CHAPTER 14
PROBABILITY

NOTES

❖ *Some terms associated with the probability of an event*

- *Random or non-deterministic experiment*

    An experiment, whose result cannot be uniquely predicted even if the previous results of the same experiment conducted under similar conditions are all known is called a random or a non-deterministic experiment.

- *Sample Space & Event*

    The totality of all the possible outcomes of an experiment is called sample space of the experiment. Any component of the sample space is an event.

- *Equally likely events*

    Events are said to be equally likely if there is no valid reason to say that one event has more chance to occur than the others.

- *Mutually exclusive events*

    Events are said to be mutually exclusive if the happening of one forecloses the happening of all the others.

- *Independent events*

    Events are said to be independent if the occurrence of one has no effect on the occurrence of the other or others.

- *Elementary events*

    An elementary event is one which cannot be further subdivided.

- *Exhaustive set of events*

    A set of events is said to be exhaustive if all the possible outcomes are included.

- *Favourable outcomes*

    For every experiment, out of the set of exhaustive outcomes, those entailing the occurrence of a particular event are called the favourable ones for the event.

❖ *Classical or Mathematical or a Priori definition of Probability due to Laplace*

    Out of n exhaustive, equally likely and mutually exclusive outcomes, if m are favourable to the event A, then the probability of the occurrence of the event A denoted by P(A) is the ratio m:n and we write

$$P(A) = \frac{\text{Number of outcomes favourable to A}}{\text{Total number of possible outcomes}}$$

Note

(i) $0 \le P(A) \le 1$

(ii) The probability of an impossible event is 0 (zero) and that of sure event is 1.

(iii) The symbol P($\overline{A}$) denotes the probability of not happening of the event A.

❖ $P(A) + P(\overline{A}) = 1$

Proof: Out of n exhaustive, equally likely and mutually exclusive outcomes, if m are favourable to the event A, n − m are not favourable to the event A.

Then, P($\overline{A}$) $= \frac{n-m}{n} = \frac{n}{n} - \frac{m}{n} = 1 - \frac{m}{n} = 1 - P(A)$

$\therefore P(A) + P(\overline{A}) = 1$

Note

(i)   P($\overline{A}$) $= 1 - $ P(A)

(ii) If events A, B and C are mutually exclusive and exhaustive then $P(A) + P(B) + P(C) = 1$.

(iii) For independent events A and B, $P(AB) = P(A)P(B)$. Here the symbol $P(AB)$ denotes the happening of both the events A and B.

❖   *A note on playing cards*

A deck or pack of cards consists of 52 cards divided into two sets of 26 cards each. One set is red set and the other set is black set. In each colour set, there are two suits of 13 cards each. In a suit, there are 3 face cards called King, Queen and Jack. In each suit, there is one card called Ace and nine numerals starting from 2 and ending at 10. Ace, King, Queen and Jack of a suit are called four powers of the suit.

Demonstration of playing cards

Suit Name	Colour	Symbol	No. of Cards			
			Ace	Face	Numeral	Total
Heart	Red	♥	1	3	9	13
Diamond	Red	♦	1	3	9	13
Club	Black	♣	1	3	9	13
Spade	Black	♠	1	3	9	13

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