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(Affiliated to CBSE up to +2 Level)

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## Probability

Probability is the study of mathematics which calculates the degree of uncertainty. There are two types of approaches to study probability-

### 1. Experimental or Empirical Probability

The result of probability based on the actual experiment is called experimental probability. In this case, the results could be different if we do the same experiment again.

$$P(E) = \frac{\text{Number of the trials in which the event happened}}{\text{Total number of trials}}$$

### 2. Probability — A Theoretical Approach

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

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

Where the outcomes are equally likely.

#### Equally Likely Outcomes

If we have the same possibility of getting each outcome then it is called equally likely outcomes.

#### Example

A dice have the same possibility of getting 1, 2, 3, 4, 5 and 6.

#### Not Equally Likely

If we don't have the same possibility of getting each outcome then it is said to be the not equally likely outcome.

#### Example

3 green balls and 2 pink balls are not equally likely as the possibility of the green ball is 3 and the possibility of the pink ball is 2.

#### Elementary Event

If an event has only one possible outcome then it is called an elementary event.

#### Remark

The sum of the probabilities of all the elementary events of an experiment is 1.

#### The General form

$$P(\text{Heads}) + P(\text{Tails}) = 1$$

$$P(H) + P(\bar{H}) = 1 \text{ where } \bar{H} \text{ is 'not H'}$$

$$P(H) - 1 = P(\bar{H})$$

$P(H)$  and  $P(\bar{H})$  are the complementary events.

## Impossible Events

If there is no possibility of an event to occur then its probability is zero. This is known as an impossible event.

### Example

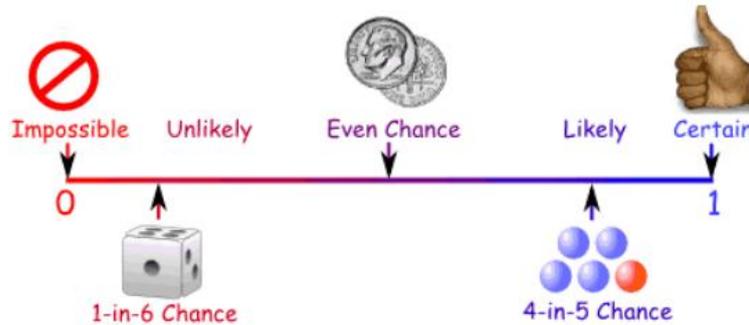
It is not possible to draw a green ball from a group of blue balls.

## Sure or Certain Event

If the possibility of an event to occur is sure then it is said to be the sure probability. Here the probability is one.

This shows that the probability of an event could be

$$0 \leq P(E) \leq 1$$



## Some Solved Examples

### Example: 1

What is the probability of drawing a heart from a deck of cards?

### Solution:

We know that there are total 52 cards in a deck out of which 13 cards are of heart.

So the favorable outcomes are 13 and the total no. of events is 52.

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

$$= 13/52 = 1/4$$

### Example: 2

If we toss two coins together, then what is the probability of getting at least one tail?

### Solution:

If we toss two coins together then the total outcomes could be

**Total Outcomes - Two Coins are tossed**

**{HH, HT, TH, TT}**

A pink rectangular box containing the text 'Total Outcomes - Two Coins are tossed' in blue. Below the text are four small images: a coin showing heads, two coins showing one head and one tail, two coins showing two heads, and a coin showing tails. At the bottom of the box, the set notation '{HH, HT, TH, TT}' is written in large blue letters.

The favorable outcomes for at least one head will be

$$\{HH\}, \{HT\}, \{TH\} = 3$$

$$P(\text{for at least one head}) = 3/4$$