RD SHARMA Solutions for Class 10 Maths Chapter 16 - Probability

Chapter 16 - Probability Exercise Ex. 16.1

Question 1

The probability that it will rain tomorrow is 0.85.

What is the probability that it will not rain tomorrow?

Solution 1

We know that

$$p\ (\text{rain}) + p\ (\text{not rain}) = 1$$

$$\Rightarrow \quad 0.85 + p\ (\text{not rain}) = 1$$

$$\Rightarrow \quad p\ (\text{not rain}) = 1 - 0.85$$

$$\Rightarrow \quad p\ (\text{not rain}) = 0.15$$

Question 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

(iv) an even prime number

(v) a number greater than 5

(iv) a number lying between 2 and 6

Solution 2

When a die is thrown, the possible outcomes are 1, 2, 3, 4, 5, 6.

Number of possible outcomes = 6

(i) Prime numbers are 2. 3 and 5.

Probability of getting a prime number $= \frac{3}{6} = \frac{1}{2}$

(ii) Favourable outcomes of getting 2 or 4 = 2 {2,4}

Probability of getting 2 or 4 $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{2}{6} = \frac{1}{3}$

(iii) Favourable outcomes of getting a multiple of 2 or 3 = 4 {2,4,6,3}

Probability of getting a multiple of 2 or 3 $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{4}{6} = \frac{2}{3}$

(iv) Favourable outcome of getting an even prime number = 1 {2}

Probability of getting an even prime number $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{1}{6}$

(v) Favourable outcome of getting a number greater than 5 = 1 {6}

Probability of getting a number greater than 5 $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{1}{6}$

(vi) Favourable outcome of getting a number lying between 2 and 6 = 3 {3, 4, 5}

Probability of getting a number lying between 2 and 6 $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} \quad \frac{3}{6} = \frac{1}{2}$

Question 3

Three coins are tossed together.Find the probabilitly of getting:

(i) Exactly two heads

(ii) at least two heads

(iii) at least one head and one tail

(iv) no tails

Solution 3

When three coins are thrown, the possible outcomes are

Number of possible outcomes = 8

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

(i)

Favourable outcomes of exactly two heads = 3 $\{HHT, HTH, THH\}$

$$\text{Probability of exactly two heads} = \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{3}{8}$$

(ii)

Favourable outcomes of at least two heads = 4 $\{HHH, HHT, HTH, THH\}$

$$\text{Probability of exactly two heads} = \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{4}{8} = \frac{1}{2}$$

(iii)

Favourable outcomes of at least one head and one tail = 6 $\{HHT, HTH, HTT, THH, THT, TTH\}$

$$\text{Probability of at least one head and one tail} = \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{6}{8} = \frac{3}{4}$$

(iv)

Favourable outcome of no tails = 1 $\{HHH\}$

$$\text{Probability of no tail} = \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{1}{8}$$

Question 4

A and B throw a pair of dice. If A throws 9, find B's chance of throwing a higher number.

Solution 4

When a pair of dice is thrown, the possible outcomes are

$$\begin{Bmatrix} (1,1)(2,1)(3,1)(4,1)(5,1)(6,1) \\ (1,2)(2,2)(3,2)(4,2)(5,2)(6,2) \\ (1,3)(2,3)(3,3)(4,3)(5,3)(6,3) \\ (1,4)(2,4)(3,4)(4,4)(5,4)(6,4) \\ (1,5)(2,5)(3,5)(4,5)(5,5)(6,5) \\ (1,6)(2,6)(3,6)(4,6)(5,6)(6,6) \end{Bmatrix}$$

Number of possible outcomes = 36

Favourable outcomes of throwing a number higher than 9 = 6

$$\begin{Bmatrix} (4,6)(5,5)(6,4) \\ (5,6)(6,5)(6,6) \end{Bmatrix}$$

$$\text{Required probability} = \frac{6}{36} = \frac{1}{6}$$

Question 5

Two unbiased dice are thrown. Find the probability that the total of the numbers on the dice is greater than 10.

Solution 5

When a pair of dice is thrown, the total number of possible outcomes are 36

Favourable outcomes of the sum greater than 10 = 3

$$\{(5,6)(6,5)(6,6)\}$$

Probability of getting the sum greater than $10 = \frac{3}{36}$

$$= \frac{1}{12}$$

Question 6

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 a king (iv) a jack, a queen or a 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 an ace (x) a ten

(xi) a Spade (xii) a black card

(xiii) the seven of clubs (xiv) jack

(xv) the ace of spades (xvi) a queen

(xvii) a heart (xvii) a red card.

