Ch-15 Probability

★ Notes :

- Terms related to probability :

1 Event : Any random experiment or outcome is considered as an event

2 Sure Event : Any event which is always going to happen is consider as a sure event. For eg: the sun will rise tommorrow.

» The probability of every sure event is always 1

3 Impossible Event : Any event which is never going to happen is considered as impossible events. For eg: In throwing a dice a number appearing greater than six is an impossible event

» The probability of every impossible event is always 0

- Elementary event : An event having only one outcome of the experiment of the experiment is called an elementary event

» The sum of the probabilities of all the elementary events of a single experiment is always 1

Formulas of Probability

» Let 'e' be any event
then,

: $p(e) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

→ The sum of probability of having a event and not having a event is always 1

- Types of questions

(i) Coin based
(ii) Dice based
(iii) Cards based
(iv) Random event based

- Coin Based:

» It will have 3 types of sums and they are: One coin, two coins, 3 coins

(i) One coins
» H, T

(ii) two coins:
» T,T ; H,H
» T,H ; H,T

(iii) Three coins:
» T,T,T ; H,H,H
T,T,H ; H,H,T
T,H,H ; H,T,T
H,T,T ; T,H,H

(ii) Dice Based questions:
» It will have 2 types of question and they are: single dice, Double dice

(i) Single Dice:
» 1, 2, 3, 4, 5, 6

(ii) Double Dice:
» (1,1); (1,2); (1,3); (1,4); (1,5); (1,6)
» (2,1); (2,2); (2,3); (2,4); (2,5); (2,6)
» (3,1); (3,2); (3,3); (3,4); (3,5); (3,6)
» (4,1); (4,2); (4,3); (4,4); (4,5); (4,6)
» (5,1); (5,2); (5,3); (5,4); (5,5); (5,6)
» (6,1); (6,2); (6,3); (6,4); (6,5); (6,6)

Ex 16.1

Q-1 While tossing 2 coins at a time, what will be the probability of getting atleast one head & atmost 1 tail

Q-2 while tossing 3 coins at a time, what will be the probability of getting atmost 3 heads and atleast 3 tails

Q-3 while throwing 2 dice at a time what is a probability: ~~ge~~

(i) ~~get~~ getting a no. whose sum is more than 12

(ii) same no. on the dice

(iii) sum of the no. whose sum is seven

(iv) sum of the no. greater than 8

(v) ~~Sum of~~ the no. whose product is less than 12

Answers

A-1 ~~3/4~~ ~~7~~

A-1 One head (atleast) = $\frac{3}{4}$

= Atmost one tail = $\frac{3}{4}$

A-2 Atmost 3 head = 1

Atleast 3 tails = $\frac{1}{8}$

A-3 (i) 0 (iii) 1/6 (v) 19/36

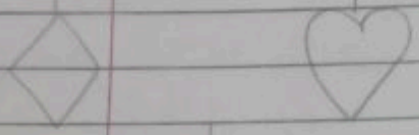
(ii) 6/36 (v) 5/18

Notes

Cards (52)

Red (26) Black (26)

Diamond (13) Heart (13) Spade (13) Club (13)



Face (3)
→ Jack
→ Queen
→ King

Non-faced (10)
→ Ace - 10

→ Exercise 15.1

(1) Complete the following statement:

(i) 1
(ii) 0, impossible event
(iii) 1, sure event
(iv) 1
(v) 0, 1

(2) Likely outcomes:

(i) Not equally likely outcome
(ii) Not equally likely outcome

(iii) equally likely outcome
(iv) equally likely outcome

(3) (2) Because, tossing a coin is a experiment which gives us equally likely outcomes. Hence the probability of getting a head or a tail is always equal so tossing a coin is considered to be a fair way

(4) Cannot be the probability of an event?

(i) $\frac{2}{3}$ → yes

(ii) -1.5 → ~~No~~

(iii) 15 % → ~~No~~ yes

(iv) 0.7 → yes

5 ~~pfs~~ P(E) = 0.05

= P(E) + P(not E) = 1

so 0.05 + x = 1

x = 1 - 0.05

x = 0.95

∴ P(not E) = 0.95

(6) (i) The probability of an orgaze flavour candy will be 'zero' as the bag only contain lemon flavoured candy

(ii) The probability of an lemon flavoured candy ~~will~~ is '1' as the bag only contain lemon flavoured candy.

