Probability

Random Experiment :- An Experiment which can be done 'n' no. of trails, in which outcomes of the Experiment are known but outcome of a particular trail is not known [results are well before conducting the Experiment]

Ex:- 1) Tossing a coin, $\{H, T\} \rightarrow S$

2) Throwing a die, $\{1, 2, 3, 4, 5, 6\} \rightarrow S$

Sample Space :- Set of all possible outcomes of a Random Experiment is called Sample Space.

Ex:- 1) For Tossing coin

$S = \{T, H\}$

2) Throwing a die : $S = \{1, 2, 3, 4, 5, 6\}$

Event :- Set of outcomes of a Random Experiment is called Event (or) Subset of Sample Space is called Event.

Sample Space can be classify in to 2 types

1) Discrete Sample Space

2) Continuous Sample Space.

1) **Discrete Sample Space :-** A Sample Space which contains finite no. of (out comes) elements

Ex:- Tossing a coin $\{T, H\} \rightarrow$ countable

Throwing a die $\{1, 2, 3, 4, 5, 6\}$

Continuous Sample Space :- A Sample Space which contains uncountable no. of out comes we call it as continuous Sample space. (1 to 6)

Ex:- weights of students {3ft to 5ft}

Event :- Subset of S $A = \{2, 4, 6\}$

$B = \{7\}$ ↓ only one outcome is called Event

Event

- Simple Event ↓ only one out come $A = \{7\}$
- Mutually Exclusive Event ↓ $A \cap B = \phi$ Ex:- $A = \{1, 2\}$, $B = \{3, 4, 5\}$, $A \cap B = \phi$
- Exhaustive Event ↓ $S = \{1, 2, 3, 4, 5, 6\}$, $A \cup B = S$ $A = \{1, 2\}$, $B = \{2, 3, 4, 5, 6\}$, $A \cup B = \{1, 2, 3, 4, 5, 6\}$, $A \cup B = S$

→ $A \cup B = S$ & $A \cap B = \phi$ then A, B are complementary events

Probability :- Probability = $\frac{\text{favourable events}}{\text{Total no. of events}}$

$P(A) = \frac{n(A)}{n(S)} = \frac{\text{no. of elements in } A}{\text{no. of elements in } S}$

Ex:- Tossing a coin {T, H}

$P\{Tail\} = \frac{1}{2} = 0.5$, = 50% chance

P(Head) = 1/2 = 0.5 = 50% chance.

Probability is always lies blw 0 & 1.

Probability is always lies blw any event

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

Any event always lies blw 0 & 1

[At worst condition (or) Probability = 0]

Impossible event

[An event which never happens Random Experiment is impossible event only Prob is zero]

→ An event which (100% chance.) always happens.

Impossible Event :- The event for which the Probability of that event is zero.

i.e., $P(\phi) = 0$

Ex:- A Die is thrown, what is Prob of getting 7

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

$P(7) = 0$

Sure Event or Certain Event :- Probability of an event is one.

i.e., $P(\Omega) = 1$

Equally likely Events :- "The same chance of happening" we call them as equally likely event.

If 6 events are there for throwing a die for each event if you calculate probability

that Probability will be same.

$P(1) = 1/6$, $P(2) = 1/6$, $P(3) = 1/6$

- - - $P(6) = 1/6$

Complementary Events :- E, E^c

$P(E) + P(E^c) = 1$

Axioms of Probability :-

① $0 \leq P(A) \leq 1$ (or) $P(A) \geq 0$ [Prob of any event is always lies b/w 0 & 1]

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

Totality of Prob condition always 1.

③ A, B are mutually exclusive events ($A \cap B = \emptyset$)

then $\boxed{P(A \cup B) = P(A) + P(B)}$