Solution 6

Total outcome in pack of cards = 52

(i)

Favourable outcome of a black king = 2

Probability of a black king $= \frac{2}{52} = \frac{1}{26}$

(ii)

Favourable outcome of either a black card or a king = 26 + 2 = 28

Probability of either a black card or a king $= \frac{28}{52} = \frac{7}{13}$

(iii)

Favourable outcome of black and a king = 2

Probability of black and a king $= \frac{2}{52} = \frac{1}{26}$

(iv)

Favourable outcome of a jack, a queen, or a king = 4 + 4 + 4
= 12

Probability of a jack,a queen,or a king $= \frac{12}{52} = \frac{3}{13}$

(v)

Favourable outcome of neither a heart nor a king = 52 – 13 – 3
= 36

Probability of neither a heart nor a king $= \frac{36}{52} = \frac{9}{13}$

(vi)

Favourable outcome of spade or an ace = 13 + 3
= 16

Probability of spade or an ace $= \frac{16}{52} = \frac{4}{13}$

(vii)

Favourable outcome of neither an ace nor a king $= 52 - 4 - 4$

$= 44$

Probability of neither an ace nor a king $= \frac{44}{52} = \frac{11}{13}$

(viii)

Favourable outcome of neither a red card nor a queen $= 52 - 26 - 2$

$= 24$

Probability of neither a red card nor a queen $= \frac{24}{52} = \frac{6}{13}$

(ix)

Favourable outcome of other than an ace $= 52 - 4 = 48$

Probability of card other than an ace $= \frac{48}{52} = \frac{12}{13}$

(x)

Favourable outcome of a ten card $= 4$

Probability of a ten card $= \frac{4}{52} = \frac{1}{13}$

(xi)

Favourable outcome of a spade $= 13$

Probability of a spade card $= \frac{13}{52} = \frac{1}{4}$

(xii)

Favourable outcome of a black card $= 26$

Probability of a black card $= \frac{26}{52} = \frac{1}{2}$

(xiii)

Favourable outcome of the seven of clubs = 1

$$\text{Probability of the seven of clubs} = \frac{1}{52}$$

(xiv)

Favourable outcome of a jack card = 4

$$\text{Probability of a jack card} = \frac{4}{52} = \frac{1}{13}$$

(xv)

Favourable outcome of the ace of spades = 1

$$\text{Probability of the ace of spades} = \frac{1}{52}$$

(xvi)

Favourable outcome of a queen = 4

$$\text{Probability of a queen} = \frac{4}{52} = \frac{1}{13}$$

(xvii)

Favourable outcome of a heart card = 13

$$\text{Probability of a heart card} = \frac{13}{52} = \frac{1}{4}$$

(xviii)

Favourable outcome of a red card = 26

$$\text{Probability of a red card} = \frac{26}{52} = \frac{1}{2}$$

Question 6(xix)

A card is drawn at random from a pack of 52 cards. Find the probability that the card drawn is neither a king nor a queen.

Solution 6(xix)

Out of 52 cards, one card can be drawn in 52 ways.
$\therefore$ n(Total number of throws) = 52

There are 4 kings and 4 queens in a pack of 52 cards.
So the number of cards which are not
kings and queens = $52-(4+4)=52-8=44$

n(neither a king nor a queen) = 44

P(neither a king nor a queen)

$$= \frac{\text{Number of favourable events}}{\text{Total number of events}}$$

$$= \frac{44}{52}$$

$$= \frac{11}{13}$$

Question 7

In a lottery of 50 tickets numbered 1 to 50, one ticket is drawn.
Find the probability that the drawn ticket bears a Prime number.

Solution 7

Total number of tickets = 50

$\{1,2,3.....50\}$

Favourable outcomes = 15

$\{2,3,5,7,11,13,17,19,23,29,31,37,41,43,47\}$

$$\text{Required probability} = \frac{\text{favourable outcomes}}{\text{Total outcomes}}$$

$$= \frac{15}{50} = \frac{3}{10}$$

Question 8

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

Solution 8

Red balls = 10

White balls = 8

Total balls = 10 + 8 = 18

$$\text{Probability of getting a white ball} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$$

$$= \frac{8}{18} = \frac{4}{9}$$

Question 9

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?

