31. PROBABILITY

IMPORTANT FACTS AND FORMULA

1.Experiment :An operation which can produce some well-defined outcome is called an experiment

2.Random experiment: An experiment in which all possible outcome are known and the exact out put cannot be predicted in advance is called an random experiment

Eg of performing random experiment:

(i)rolling an unbiased dice

(ii)tossing a fair coin

(iii)drawing a card from a pack of well shuffled card

(iv)picking up a ball of certain color from a bag containing ball of different colors

Details:

(i)when we throw a coin. Then either a **head(h)** or a **tail (t)** appears.

(ii)a dice is a solid cube, having 6 faces ,marked 1,2,3,4,5,6 respectively when we throw a die , the outcome is the number that appear on its top face .

(iii)a pack of cards has 52 cards it has 13 cards of each suit ,namely spades, clubs ,hearts and diamonds

Cards of spades and clubs are black cards

Cards of hearts and diamonds are red cards

There are 4 honors of each suit

These are **aces ,king ,queen and jack**

These are called face cards

3.S**ample space :W**hen we perform an experiment ,then the set S of all possible outcome is called the sample space

eg of sample space:

(i)in tossing a coin ,s={h,t}

(ii)if two coin are tossed ,then s={hh,tt,ht,th}.

(iii)in rolling a die we have,s={1,2,3,4,5,6}.

4.event:Any subset of a sample space.

5.Probability of occurrence of an event.

let S be the sample space and E be the event .

then,$E \subseteq S$.

$P(E)=n(E)/n(S)$.

6.Results on Probability:

(i)$P(S) = 1$ (ii)$0 \leq P(E) \leq 1$ (iii)$P(\phi)=0$

(iv)For any event a and b, we have:

$P(a \cup b)=P(a)+P(b)-P(a \cup b)$

(v)If $\overline{A}$ denotes (not-a),then P($\overline{A}$)=1-P(A).

SOLVED EXAMPLES

Ex 1. In a throw of a coin ,find the probability of getting a head.
sol. Here s={H,T} and E={H}.
P(E)=n(E)/n(S)=1/2

Ex2.Two unbiased coin are tossed .what is the probability of getting atmost one head?
sol.Here S={HH,HT,TH,TT}
Let Ee=event of getting one head
E={TT,HT,TH}
P(E)=n(E)/n(S)=3/4

Ex3.An unbiased die is tossed .find the probability of getting a multiple of 3
sol. Here S={1,2,3,4,5,6}
Let E be the event of getting the multiple of 3
then ,E={3,6}
P(E)=n(E)/n(S)=2/6=1/3

E**x4. I**n a simultaneous throw of pair of dice .find the probability of getting the total more than 7
sol. Here n(S)=(6*6)=36
let E=event of getting a total more than 7

={(2,6),(3,5),(3,6),(4,4),(4,5),(4,6),(5,3),(5,4),(5,5),(5,6),(6,2),(6,3),(6,4),(6,5),(6,6)}
P(E)=n(E)/n(S)=15/36=5/12.

Ex5. A bag contains 6 white and 4 black balls .2 balls are drawn at random. find the probability that they are of same colour.
Sol .let S be the sample space
Then n(S)=no of ways of drawing 2 balls out of (6+4)=10c2=(10*9)/(2*1)=45
Let E=event of getting both balls of same colour
Then n(E)=no of ways(2 balls out of six) or(2 balls out of 4)
=(^{6}c2+^{4}c2)=(6*5)/(2*1)+(4*3)/(2*1)=15+6=21
P(E)=n(E)/n(S)=21/45=7/15

Ex6.Two dice are thrown together .What is the probability that the sum of the number on the two faces is divided by 4 or 6
sol. Clearly n(S)=6*6=36
Let E be the event that the sum of the numbers on the two faces is divided by 4 or 6.Then

E={(1,3),(1,5),(2,2),(2,4),(2,6),(3,1),(3,3),(3,5),(4,2),(4,4),(5,1),(5,3),(6,2),(6,6)}
n(E)=14.
Hence p(e)=n(e)/n(s)=14/36=7/18

Ex7.Two cards are drawn at random from a pack of 52 cards.what is the probability that either both are black or both are queen?
sol. We have n(s)=52c2=(52*51)/(2*1)=1326.
Let A=event of getting both black cards
B=event of getting both queens
$A\cap B$=event of getting queen of black cards
n(A)=^{26}c2=(26*25)/(2*1)=325,
n(B)=^{4}c2=(4*3)/(2*1)=6 and
$n(A\cap B)$=2c2=1
P(A)=n(A)/n(S)=325/1326;
P(B)=n(B)/n(S)=6/1326 and
$P(A\cap B)=n(A\cap B)/n(S)$=1/1326
$P(A\cup B)=P(A)+P(B)-P(A\cap B)$=(325+6-1/1326)=330/1326=55/221