① Probability

Experiment : An experiment is an act that can be repeated under ~~certain~~ some given conditions.

Example :- Tossing a fair coin to see the proportion of heads and tails.

Experiment are of two types

① Deterministic experiment : All possible outcomes are known and the outcome of a particular trial is also known.

② Random experiment : All possible outcomes are known but outcomes of a particular trial is not known.

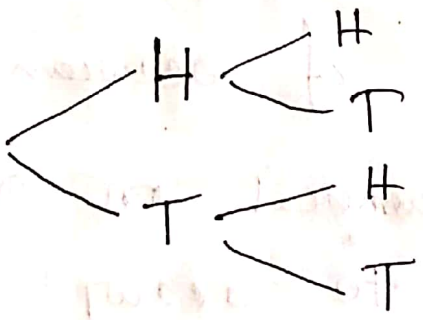
Example : Tossing a coin, throwing a die.

Sample Space :- A sample space of an experiment is a set or collection of all possible outcomes. The sample space is denoted by S.

Example :- let us consider throwing a die which has 6 possible outcomes that is 1, 2, 3, 4, 5, 6.

So, sample space, $S = \{1, 2, 3, 4, 5, 6\}$

Example :- If an experiment consist of tossing two coins and noting whether they land head (H) or tail (H). Then sample space, $S = \{HH, HT, TH, TT\}$



Event:- Any subset of a sample space is an event.

Example:- In our previous Example

$S = \{HH, HT, TH, TT\}$

Here $\{HH\}$ is an event of two heads i.e. both the coins lands head.

$\{TH\}$ is the event that first coin land ~~head~~ tail and second coin land Head.

Equally likely events:- Equally likely events are the events that have the same probability of occurance.

Example:- Each numeral on a die is equally likely to occur when the die is tossed.

Mutually Exclusive Events :- Two events are mutually exclusive if they cannot occur at the same time. Another word that means mutually exclusive is disjoint

Example :- If we throw a die once the sample space $S = \{1, 2, 3, 4, 5, 6\}$.

Let the event $A = \{1, 3, 5\}$ which is the event of odd numbers.

and $B = \{2, 4, 6\}$ which is the event of even numbers.

These two events are mutually exclusive.

Let $C = \{1, 2, 3\}$ is the event of first three numbers of a die.

Then A and C, B and C are not mutually exclusive.

Sample Space :- A Sample Space of an experiment is a set or collection

Exhaustive Event :- The events are said to be exhaustive if the comprise the whole sample space.

Example :- Consider the example of throwing a die. $S = \{1, 2, 3, 4, 5, 6\}$ and $A = \{1, 3, 5\}$ → odd number's event

$B = \{2, 4, 6\}$ → Even number's event

A and B are exhaustive events as they comprise the sample space.

~~Exhaustive event:~~

Definition of probability :- If a random experiment can result in $n(S)$ mutually exclusive, exhaustive and equally likely outcomes and if $n(A)$ of these outcomes are favorable to an event A, then the probability of A is the ratio of $n(A)$ to $n(S)$.

In symbol, $P(A) = \frac{n(A)}{n(S)}$.

Example :- Consider the previous die throwing example.

$S = \{1, 2, 3, 4, 5, 6\}$, $A = \{1, 3, 5\}$, $B = \{2, 4, 6\}$

What is the probability that an even number will be faced if a die is thrown once?

Here, the event of even number

$A = \{2, 4, 6\}$, $n(A) = 3$.

$n(S) = 6$, $P(A) = \frac{3}{6} = \frac{1}{2}$,

Problem :- A bag contains 4 white and 6 red balls. A ball is drawn at random from the bag. What is the probability that the ball is red? What is " " the ball is white? Are the events of obtaining a red and the events of obtaining a white ball equally likely?

Solution :- Let W stands for white ball and R stand for red ball

Then a possible sample space for this experiment is

$$S = \{ W, W, W, W, R, R, R, R, R, R \}$$

Let R_S is the event of red balls

then $R_S = \{ R, R, R, R, R, R \}$

$$n(R_S) = 6$$

let W_S " " white "

$$W_S = \{ W, W, W, W \}$$

$$P(R_s) = \frac{6}{10}$$

$$P(W_s) = \frac{4}{10}.$$

$$P(R_s) \neq P(W_s)$$

So, the events are not equally likely.

H.W Let us consider that a coin is tossed three times. Obtain the sample space. Find the probability of exactly two heads will be occured.