Solution 9

Red balls = 3

Black balls = 5

White balls = 4

Total balls = 3 + 5 + 4 = 12

(i)

$$\text{Probability that the ball drawn is white ball} = \frac{4}{12} = \frac{1}{3}$$

(ii)

$$\text{Probability that the ball drawn is red ball} = \frac{3}{12} = \frac{1}{4}$$

(iii)

$$\text{Probability that the ball drawn is black ball} = \frac{5}{12}$$

(iv)

$$\text{Probability that the ball drawn is not red ball} = \frac{5+4}{12} = \frac{9}{12} = \frac{3}{4}$$

Question 10

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

Solution 10

Total numbers = 15

$\{1, 2, 3.....15\}$

Favourable outcomes = 3

$\{4, 8, 12\}$

$$\text{Required probability} = \frac{3}{15} = \frac{1}{5}$$

Question 11

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

Solution 11

Red balls = 6

Black balls = 8

White balls = 4

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

Probability that the ball drawn is not black $= \frac{6+4}{18}$

$= \frac{10}{18} = \frac{5}{9}$

Question 12

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?

Solution 12

White balls = 5

Red balls = 7

Total balls $= 5 + 7 = 12$

Probability that the ball drawn is white $= \frac{5}{12}$

Question 13

Tickets numbered from 1 to 20 are mixed up and a ticket is drawn at random.
What is the probability that the ticket drawn has a number which is a multiple of 3 or 7?

Solution 13

Total number of tickets = 20

$\{1, 2, 3.....20\}$

Favourable outcomes (tickets with number as a multiple of 3 or 7) = 8

$\{3, 6, 9, 12, 15, 18, 7, 14\}$

Required probability $= \frac{8}{20} = \frac{2}{5}$

Question 14

In a lottery there are 10 prizes and 25 blanks.What is the probability of getting a prize?

Solution 14

Number of prizes = 10

Number of blanks = 25

Total number of tickets = 10 + 25 = 35

Probability of getting a prize = $\frac{10}{35} = \frac{2}{7}$

Question 15

If the probability of winning a game is 0.3, what is the probability of loosing it?

Solution 15

We have

$p(\text{winning}) = 0.3$

We know that

$p(\text{winning}) + p(\text{loosing}) = 1$

$\Rightarrow \quad 0.3 + p(\text{loosing}) = 1$

$\Rightarrow \quad p(\text{loosing}) = 1 - 0.3$

$= 0.7$

Question 16

A bag contains 5 black, 7 red and 3 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is:

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

Solution 16

Black balls = 5

Red balls = 7

White balls = 3

Total balls = 5 + 7 + 3 = 15

(i) P(drawing a red ball) = $\frac{7}{15}$

(ii) P(drawing black or white ball) = $\frac{5+3}{15} = \frac{8}{15}$

(iii) P(drawing a ball which is not black) = 1 - P(drawing a black ball)

$= 1 - \frac{5}{15}$

$= 1 - \frac{1}{3} = \frac{2}{3}$

Question 17

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

Solution 17

Red balls = 4

black balls = 5

white balls = 6

Total balls = 4 + 5 + 6 = 15

(i) P(drawing a white ball) $= \frac{6}{15} = \frac{2}{5}$

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

(iii) P(drawing a ball which is not black) = 1 - P(drawing a black ball)

$$= 1 - \frac{5}{15}$$

$$= 1 - \frac{1}{3} = \frac{2}{3}$$

(iv) Probability of red or white ball $= \frac{4+6}{15} = \frac{10}{15} = \frac{2}{3}$

Question 18

One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

(i) a king of red suit

(ii) a face card

(iii) a red face card

(iv) a queen of black suit

(v) a jack of hearts

(vi) a spade

Solution 18

Total number of cards in a well shuffled deck = 52

(i) Total number of kings of red colour = 2

$$P(\text{getting a king of red colour}) = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}}$$

$$= \frac{2}{52} = \frac{1}{26}$$

(ii) Total number of face cards = 12

$$P(\text{getting a face card}) = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}}$$

$$= \frac{12}{52} = \frac{3}{13}$$

(iii) Total number of red face cards = 6

$$P(\text{getting a red face card}) = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}}$$

$$= \frac{6}{52} = \frac{3}{26}$$

(iv) Total number of queen of black suit = 2

$$P(\text{getting a queen of black suit}) = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}}$$

$$= \frac{2}{52} = \frac{1}{26}$$

(v) Total number of Jack of hearts = 1

$$P(\text{getting a Jack of hearts}) = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}}$$

$$= \frac{1}{52}$$

(vi) The total number of spade cards = 13

$$P(\text{getting a spade card}) = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}}$$

$$= \frac{13}{52} = \frac{1}{4}$$

Question 19(i)

Five cards-ten, jack, queen, king, and an ace of diamonds are shuffled face downwards. One card is picked at random.

(i) What is the probability that the card is a queen?

