

Data handling - IV (Probability)Exercise 26.1

Q1 The Probability that it will rain tomorrow is 0.85, what is the probability that it will not rain tomorrow?

Solution: let Probability of raining = $P(A) = 0.85$

$$P(\text{not raining}) = P(\bar{A}) = 1 - P(A) \\ = 1 - 0.85 = 0.15$$

Q.2 A die is thrown. Find the probability of getting
(i) a prime number (ii) 2 or 4 (iii) a multiple of 2 or 3

Sol: Possible outcomes = $\{1, 2, 3, 4, 5, 6\}$

(i) Prime numbers = 2, 3, 5

$$\therefore P(\text{Prime number}) = \frac{\text{Total Prime numbers}}{\text{Total Possible outcomes}} \\ = \frac{3}{6} = \frac{1}{2}$$

$$(ii) P(\text{getting 2 or 4}) = \frac{2}{6} = \frac{1}{3}$$

(iii) Multiple of 2 or 3 are 2, 4, 6, 3

$$\therefore P(\text{getting multiple of } 2 \text{ or } 3) = \frac{4}{6} = \frac{2}{3}$$

Q.3 In a simultaneous throw of a pair of dice, find the probability of getting

- (i) 8 as the sum
- (ii) a doublet
- (iii) doublet of prime numbers
- (iv) doublet of odd numbers
- (v) a sum greater than 9
- (vi) an even number or 11
- (vii) an even number on one and a multiple of 3 on the other
- (viii) neither 9 nor 11 as the sum of numbers on the faces.
- (ix) a sum less than 6
- (x) a sum less than 7
- (xi) a sum more than 7
- (xii) at least one 5
- (xiii) A number other than 5 on any dice

Solution: Here the possible outcomes by throwing two dices simultaneously.

(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)

$\therefore$ Total possible outcomes = 36

(i) 8 as the sum: $(2,6) (3,5), (4,4) (5,3), (6,2)$

$$\therefore P(8 \text{ as the sum}) = \frac{5}{36}$$

(ii) A doublet: $(1,1) (2,2) (3,3) (4,4) (5,5) (6,6)$

$$\therefore P(\text{doublet}) = \frac{6}{36} = \frac{1}{6}$$

(iii) A doublet of prime numbers = $(2,2) (3,3) (5,5)$

$$P(\text{doublet of primes}) = \frac{3}{36} = \frac{1}{12}$$

(iv) A doublet of odd numbers $(1,1) (3,3) (5,5)$

$$\therefore P(\text{doublet of odd numbers}) = \frac{3}{36} = \frac{1}{12}$$

(v) A sum greater than 9: $(4,6) (5,5) (5,6) (6,4) (6,5)$
 $(6,6)$

$$\therefore P(\text{sum greater than 9}) = \frac{6}{36} = \frac{1}{6}$$

(vi) An even number on first

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

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

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

$$P(\text{even no. on first}) = \frac{18}{36} = \frac{1}{2}$$

(vi) An even number on one and a multiple of 3 on the other.

Possible outcomes: $(2,3) (2,6) (4,3) (4,6) (6,3) (6,6)$

$$P(E) = \frac{6}{36} = \frac{1}{6}$$

(vii) neither 9 nor 11 as sum of the numbers on faces

Possible outcomes of ^{sum} either 9 or 11 are

$(3,6) (4,5) (5,4) (6,3) (5,6) (6,5)$

= 6 outcomes.

∴ Possible outcomes of neither getting sum 9 nor 11 are
 $= 36 - 6 = 30$

$$\therefore P(E) = \frac{30}{36} = \frac{5}{6}$$

(ix) a sum less than 6

Possible outcomes = $(1,1) (1,2) (1,3) (1,4) (2,1)$

$(2,2) (2,3) (3,1) (3,2) (4,1)$

= Total 10 outcomes.

$$\Rightarrow P(\text{a sum less than 6}) = \frac{10}{36} = \frac{5}{18}$$

(X) A sum less than 7

Possible outcomes: (1,1) (1,2) (1,3) (1,4) (1,5)
 (2,1) (2,2) (2,3) (2,4), (3,1) (3,2) (3,3) (4,1)
 (4,2) (5,1)

$$P(\text{sum less than 7}) = \frac{15}{36} = \frac{5}{12}$$

(XI) A sum more than 7

no. of outcomes having sum 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)

$$\text{Total} = 15$$

$$\therefore P(E) = \frac{15}{36} = \frac{5}{12}$$

(XII) at least once

Total no. of possible outcomes = 36

no. of outcomes having at least once = 11

$$P(\text{at least once}) = \frac{11}{36}$$

(XIII) A number other than 5 on any dice

no. of outcomes having 5 on any dice

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

(5,6) (6,5)

Total = 11

~~P(E)~~ $\therefore P(\text{having 5 on any dice}) = \frac{11}{36}$

$\therefore P(\text{not getting 5 on any dice}) = 1 - \frac{11}{36}$

$$= \frac{36-11}{36} = \frac{25}{36}$$

Q4 Three coins are tossed together, find the probability of getting:

- (i) exactly two heads
- (ii) at least two heads
- (iii) at least one head one tail
- (iv) no tails.

