a number obtained after throwing a die is less than 7?

So, P(E) = P(Getting a number less than 7) = $\frac{6}{6}=1$

Range of Probability of an event:

The range of probability of an event lies between 0 and 1 inclusive of 0 and 1, i.e.

$0 \le P(E) \le 1$.

Complementary event:

Complementary events are two outcomes of an event that are the only two possible outcomes. This is like flipping a coin and getting heads or tails. $P(E)+P(\bar{E})=1$, where E and $\bar{E}$ are the complementary events.

The event $\bar{E}$, representing **'not E '**, is called the **complement** of the event E.

Some Important Experiment and their outcomes:

Tossing a Coin:

When flipping a coin, two outcomes are possible, such as head and tail. Therefore the sample space for this experiment is given as,

S = { H, T } = { Head, Tail }

A Die is Thrown :

When a single die is thrown, it has 6 outcomes since it has 6 faces. Therefore, the sample Space is given as

S = { 1, 2, 3, 4, 5, 6}

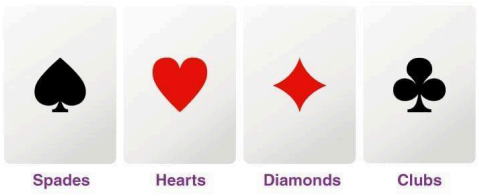
Two Dice are thrown:

In a dice there are six faces with numbers 1, 2, 3, 4, 5, 6
So, when two dice are thrown, then we have two faces of dice (one of each) show any two Combination of numbers from 1, 2, 3, 4, 5, 6.
Thus, the number of elements in sample space = $6^2 = 36$
S= {(1, 1),(1, 2),(1,3),(1, 4),(1,5),(1, 6),
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),

(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6),
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

For Deck of Cards:

There are total 52 playing cards which are divided into 4 suits – Spade, Heart, Diamond and Club. 13 cards in each suit contains 4 Aces, 4 Kings, 4 Queens and 4 jacks.



- Only two colours of cards in each deck Red and Black.
- Face cards (court card) are King , Queen and Jack .
- Total face cards = 3x4 = 12
- All the cards from 2 to 10 in any suits are called the number card.