Solution 19(i)

(i) Total number of cards $= 5$

Total number of queen $= 1$

$$P(\text{getting a queen}) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{1}{5}$$

Question 19(ii)

Five cards – ten, jack, queen, king, and an ace of diamonds are shuffled face downwards. One card is picked at random.

If a king is drawn first and put aside, what is the probability that the second card picked up is the
(i)ace? (ii)king?

Solution 19(ii)

Since the first card drawn is a king, therefore there are 4 remaining cards.

$(i) n(\text{total outcomes}) = 4$

$n(\text{favourable outcome}) = 1$

$$P(\text{second card is an ace}) = \frac{1}{4}$$

Since the first card drawn is a king, therefore there are 4 remaining cards and there are no remaining kings.

$(ii) n(\text{total outcomes}) = 5$

$n(\text{favourable outcome}) = 0$

$$P(\text{second card is a king}) = \frac{0}{5} = 0$$

Question 20

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?

Solution 20

Number of red balls = 3

Number of black balls = 5

Total number of balls in the bag = 3 + 5 = 8

(i) Probability of getting a red ball = $\frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}} = \frac{3}{8}$

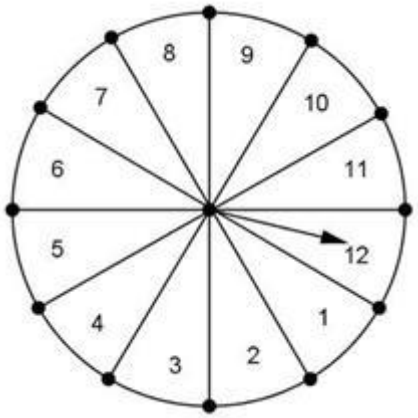
(ii) Probability of getting a black ball = $\frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}} = \frac{5}{8}$

Question 21

A game of chance consists of spinning an arrow which is equally likely to come to rest pointing to one of the number 1,2,3,.....12 as shown in figure 13.3. What is the probability that it will point to

(i) 10? (ii) an odd number?

(iii) a number which is multiple of 3? (iv) an even number?



Solution 21

Total outcomes = 12

$\{1,2,3.....12\}$

(i) Favourable outcomes = 1

Probability of obtaining number 10 = $\frac{1}{12}$

(ii) Favourable outcomes = 6

$\{1,3,5,7,9,11\}$

Probability of obtaining an odd number = $\frac{6}{12} = \frac{1}{2}$

(iii) Favourable outcomes = 4

$\{3,6,9,12\}$

Probability of a number which is a multiple of 3 = $\frac{4}{12} = \frac{1}{3}$

(iv) Favourable outcomes = 6

$\{2,4,6,8,10,12\}$

Probability of obtaining an even number = $\frac{6}{12} = \frac{1}{2}$

Question 22

In a class, there are 18 girls and 16 boys. The class teacher wants to choose one pupil for class monitor. What she does, she writes the name of each pupil on a card and puts them into a basket and mixed thoroughly. A child is asked to pick one card from the basket. What is the probability that the name written on the card is

(i) the name of a girl (ii) the bame of a boy

Solution 22

Number of girls = 18

Number of boys = 16

Total pupil = 18 + 16 = 34

(i)

Probability of a girl monitor = $\frac{18}{34} = \frac{9}{17}$

(ii)

Probability of a boy monitor = $\frac{16}{34} = \frac{8}{17}$

Question 23

Why is tossing a coin considered to be a fair way of deciding which team should choose ends in a game of cricket?

Solution 23

A coin has only two options-head and tail and both are equally likely events i.e. the probability of occurrence of both is same. Hence, a coin is a fair option to decide which team will choose ends in the game.

Question 24

What is the probability that a number selected at random from the number 1,2,2,3,3,3,4,4,4,4, will be their average?

Solution 24

Numbers are 1,2,2,3,3,3,4,4,4,4

$$\therefore \quad \text{Average} = \frac{\text{Sum of numbers}}{\text{Total numbers}}$$

$$= \frac{1+2+2+3+3+3+4+4+4+4}{10}$$

$$= \frac{30}{10} = 3$$

$$\text{Probability of the average number} = \frac{3}{10}$$

Question 25

There are 30 cards, of same size, in a bag on which numbers 1 to 30 are written. One card is taken out of the bag at random. Find the probability that number on the selected card is not divisible by 3 ?

Solution 25

Total cards = 30

$$\{1, 2, 3 \ldots\ldots 30\}$$

Favourable outcome of a card that is not divisible by 3 = 20

$$\{1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29\}$$

$$\text{Probability of a card that is not divisible by 3} = \frac{20}{30}$$

$$= \frac{2}{3}$$

Question 26

A bag contains 5 red , 8 white and 7 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is

(ii) red or white (ii) not black (iii) neither white nor black?