Sol: Possible out comes by tossing three coins are

(HHH, HHT, HTH, HTT, THT, TTH, TTT)

(i) Exactly two heads : { HHT, HTH, TTH }

$\therefore P(\text{exactly two heads}) = \frac{3}{8}$

(ii) At least two head = { HHT, HTH, TTH, HHH }

$P(\text{at least two head}) = \frac{4}{8} = \frac{1}{2}$

(iii) At least one head one tail

$\{HTT, HHT, \cancel{HHH}, HTH, TTT, THT, THH\}$

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

(iv) no tails: $\{HHH\}$

$$P(\text{no tails}) = \frac{1}{8}$$

Q.5 A card is drawn at random from a pack of 52 cards. Find the probability that the card drawn is

- | | |
|---------------------------------|--|
| (i) A black king | (ii) either a black card or a king |
| (iii) black and king | (iv) a jack, queen or king |
| (v) neither a heart nor a king | (vi) Spade or an ace |
| (vii) neither an ace nor a king | (viii) neither a red card nor a queen. |
| (ix) other than the ace | (x) a ten |
| (xi) a spade | (xii) a black card |
| (xiii) The seven of club | (xiv) jack |
| (xv) The ace of spades | (xv) a queen |
| (xvii) a heart | (xviii) a red card. |

Solution: (i) A black king

Total no. of cards = 52

Total black king = 2

$$\therefore P(\text{black king}) = \frac{2}{52} = \frac{1}{26}$$

(ii) Either a black card or king

$$\text{No. of black card or king} = 26 + 2 = 28$$

$$P(E) = \frac{28}{52} = \frac{7}{13}$$

(iii) Black and king

$$\text{no. of cards black and king} = 2$$

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

(iv) A Jack, king or queen

$$\text{Total no. of cards} = 52$$

$$\text{Cards of Jack, king or queen} = 4 + 4 + 4 = 12$$

$$P(E) = \frac{12}{52}$$

(v) neither a heart nor a king

$$\text{No. of heart} = 13$$

$$\text{No. of king} = 4 \text{ (having one heart)}$$

$$\therefore \text{either a heart or king} = 13 + 1 = 14$$

$$\text{neither a heart nor a king} = 52 - 14 = 38$$

$$\therefore P(E) = \frac{38}{52} = \frac{19}{26}$$

(ix) other than ace

$$\text{no. of cards other than ace} = 52 - 4 = 48$$

$$P(\text{other than ace}) = \frac{48}{52} = \frac{12}{13}$$

(x) A ten:

$$\text{no. of cards of ten} = 4$$

$$P(\text{A ten}) = \frac{4}{52} = \frac{1}{13}$$

(xi) A spade!

$$\text{no. of cards of spade} = 13$$

$$\therefore P(\text{a spade}) = \frac{13}{52} = \frac{1}{4}$$

(xii) A black card

$$\text{no. of black cards} = 26$$

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

(xiii) The seven of clubs:

$$\text{no. of cards of seven of club} = 1$$

$$P(\text{seven of club}) = \frac{1}{52}$$

(xiv) Jack: no. of Jack = 4

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

(xv) The ace of spade

no. of cards of ace of spade = 1

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

(xvi) a queen:

no. of queens = 4

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

(xvii) a heart:

no. of heart = 13

$$\therefore P(\text{a heart}) = \frac{13}{52} = \frac{1}{4}$$

(xviii) A red card

no. of red cards = 26

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

Q6 An urn contains 10 red and 8 white balls. one ball is drawn at random. Find the probability that the ball drawn is white.

Sol: no. of red balls = 10

no. of white balls = 8

Total balls = 10 + 8 = 18

$$\therefore P(\text{white ball}) = \frac{8}{18} = \frac{4}{9}$$

Q.7 A bag contains 3 red balls, 5 black balls and 4 white balls; A ball is drawn at random from the bag. What is the probability that the ball drawn is -

(i) white (ii) red? (iii) black? (iv) not red?

Sol! red balls = 3
 black balls = 5
 white balls = 4
 Total balls = $3 + 5 + 4 = 12$

$$(i) P(\text{white}) = \frac{4}{12} = \frac{1}{3}$$

$$(ii) P(\text{Red}) = \frac{3}{12} = \frac{1}{4}$$

$$(iii) P(\text{Black}) = \frac{5}{12}$$

$$(iv) P(\text{not red}) = 1 - \frac{1}{4} = \frac{4-1}{4} = \frac{3}{4}$$

Q.8 What is the probability that a number selected from the numbers 1, 2, 3, ..., 15 is a multiple of 4?

Sol! Multiples of 4 are 4, 8, 12 i.e. 3

Total numbers = 15

$$P(\text{Multiple of 4}) = \frac{3}{15} = \frac{1}{5}$$

Q9: A bag contains 6 red, 8 black and 4 white balls. A ball is drawn at random. What is the probability that ball drawn is not black.

