

Probability

- *Experiment:*

An operation which can produce some well-defined outcomes is called an experiment.

- *Random Experiment:*

An experiment in which all possible outcomes are known and the exact output cannot be predicted in advance, is called a random experiment.

Examples:

- i. Rolling an unbiased dice.
- ii. Tossing a fair coin.
- iii. Drawing a card from a pack of well-shuffled cards.
- iv. Picking up a ball of certain colour from a bag containing balls of different colours.

Details:

- i. When we throw a coin, then either a Head (H) or a Tail (T) appears.
- ii. A dice is a solid cube, having 6 faces, marked 1, 2, 3, 4, 5, 6 respectively. When we throw a die, the outcome is the number that appears on its upper face.
- iii. A pack of cards has 52 cards.

It has 13 cards of each suit, name *Spades, Clubs, Hearts and Diamonds*.

Cards of spades and clubs are *black cards*.

Cards of hearts and diamonds are *red cards*.

There are 4 honours of each unit.

There are *Kings, Queens and Jacks*. These are all called *face cards*.

- *Sample Space:*

When we perform an experiment, then the set S of all possible outcomes is called the *sample space*.

Examples:

1. In tossing a coin, $S = \{H, T\}$
2. If two coins are tossed, the $S = \{HH, HT, TH, TT\}$.
3. In rolling a dice, we have, $S = \{1, 2, 3, 4, 5, 6\}$.

- *Event:*

Any subset of a sample space is called an *event*.

- *Probability of Occurrence of an Event:*

Let S be the sample and let E be an event.

Then, $E \subseteq S$.

$$\therefore P(E) = \frac{n(E)}{n(S)}.$$

- *Results on Probability:*

- i. $P(S) = 1$
- ii. $0 \leq P(E) \leq 1$
- iii. $P(\Phi) = 0$
- iv. For any events A and B we have : $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- v. If A denotes (not-A), then $P(A) = 1 - P(A)$.