Solution 26

Red balls = 5
White balls = 8
Black balls = 7

Total balls = 5 + 8 + 7 = 20

(i)
Favourable outcome of red or white ball = 5 + 8 = 13

Probability of red or white ball = $\frac{13}{20}$

(ii)
Favorable outcome of not a black ball = total balls − number of black balls = 20 − 7 = 13

Probability of not black ball = $\frac{13}{20}$

(iii)
Favourable outcome of neither white nor black ball = total balls − number of white balls − number of black balls = 20 − 8 − 7 = 5

Probability of neither white nor black ball = $\frac{5}{20} = \frac{1}{4}$

Question 27

Find the probability that a number selected from the number 1 to 25 is not a prime number when each of the given numbers is equally likely to be selected.

Solution 27

Total cards = 25

$\{1, 2, 3.....25\}$

Favourable outcome of a card not having a prime number = 16

$\{1, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25\}$

Probability of a card not having a prime number = $\frac{16}{25}$

Question 28

A bag contains 8 red, 6 white and 4 black balls. A ball is drawn at random from the bag. Find he probability that the drawn ball is
(i) red or white (ii) not black (iii) neither white nor black

Solution 28

Red balls = 8
White balls = 6
Black balls = 4
Total balls = 8 + 6 + 4 = 18

(i)
Favourable outcome of red or white ball = 8 + 6 = 14

Probability of red or white ball = $\frac{14}{18} = \frac{7}{9}$

(ii)
Favorable outcome of not a black ball = total balls − number of black balls = 18 − 4 = 14

Probability of not black ball = $\frac{14}{18} = \frac{7}{9}$

(iii)
Favourable outcome of neither white nor black ball = total balls − number of white balls − number of black balls = 18 − 6- 4 = 8

Probability of neither white nor black ball = $\frac{8}{18} = \frac{4}{9}$

Question 29

Find the probability that a number selected at random from the numbers 1,2,3.....35 is a
(i) prime number (ii) multiple of 7 (iii) a multiple of 3 or 5

Solution 29

Total numbers = 35
$\{1, 2, 3.....35\}$

(i) Favorable outcomes for a prime number between 1 and 35 = 11
$\{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31\}$
Probability of a prime number = $\frac{11}{35}$

(ii) Favorable outcomes for a number which is multiple of 7 = 5
$\{7, 14, 21, 28, 35\}$
Probability of a number multiple of 7 = $\frac{5}{35} = \frac{1}{7}$

(iii) Favorable outcomes for a number which is multiple of 3 or 5 = 16
$\{3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 5, 10, 20, 25, 35\}$
Probability of a number multiple of 3 or 5 = $\frac{16}{35}$

Question 30

From a pack of 52 playing cards Jacks, queens,kings and aces of red colour are removed. From the remaining, a card is drawn at random. Find the probability that the card drawn is

(i) a black queen (ii) a red card (iii) a black jack

(iv) a picture card (jacks,queens and kings are picture cards)

Solution 30

Total number of cards = 52

All jacks, queens, kings and aces of red colour are removed

then remaining cards = 52 – 2 – 2 – 2 – 2

= 44

(i) Favourable outcome of a black queen = 2

Probability of a black queen $= \frac{2}{44} = \frac{1}{22}$

(ii) Total red cards = $13 \times 2 = 26$

Favorable outcome of a red card = total red cards – red picture cards – red aces = 26 – 6 – 2 = 18

Probability of a red card $= \frac{18}{44} = \frac{9}{22}$

(iii) Favourable outcome of a black jack = 2

Probability of a black jack $= \frac{2}{44} = \frac{1}{22}$

(iv) Total number of picture cards in a suit = $4 \times 3 = 12$

Favorable outcome of a picture card = total picture cards – red picture cards = 12 – 6 = 6

Probability of a picture card $= \frac{6}{44} = \frac{3}{22}$

Question 31

A bag contains lemon flavoured candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out

(i) an orange flavoured candy?

(ii) a lemon flavoured candy?

Solution 31

(i) The bag contains lemon flavoured candies only. So, event that Malini will take out an orange flavoured candy, is an impossible event.

∴ P (an orange flavoured candy) = 0

(ii) The bag contains lemon flavoured candies only. So, the event that Malini will take out a lemon flavoured candy, is a sure event.

∴ P (a lemon flavoured candy) = 1

Question 32

It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday?