(7) Let E be the event that the probability of 2 students have the same birthday

$\therefore$ $P(!E) = 0.992$

we know $P(E) + P(!E) = 1$

$= P(E) = 1 - 0.992$

$= P(E) = 0.008$

$\therefore$ The probability of having the same birthday is 0.008

(8) Let 'E' be the event that the ball drawn is of red colour

= Red balls = 3

= Black balls = 5

= Total = 8

$\therefore$ $P(E) = \frac{\text{No. of favourable outcomes}}{\text{Total no. of outcomes}}$

$= \frac{\text{No. of red balls}}{\text{Total balls}} = \frac{3}{8}$

(ii) Let 'B' be the event that the ball drawn is not of red colour

$\therefore P(B) = \frac{\text{no. of non-red balls}}{\text{Total balls}} = \frac{5}{8}$

(9) Red marbles = 5
White marbles = 8
Green marbles = 4
Total = 17

(i) Let 'A' be the event that the marble taken out will be of red colour

We know $P(E) = \frac{\text{No. of favourable outcomes}}{\text{Total no. of outcomes}}$

$\therefore P(A) = \frac{\text{No. of red marbles}}{\text{Total no. of marbles}} = \frac{5}{17}$

(ii) Let 'B' be the event that the marble taken out is of white colour

$\therefore P(B) = \frac{\text{No. of white marbles}}{\text{Total no. of marbles}} = \frac{8}{17}$

(iii) Set 'C' be the event that the marble taken out will be a not green

= $P(C) = \frac{\text{No. of non-green marble}}{\text{Total marbles}}$

= $\frac{13}{17}$

(10) 50p coins = 100
₹1 coins = 50
₹2 coins = 20
₹5 coins = 10
Total = 180

(i) Set 'A' be the event that the coin taken out is 50p

= $P(E) = \frac{\text{No. of favourable outcomes}}{\text{Total outcomes}}$

= $P(A) = \frac{\text{No. of 50p coins}}{\text{Total coins}} = \frac{100}{180} = \frac{5}{9}$

(ii) Set 'B' be the event that the coin take out is not a ₹5 coins

$P(B) = \frac{\text{No. of non-5 rupee coins}}{\text{Total coins}} = \frac{170}{180} = \frac{17}{18}$

(a) Male fish = 5
Female fish = 8

→ Let 'A' be the event that the fish taken out is a male fish

∴ $P(A) = \frac{\text{No. of male fish}}{\text{Total fish}} = \frac{5}{13}$

(12) (i) $\frac{1}{8}$

(12) (ii) Let 'A' be the event that arrow will point at A

∴ $P(A) = \frac{\text{No. of favourable outcome}}{\text{Total outcome}}$

$= \frac{1}{8}$

(ii) Let 'B' be the event that arrows are odd no.

$= P(B) = \frac{\text{No. of favourable outcomes}}{\text{Total outcomes}} = \frac{4}{8} = \frac{1}{2}$

(iii) Let 'C' be the event that arrows come at a no. greater than 2

$= P(C) = \frac{\text{No. of favourable outcomes}}{\text{Total outcomes}}$

$= P(C) = \frac{6}{8} = \frac{3}{4}$

(iv) Let 'D' be the event that the arrow comes at a no. less than 9

$= P(D) = \frac{\text{No. of favourable outcome}}{\text{Total outcome}}$

$= \frac{8}{8} = 1$

13 Total no. of outcomes while throwing a dice are 1, 2, 3, 4, 5, 6

(i) Let 'A' be the event that the no. are prime no.

$= P(A) = \frac{\text{No. of odd numbers}}{\text{Total no. in dice}}$

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

(ii) Let 'B' be the event that the no. ~~the~~ same between 2 & 6

$$P(B) = \frac{\text{Nos. between 2 \& 6}}{\text{Total outcomes}}$$

$$= P(B) = \frac{3}{6} = \frac{1}{2}$$

(iii) Set 'C' be the event that the no. is an odd no.

$$= P(C) = \frac{\text{No. of odd number}}{\text{Total outcomes}}$$

$$= P(C) = \frac{3}{6} = \frac{1}{2}$$

(14)(i) Set 'A' be the event of getting a king of red colour.

$$\therefore P(A) = \frac{\text{No. of red colour kings}}{\text{Total cards}}$$

$$= P(A) = \frac{2}{52} = \frac{1}{26}$$

(ii) Set 'B' be the event of getting a face card

$$= P(B) = \frac{\text{No. of face card}}{\text{Total card}} = \frac{12}{52} = \frac{3}{13}$$

