CHAPTER-15

PROBABILITY

INTRODUCTION

In our day to day life when we are not sure of happening an event then we use the word 'probably' $e.g.$.

- Probably it may rain today
- It may possible that he may win the watch.
- Chancing of his passing in the examinations are very few.

Probability is just a estimate. Suppose a coin is tossed 20 times and Head comes 13 times and Tail come 7 times but if we toss it next time 20 times then it is not sure that we will get same result.

The probability of an event E is defined as:

$$\mathbf{P(E) = \frac{Number\ of\ favourable\ outcomes}{Total\ number\ of\ possible\ outcomes\ of\ the\ experiment}}$$

- Probability of sure event is 1.
- Probability of an Impossible event is 0.
- In general, the probability of an event (other than sure and impossible event) lies between 0 and 1. i.e. $0 \leq P(E) \leq 1$
- Total Probability = 1
  $i.e.$ $\mathrm{P(occurence\ of\ E) + P(Non-occurence\ of\ E) = 1}$
  $\mathrm{P(E) + P\ (Not\ E) = 1}$

- When a die/dice is thrown then Sample Space = {1,2,3,4,5,6]
- When two dice are thrown then there are $6^2 = 36$ outcomes.
- When n dice are thrown then there are 6^n outcomes.
- When one coin is tossed, then Sample Space = {H, T} then 2 possible outcomes. .
- When two coins are tossed then Sample Space = {HH, HT, TT, TH}
  There are 4 possible outcomes.
- When n coins are tossed then there are 2^n outcomes
- There are 52 Cards
  - In 52 cards there are 26 Red and 26 Black cards
  - In 26 Red, 13 are of Diamond (♦) and 13 are of Heart (♥)
  - In 26 Black, 13 are of Spade (♠) and 13 are of Club (♣)
  - 13 cards are A(Ace), 2,3,4,5,6,7,8,9,10, J(Jack), Q(Queen), K(King).
  - All 13 cards are four in numbers with different suits
  - King, queen, Jack are called face cards which are 12 in number.

1. **Find the probability of getting a head when a coin is tossed once. Also find the probability of getting a tail.** **[Example 1]**

Sol:-When a coin is tossed then possible number of outcomes $= \{H, T\} = 2$

i) No. of Heads $= 1$ out of 2

$\therefore$ P(Head) $= \frac{1}{2}$

ii) No. of Tails $= 1$ out of 2

$\therefore$ P(Tail) $= \frac{1}{2}$

2. **A die is thrown, find the probability of getting number**

i) **odd number** **ii**) **even number** **iii**) **number greater than 4**

iv) **prime number** **v**) **number less than 5**

Sol:-When a die is thrown then possible number of outcomes $= \{1,2,3,4,5,6\} = 6$

i) Odd numbers $= \{1,3,5\} = 3$ out of 6

$\therefore$ P(Odd Number) $= \frac{3}{6} = \frac{1}{2}$

ii) Even numbers $= \{2,4,6\} = 3$ out of 6

$\therefore$ P(Even Number) $= \frac{3}{6} = \frac{1}{2}$

iii) Numbers greater than $4 = \{5,6\} = 2$ out of 6

$\therefore$ P(Number greater than 4) $= \frac{2}{6} = \frac{1}{3}$

iv) Prime numbers $= \{2,3,5\} = 3$ out of 6

$\therefore$ P(Prime Number) $= \frac{3}{6} = \frac{1}{2}$

v) Numbers less than $5 = \{1,2,3,4\} = 4$ out of 6

$\therefore$ P(Number less than 5) $= \frac{4}{6} = \frac{2}{3}$

3. **In a box, there are 4 red, 5 black, 3 green and 6 yellow balls. One ball is drawn at random. Find the probability that drawn ball is**

i) **green** **ii**) **blue** **iii**) **red** **iv**) **yellow and black** **v**) **not green**

Sol:-Total balls in the box $= 4 + 5 + 3 + 6 = 18$

i) No. of Green Balls $= 3$ out of 18

$\therefore$ P(Green Ball) $= \frac{3}{18} = \frac{1}{6}$

ii) No. of Blue balls $= 5$ out of 18

$\therefore$ P(Blue ball) $= \frac{5}{18}$

iii) No. of Red Balls $= 4$ out of 18

$\therefore$ P(Red Ball) $= \frac{4}{18} = \frac{2}{9}$

iv) No. of Yellow and Black Balls $= 6 + 5 = 11$ out of 18

$\therefore$ P(Yellow and Black Ball) $= \frac{11}{18}$

v) No. of balls which are not Green $= 4 + 6 + 5 = 15$ out of 18

$\therefore$ P(not Green Ball) $= \frac{15}{18} = \frac{5}{6}$

4. In a deck of 52 cards, one card is drawn at random. Find the probability that selected card is

i) club **ii) red** **iii) face card** **iv) ace** **v) black jack**

Sol:-Total cards $= 52$

i) No. of Club cards $= 13$ out of 52

$\therefore$ P(Club) $= \frac{13}{52} = \frac{1}{4}$

ii) No. of Red cards $= 26$ out of 52

$\therefore$ P(Red card) $= \frac{26}{52} = \frac{1}{2}$

iii) No. of Face cards $= 16$ out of 52

$\therefore$ P(face card) $= \frac{16}{52} = \frac{4}{13}$

iv) No. of Ace cards $= 4$ out of 52

$\therefore$ P(Ace) $= \frac{4}{52} = \frac{1}{13}$

v) No. of black jacks $= 2$ out of 52

$\therefore$ P(Black Jack) $= \frac{2}{52} = \frac{1}{26}$

EXERCISE

1. A die is thrown, find the probability of getting number
i) less than 4 ii) between 2 and 6 iii) less than 7 iv) number 8

2. In a box, there are 3 blue, 2 white and 4 red marbles. One marble is drawn at random. Find the probability that drawn marble is
i) white ii) blue iii) red iv) yellow and red v) not red

3. In a deck of 52 cards, one card is drawn at random. Find the probability that selected card is
i) queen ii) $'10'$ of club iii) not face card iv) not an ace v) black suit

4. Ex 15.1, Q 1,2,4,6,8,9,12,13,14,19