Solution 32

Probability that two students are not having same birthday = P (E) = 0.992

∴ Probability that two students are having same birthday P (E') = 1 – P (E)

We know, probability of occurrence of an event and probability of non occurrence of event = 1

$\therefore P(E) + P(\bar{E}) = 1$

$\Rightarrow 0.992 + P(\bar{E}) = 1$

$\Rightarrow P(\bar{E}) = 1 - 0.992$

$\Rightarrow P(\bar{E}) = 0.008$

Hence, P(2 students have the same birthday) = 0.008

Question 33

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) not red?

Solution 33

Red balls = 3

Black balls = 5

Total ball = 3 + 5 = 8

$$\text{Probability of red ball} = \frac{\text{favourable outcome}}{\text{Total outcome}}$$

$$= \frac{3}{8}$$

Probability of a red ball + Probability of not a red ball = 1

$\therefore P(E) + P(\bar{E}) = 1$

$\Rightarrow \frac{3}{8} + P(\bar{E}) = 1$

$\Rightarrow P(\bar{E}) = 1 - \frac{3}{8}$

$\Rightarrow P(\bar{E}) = \frac{5}{8}$

Hence, Probability of not a red ball $= \frac{5}{8}$

Question 34

A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be (i) red? (ii) white? (iii) not green?

Solution 34

Total number of marbles = 5 + 8 + 4 = 17

(i) Number of red marbles = 5

$$\text{Probability of getting a red marble} = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{5}{17}$$

(ii) Number of white marbles = 8

$$\text{Probability of getting a white marble} = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{8}{17}$$

(iii) Number of green marbles = 4

$$\text{Probability of getting a green marble} = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{4}{17}$$

$$\text{Probability of not getting a green marble } 1 - \text{Probability of getting a green marble} = 1 - \frac{4}{17} = \frac{13}{17}$$

Question 35

A lot consists of 144 ball pens of which 20 are defective and the others are good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. What is the probability that

(i) She will buy it?

(ii) She will not buy it?

Solution 35

Total number of pens = 144

Total number of defective pens = 20

Total number of good pens = 144 − 20 = 124

$$\text{(i) P (Nuri buys a pen)} = \text{Probability of getting a good pen} = \frac{124}{144} = \frac{31}{36}$$

$$\text{(ii) P(Nuri will not buy a pen)} = 1 - \text{P(Nuri will buy a pen)} = 1 - \frac{31}{36} = \frac{5}{36}$$

Question 36

12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one.

Solution 36

Total number of pens = 12 + 132 = 144

Total number of good pens = 132

$$\text{P (getting a good pen)} = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

$$= \frac{132}{144} = \frac{11}{12}$$

Question 37

Five cards -the ten, jack , queen , king and ace of diamonds, are well- shuffled with their face downwards. One card is then picked up at random.

(i) What is the probability that the card is the queen?

(ii) If the queen is drawn and put aside, what is the probability that the second card picked up is (a) an ace? (b) a queen?

Solution 37

We have five cards-the ten, jack, queen, king and ace.

(i) Number of queens = 1

Probability of a queen $= \frac{1}{5}$

(ii)

If the queen is drawn and put aside, then remaining cards $= 5 - 1 = 4$

(a) number of aces = 1

Probability of an ace $= \frac{1}{4}$

(b) number of queens = 0

Probability of an queen $= \frac{0}{4} = 0$

Question 38

Harpreet tosses two different coins simultaneously (say, one is of Re 1 and other of Rs 2). What is the probability that gets at least one head?

Solution 38

We write H for 'head and T for 'tail'. When two coins are tossed simultaneously, the possible outcomes are (H,H),(H,T),(T,H),(T,T), which are all equally likely. Here (H,H) means head up on the first coin (say on Re 1) and head up on the second coin (Rs 2). Similarly (H,T) means head up on the first coin and tail up on the second coin and so on.

The outcomes favourable to the event E, 'at least one head' are (H,H),(H,T) and (T,H).

So, the number of outcomes favourable to E is 3.

Therefore, $P(E) = \frac{3}{4}$

i.e., the probability that Harpreet gets at least one head is $\frac{3}{4}$.

Note You can also find P(E) as follows:

$P(E) = 1 - P(\bar{E}) = 1 - \frac{1}{4} = \frac{3}{4}$ $\left(\text{Since } P(\bar{E}) = P(\text{no head}) = \frac{1}{4}\right)$

Question 39

Card marked with numbers 13,14,15.....60 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that number on the card drawn is

(i) divisible by 5 (i) a number is perfect square.