(iii) Let 'C' be the event of getting a red face card

$$= P(C) = \frac{\text{No. of red face}}{\text{Total cards}}$$

$$= P(C) = \frac{6}{52} = \frac{3}{26}$$

(iv) Let 'D' be the event of getting jack of heart cards

$$= P(D) = \frac{\text{No. of heart Jack}}{\text{Total cards}}$$

$$= P(D) = \frac{1}{52}$$

(v) Let 'E' be the event of getting a spade

$$= P(E) = \frac{\text{No. of spade}}{\text{Total card}}$$

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

(vi) Let 'f' be the event of getting queen of diamonds

$\therefore P(F) = \frac{\text{No. of queen of diamonds}}{\text{Total cards}}$

$= P(F) = \frac{1}{52}$

(15)(ii) Let 'A' be the event that the card is a queen

$\therefore P(A) = \frac{\text{No. of queens}}{\text{Total cards}} = \frac{1}{5}$

(iii) Let 'B' be the event that the card is an ace

$\therefore P(B) = \frac{\text{No. of ace}}{\text{Total cards}} = \frac{1}{4}$ (As queen is removed)

(iii) → Let 'C' be the event that the card is a queen

$\therefore P(C) = \frac{\text{No. of queen}}{\text{Total cards}} = 0$

(16) Let 'A' be the event of getting a good pen

$\therefore P(A) = \frac{\text{No. of good}}{\text{Total pen}} = \frac{132}{144} = \frac{11}{12}$

17(ii) Let 'A' be the event of getting a defective bulb

$= P(A) = \frac{\text{No. of defective}}{\text{Total bulb}} = \frac{4}{20} = \frac{1}{5}$

(iii) Let 'B' be the event of getting a non-defective bulb

$= P(B) = \frac{\text{No. of good bulb}}{\text{Total bulb (19 bulb)}}$

$= P(B) = \frac{15}{19}$

(18) A box contain = 90 dics (1-90)

(i) Let 'A' be the event of getting a 2-digit no.

$= \text{Let } A = \frac{\text{No. of 2 digit no.}}{\text{Total no.}} = \frac{81}{90} = \frac{9}{10}$

(ii) Let 'B' be the event of getting a perfect square no.

$= P(B) = \frac{\text{No. of perfect square}}{\text{Total no}} = \frac{9}{90} = \frac{1}{10}$

(iii) Set 'C' be the event of getting a no. that is divisible by 5

$$= P(C) = \frac{\text{No. divisible by 5}}{\text{Total no.}} = \frac{18}{90} = \frac{1}{5}$$

(19) (i) Set 'A' be the event of getting a letter "A"

$$= P(A) = \frac{\text{No. of A letter}}{\text{Total letter}} = \frac{1}{6} = \frac{1}{3}$$

(ii) Set 'B' be the event of getting a letter 'B'

$$P(B) = \frac{\text{No. of B letter}}{\text{Total letter}} = \frac{1}{6}$$

(20) Area of rectangle = $L \times B$
$= 3 \times 2$
$= 6\ m^2$

Area of circle = $\frac{\pi d^2}{2} = \frac{\pi}{4}\ m^2$

II
24

(21) The total numbers of outcomes i.e pens given, numbers of defective pens = 20

Set 'A' be the event of non defective peace

$$P(A) = \frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}}$$

(i) Total numbers events in which she will buy them = 124

So P(buying) = 124/144 = 31/36 = 0.86

(ii) Total numbers event in which she will not buy them = 20

so P(not buying) = 20/144 = 5/36 = 0.138

(22) If 2 dice are thrown, the possible events are:

(1,1) (1,2) (1,3) (1,4) (1,5) (1,6)
(2,1) (2,2) (2,3) (2,4) (2,5) (2,6)
(3,1) (3,2) (3,3) (3,4) (3,5) (3,6)
(4,1) (4,2) (4,3) (4,4) (4,5) (4,6)
(5,1) (5,2) (5,3) (5,4) (5,5) (5,6)
(6,1) (6,2) (6,3) (6,4) (6,5) (6,6)

(i) It is given that to get the sum as 2, the probability is 1/36

= Probability of getting a sum of $2 = \frac{1}{36}$

= Probability of getting a sum of $3 = \frac{1}{18}$

= Probability of getting a sum of $4 = \frac{3}{36} = \frac{1}{12}$

= Probability of getting a sum of $5 = \frac{4}{36} = \frac{1}{9}$

= Probability of getting a sum of $6 = \frac{5}{36}$

= Probability of getting a sum of $7 = \frac{6}{36} = \frac{1}{6}$

= Probability of getting a sum of $8 = \frac{5}{36}$

= Probability of getting a sum of $9 = \frac{4}{36} = \frac{1}{9}$

= Probability of getting a sum of $10 = \frac{3}{36} = \frac{1}{12}$

= Probability of getting a sum of $11 = \frac{2}{36} = \frac{1}{18}$

= Probability of getting a sum of 12 = $\frac{1}{36}$

(iii) As we can see different values all over the table, we can conclude that, the given statement is wrong. The probability of each is $\frac{1}{11}$