Sol: Total balls = $6 + 8 + 4$
 $= 18$

Black balls = 8

$\therefore P(\text{Black balls}) = \frac{8}{18} = \frac{4}{9}$

$\therefore P(\text{not black}) = 1 - \frac{4}{9} = \frac{9-4}{9} = \frac{5}{9}$

Q.10 A bag contains 5 white and 7 red balls. One ball is drawn at random. What is the probability that the ball drawn is white?

Sol: White balls = 5

Red balls = 7

Total balls = $5 + 7 = 12$

$\therefore P(\text{white balls}) = \frac{5}{12}$

Q.11 A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random.

Find the probability that the ball drawn is

(i) white (ii) Red (iii) not black (iv) red or white

Sol:

Red Balls = 4

Black balls = 5

White balls = 6

Total balls = $4 + 5 + 6 = 15$

(i) $P(\text{white}) = \frac{6}{15} = \frac{2}{5}$

(ii) $P(\text{red}) = \frac{4}{15}$

(iii) $P(\text{not Black}) = \frac{15-5}{15} = \frac{10}{15} = \frac{2}{3}$

$$(iv) P(\text{red or white}) = \frac{\text{red balls} + \text{white balls}}{\text{Total balls}}$$

$$= \frac{4 + 6}{15} = \frac{10}{15} = \frac{2}{3}$$

Q. 12 A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is -

(i) red

(ii) Black

Sol:

Red balls = 3

Black balls = 5

$\therefore$ Total balls = $3 + 5 = 8$

(i) $P(\text{red}) = \frac{3}{8}$

(ii) $P(\text{Black}) = \frac{5}{8}$

Q.13 A bag contains 5 red marbles, 8 white marbles, 4 green marbles. What is the probability that if one marble is taken out of the bag at random, it will be

- (i) red (ii) white (iii) not green.

Sol: No. of red marbles = 5

No. of white marbles = 8

No. of green marbles = 4

$$\text{Total marbles} = 5 + 8 + 4 = 17$$

$$\begin{aligned} \text{(i)} \quad P(\text{red marbles}) &= \frac{\text{No. of red marbles}}{\text{Total marbles}} \\ &= \frac{5}{17} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad P(\text{white marbles}) &= \frac{\text{No. of white marbles}}{\text{Total marbles}} \\ &= \frac{8}{17} \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad \text{No. of marbles not green} &= 17 - (4) \\ &= 13 \end{aligned}$$

$$\therefore P(\text{not green}) = \frac{13}{17}$$

Q.14 If you put 21 Consonants and 5 vowels in a bag, what would carry greater probability.

Getting a Consonant or a vowel? Find each probability.

Sol: No. of Consonants = 21
Vowels = 5

$$\text{Total Alphabets} = 21 + 5 = 26$$

$$\therefore P(\text{getting consonant}) = \frac{\text{no. of Consonant}}{\text{Total alphabets}} = \frac{21}{26}$$

$$P(\text{vowel}) = \frac{\text{No. of vowels}}{\text{Total alphabets}} = \frac{5}{26}$$

Q.15 If we have 15 boys and 5 girls in a class which carries a higher probability? Getting a copy belonging to boy or a girl. Can you give it a value.

Sol: No. of boys = 15
No. of girls = 5

$$\text{Total students} = 15 + 5 = 20$$

$$\therefore P(\text{copy belonging to boy}) = \frac{15}{20} = \frac{3}{4}$$

$$(ii) P(\text{Copy belonging to girls}) = \frac{5}{20} = \frac{1}{4}$$

Q.16 If you have a collection of 6 pairs of white socks and 3 pairs of black socks, what is the probability that a pair you pick without looking is
(i) white? (ii) black?

Sol: No. of pairs of white socks = 6
No. of pairs of black socks = 3

$$(i) P(\text{white pair}) = \frac{6}{9} = \frac{2}{3}$$

$$(ii) P(\text{Black pair}) = \frac{3}{9} = \frac{1}{3}$$

Q.17 If you have a spinning wheel with 3 green sectors, 1-blue sector and 1-red sector, what is the probability of getting a green sector? Is it maximum?

Sol: No. of green sectors = 3
Blue Sectors = 1
red sectors = 1

$$\text{Total sectors} = 3 + 1 + 1 = 5$$

$$P(\text{green sector}) = \frac{3}{5}$$

Q.18 : when two dice are rolled

- (i) list the outcomes for the event that the total is odd.
 (ii) Find Probability of getting an odd total.
 (iii) list the outcome for the event that total is less than 5
 (iv) Find the probability of getting a total less than 5?

Sol: (i) outcomes that the total is odd.

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

$$(ii) \quad P(\text{getting odd total}) = \frac{18}{36} \\ = \frac{1}{2}$$

(iii) List the outcome for the event that total is less than 5.

(1,1) (1,2) (1,3) (2,1) (2,2), (3,1)

$$(iv) \quad P(\text{getting a total less than 5}) = \frac{6}{36} \\ = \frac{1}{6}$$