Solution 39

Total cards = 48

$\{13, 14, 15.....60\}$

(i)

Favourable outcome of a card divisible by 5 = 10

$\{15, 20, 25, 30, 35, 40, 45, 50, 55, 60\}$

Probability of a card divisible by 5 = $\frac{10}{48} = \frac{5}{24}$

(ii)

Favourable outcome of a card which is a perfect square = 4

$\{16, 25, 36, 49\}$

Probability of a card which is a perfect square = $\frac{4}{48} = \frac{1}{12}$

Question 40

A bag contains tickets numbered 11,12,13.....30. A ticket is taken out from the bag at random. Find the probability that the number on the drawn ticket (i) is a multiple of 7

(ii) is greater than 15 and a multiple of 5.

Solution 40

Total number of tickets = 20

$\{11, 12, 13 \ldots\ldots\ldots 30\}$

(i)

Favourable outcome of a ticket which is a multiple of 7 = 3

$\{14, 21, 28\}$

Probability of a ticket which is a multiple of $7 = \frac{3}{20}$

(ii)

Favourable outcome of a ticket which is greater than 15 and a multiple of 5 = 3

$\{20, 25, 30\}$

Probability of a ticket which is greater than 15 and a multiple of $5 = \frac{3}{20}$

Question 41

Fill in the blanks:

(i) Probability of a sure event is _____.

(ii) Probability of an impossible event is _____.

(iii) The probability of an event (other than sure and impossible event) lies between _____.

(iv) Every elementary event associated to a random experiment has _____ probability.

(v) Probability of an event A + Probability of an event 'not A' = _____.

(vi) Sum of the probabilities of each outcome in an experiment is _____.

Solution 41

(i) 1

(ii) 0

(iii) 0 and 1

(iv) equal

(v) 1

(vi) 1

Question 42

Which of the following arguments are correct and which are not correct. Give reasons for your answer.

(i) If two coins are tossed simultaneously there are three possible outcomes – two heads, two tails or one of each. Therefore, for each of these outcomes, the probability is $\frac{1}{3}$.

(ii) If a die is thrown, there are two possible outcomes – an odd number or an even number. Therefore, the probability of getting an odd number is $\frac{1}{2}$ and probability of getting an even number is $\frac{1}{2}$.

Solution 42

(i) The given statement is incorrect.
When two coins are tossed simultaneously, the possible outcomes are (H, H), (H, T), (T, H), and (T, T).

So, the probability of getting two heads is $\frac{1}{4}$; Probability of getting two tails is $\frac{1}{4}$ and Probability of getting one of each is $\frac{2}{4} = \frac{1}{2}$.

(ii) The given statement is correct.
When a die is thrown possible outcomes are 1, 2, 3, 4, 5, and 6. Out of which 1, 3, 5 are odd and 2, 4, 6 are even numbers.
In other words, it can be said that when a die is thrown, there are two possible outcomes – an odd number or an even number as these outcomes are equally likely.

So, the probability of getting an odd number is $\frac{3}{6} = \frac{1}{2}$.

Question 43

A box contains 100 red cards, 200 yellow cards and 50 blue cards. If a card is drawn at random from the box, then find the probability that it will be (i) a blue card (ii) not a yellow card (iii) neither yellow nor a blue card.

Solution 43

Number of red cards = 100

Number of yellow cards = 200

Number of blue cards = 50

Total number of cards = 100 + 200 + 50 = 350

(i) Favourable outcomes = Number of blue cards = 50

$$\text{Required probability} = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}} = \frac{50}{350} = \frac{1}{7}$$

(ii) Number of yellow cards = 200

Favourable outcomes = Number of cards which are not yellow = 350 - 200 = 150

$$\text{Required probability} = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}} = \frac{150}{350} = \frac{3}{7}$$

(iii) Favourable outcomes = Number of cards which are neither yellow nor blue = 100

$$\text{Required probability} = \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}} = \frac{100}{350} = \frac{2}{7}$$

Question 44

A box contains cards numbered 3,5,7,9,…,35,37. A card is drawn at random from the box. Find the probability that the number on the drawn card is a prime number.

Solution 44

Numbered cards = {3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37}

$n(\textit{total number of outcomes}) = 18$

Number of prime cards={3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37}

$n(\textit{favourable outcomes}) = 11$

$$P(\textit{number drawn is a prime number}) = \frac{11}{18}$$

* *Note*: Answer given in the book is incorrect.

Question 45

A group consists of 12 persons, of which 3 are extremely patient, 6 are extremely honest and the rest are extremely kind. A person from the group is selected at random. Assuming that each person is equally likely to be selected, find the probability of selecting a person who is (i) extremely patient (ii) extremely kind or honest. Which of the above would you prefer more?