(23) The probability of Hanif losing the game = The probability of not getting 3 heads & 3 tails

= The total no. of outcomes is 8

∴ The probability is = $1 - \frac{2}{8} = \frac{6}{8} = \frac{3}{4}$

(24) In this problem, 2 coins are tossed ie (HH, TH, TT, HT)

so the ~~ADS~~ probability of getting 2 head & tails = $\frac{1}{2}$

∴ Thus, the statement is wrong

(ii) If a die is thrown, their are 2 possibilities an odd number & an even number. Therefore of getting an odd number = $\frac{1}{2}$

∴ By throwing a die, we get 6 possible outcome the odd no. are 1, 3, 5

∴ The probability of odd no. is $\frac{3}{6} = \frac{1}{2}$

so it is true

(iv) we see 2 dice throwing together. Therefore the total number of outcomes = 36

∴ Now, the total cases where atleast 5 occurs (1,5), (2,5), (3,5), (4,5), (5,5), (6,5), (5,1), (5,2), (5,3), (5,4), (5,6)

so the probability of not getting 5 is $1 - \frac{11}{36} = \frac{25}{36}$

(iii) And, probability of getting 5 atleast once is $\frac{11}{36}$

→ Ex 15.2

(i)

Tue	Wed	Thu	Fri	Sat
(Tue, Tue)	(Wed, Tue)	(Thu, Tue)	(Fri, Tue)	(Sat, Tue)
(Tue, Wed)	(Wed, Wed)	(Thu, Wed)	(Fri, Wed)	(Sat, Wed)
(Tue, Fri)	(Wed, Thu)	(Thu, Thu)	(Fri, Thu)	(Sat, Thu)
(Tue, Sat)	(Wed, Sat)	(Thu, Sat)	(Fri, Sat)	(Sat, Sat)

(ii) Let 'a' be the event that they go on same day

∴ $P(a) = \frac{\text{no of favourable outcome}}{\text{Total outcome}}$

∴ $\frac{5}{25} = \frac{1}{5}$

(iii) Set 'G' be the event that they go on consecutive days

$= P(G) = \frac{\text{No. of favourable outcome}}{\text{Total outcome}}$

$= \frac{8}{25}$

(iii) Set 'C' be the event that they go on different days

$= \frac{\text{No. of favourable}}{\text{Total outcome}} = \frac{4}{5}$

(2)

→ Set 'a' be the event

$\therefore P(a) = \frac{\text{No. of even}}{\text{Total score}} = \frac{1}{2}$

→ Set 'G' be the event that the score is 6

$= P(G) = \frac{4}{36} = \frac{1}{9}$

(i) Let 'A' be the event that the total score is even

$$P(A) = \frac{\text{Number of even scores}}{\text{Total number of scores}} = \frac{18}{36} = \frac{1}{2}$$

(ii) Let 'B' be the event that the total score is '6'

$$P(B) = \frac{\text{Total score is exactly 6}}{\text{Total number of scores}} = \frac{5}{36}$$

(iii) Let 'C' be the event that the total score is atleast 6

$$P(C) = \frac{\text{Score is more than 6}}{\text{total number of score}} = \frac{15}{36} = \frac{5}{12}$$

(3) Red balls = 5

Let no. of blue ball be 'x'

Let P(A) be the probability of Red ball

Let P(B) be the probability of blue ball

As per the statement

$$P(B) = 2P(A)$$

$$\frac{x}{x+5} = 2\left(\frac{5}{x+5}\right)$$

$$x = 10$$

(4) Blue balls = x
Total balls = 12

Let 'A' be the event that ball taken out is black

$$P(A) = \frac{\text{No. of black balls}}{\text{Total no. of balls}}$$

$$P(A) = \frac{x}{12}$$

Now, adding 6 balls

Black balls = x+6
Total balls = 18

Let 'B' be the event that it is a black ball after addition

$$P(B) = \frac{x+6}{18}$$

$$P(B) = 2P(A)$$

$$\frac{x+6}{18} = \frac{2(x)}{12}$$

$$\frac{x+6}{3} = x$$

$\therefore x + 6 = 3x$

$\therefore 2x = 6$

$\therefore x = 3$

(ii) Let number of green marbles be 'x'
No. of blue marbles will be $24 - x$

Let $p(A)$ be the probability that it is green

$\therefore p(A) = \frac{2}{3}$

$\therefore \frac{x}{24} = \frac{2}{3}$

$\therefore 3x = 48$

$x = 16$

$\therefore$ Blue marbles will be $24 - 16 = 8$