Chapter- 23

Probability

Chance and Probability

Probability tells the degree of uncertainty. It **measures** the likelihood that an **event** will occur.

Random Experiment

If the result of the experiment is not known then it is known as a random experiment.

Example

If we throw a dice then the result could be any number from 1 – 6.

Outcomes

When we do an experiment then there could be different results, these possible results of the random experiment are called outcomes.

Example

There are two possible outcomes when we toss a coin i.e. head and tail.

Equally Likely Outcomes

If every outcome has the same possibility of occurring these outcomes are called **Equally Likely Outcomes**.

Example

If we throw a dice then there is an equal chance of every no. to come while doing the random experiment. i.e. a dice has the same possibility of getting 1, 2, 3, 4, 5 and 6.

Linking Chances to the Probability

$$\text{Probability} = \frac{\text{Number of chances for a particular outcome}}{\text{Total number of outcomes}}$$

Example

What is the chance of getting 3 when we throw a dice?

Solution

There is only one chance to get 3 in one throw and the total possible outcomes are 6.

Hence the probability of getting =1/6.

Outcomes as Events

Each outcome or collection of outcomes of an experiment is known as an event.

$$\text{probability} = \frac{\text{event}}{\text{number of outcomes}}$$

Example

If we throw a dice then getting each outcome 1, 2, 3, 4, 5 and 6 are events.

Example

What is the event of getting odd numbers when we throw a dice?

Solution

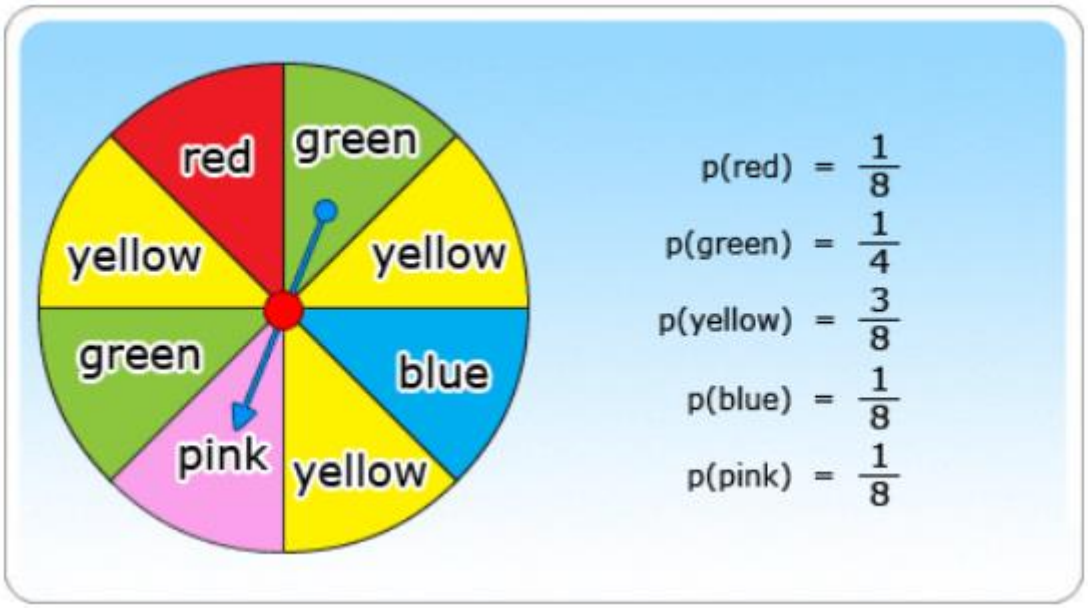
The probability of getting an odd number is 3(odd numbers are 1, 3, 5)

The total number of outcomes is 6.

The probability of getting an odd number = 3/6.

Example

What is the probability of spinning yellow?



Here number of chance to come yellow while spinning is 3.

The total number of outcomes is 8.

$$\text{The probability of spinning yellow} = \frac{\text{No. of chance to come yellow}}{\text{Total no. of outcomes}}$$

$$= \frac{3}{8}$$

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 (Heads) + P (Tails) = 1

P (H) + P $(\overline{H})$= 1 where $\overline{H}$ is 'not H'.

P (H) – 1 = P $(\overline{H})$

P (H) and P $(\overline{H})$ 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

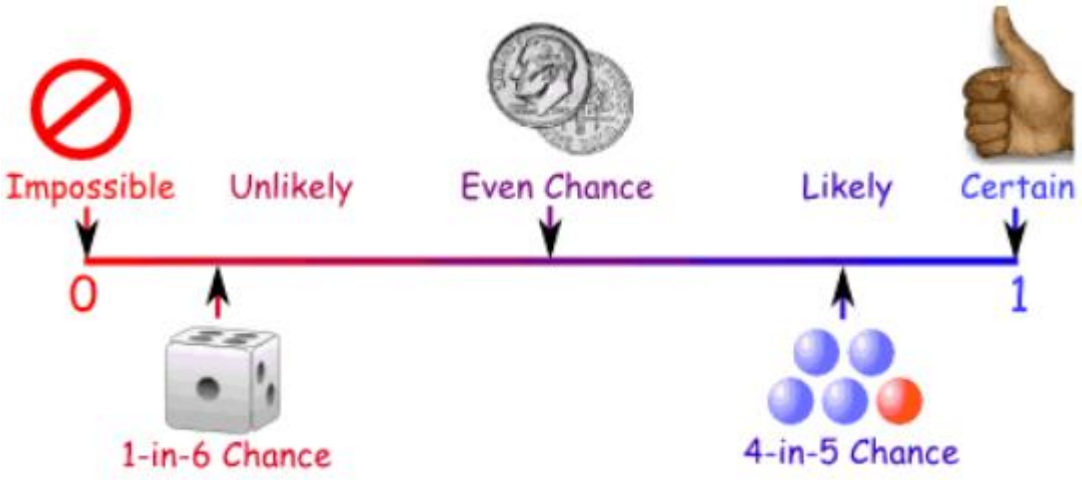
It is not possible to draw a green ball from a group of blue balls.

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 favourable 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

The favorable outcomes for at least one head will be

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

P (for at least one head) = 3/4