Solution 45

$n(Total\ number\ of\ persons) = 12$

$n(extremely\ patient) = 3$

$n(extremely\ honest) = 6$

$n(extremely\ kind) = 3$

$$(i) P(extremely\ patient) = \frac{n(extremely\ patient)}{n(Total\ number\ of\ persons)}$$

$$= \frac{3}{12} = \frac{1}{4}$$

$$(ii) P(extremely\ kind\ or\ honest) = \frac{n(extremely\ kind\ or\ honest)}{n(Total\ number\ of\ persons)}$$

$$= \frac{6}{12} + \frac{3}{12} = \frac{6+3}{12} = \frac{9}{12} = \frac{3}{4}$$

I would prefer the person selected to be kind and honest.

Question 46

Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on the drawn card is,
(i) Not divisible by 3
(ii) A prime number greater than 7
(iii) Not a perfect square number.

Solution 46

$$\text{Cards in the bag} = \begin{Bmatrix} 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, \\ 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, \\ 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 \end{Bmatrix}$$

$\therefore n(\text{total number of outcomes}) = 30$

(i)

$$\text{Numbers which are not divisible by 3} = \begin{Bmatrix} 1, 2, 4, 5, 7, 8, 10 \\ 11, 13, 14, 16, 17, 19, 20, \\ 22, 23, 25, 26, 28, 29 \end{Bmatrix}$$

$\Rightarrow n(\text{not divisble by 3}) = 20$

$$\Rightarrow P(\text{not divisible by 3}) = \frac{20}{30} = \frac{2}{3}$$

(ii)

$\text{Prime Numbers that are greater than 7} = \{11, 13, 17, 19, 23, 29\}$

$\Rightarrow n(\text{prime numbers that are greater than 7}) = 6$

$$\Rightarrow P(\text{a prime number greater than 7}) = \frac{6}{30} = \frac{1}{5}$$

(iii)

Numbers which are not perfect square numbers

$$= \begin{Bmatrix} 2, 3, 5, 6, 7, 8, 10 \\ 11, 12, 13, 14, 15, 17, 18, 19, 20, \\ 21, 22, 23, 24, 26, 27, 28, 29, 30 \end{Bmatrix}$$

$\Rightarrow n(\text{Numbers which are not perfect square numbers}) = 25$

$$\Rightarrow P(\text{not a perfect square number}) = \frac{25}{30} = \frac{5}{6}$$

Question 47

A piggy bank contains hundred 50 paise coins, fifty Rs. 1 coins, twenty Rs. 2 coins and ten Rs. 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, find the probability that the coin which falls out

(i) is a 50 paise win

(ii) is of value more than Rs. 1

(iii) is of value less than Rs. 5

(iv) is a Rs. 1 or Rs. 2 coin

Solution 47

$n(50\ paisa\ coins) = 100$

$n(Re.1\ coins) = 50$

$n(Rs.2\ coins) = 20$

$n(Rs.5\ coins) = 10$

$n(Total\ no.\ of\ coins) = 180$

$(i) P(will\ be\ a\ 50\ paisa\ win) = \frac{100}{180} = \frac{5}{9}$

$(ii) P(will\ be\ of\ value\ more\ than\ Re.1) = \frac{30}{180} = \frac{1}{6}$

$(iii) P(will\ be\ of\ value\ less\ than\ Rs.5) = \frac{170}{180} = \frac{17}{18}$

$(iv) P(will\ be\ a\ Re.1\ or\ Rs.2\ coins) = \frac{70}{180} = \frac{7}{18}$

Question 48

A bag contains cards numbered from 1 to 49. A card is drawn from the bag at random, after mixing the card thoroughly. Find the probability that the number on the drawn card is
(i) an odd number
(ii) a multiple of 5
(iii) a perfect square
(iv) an even prime number

Solution 48

Consider the sample space

$$S = \begin{Bmatrix} 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15, \\ 16,17,18,19,20,21,22,23,24,25,26,27, \\ 28,29,30,31,32,33,34,35,36,37,38,39, \\ 40,41,42,43,44,45,46,47,48,49 \end{Bmatrix}$$

$n(\text{total number of cards}) = 49$

(i)

$$\text{Number of odd numbered cards} = \begin{Bmatrix} 1,3,5,7,9,11,13,15,17,19, \\ 21,23,25,27,29,31,33,35, \\ 37,39,41,43,45,47,49 \end{Bmatrix}$$

$n(\text{an odd number}) = 25$

$$P(\text{an odd number}) = \frac{25}{49}$$

(ii)

$$\text{Number of multiples of } 5 = \{5,10,15,20,25,30,35,40,45\}$$

$n(\text{a multiple of } 5) = 9$

$$P(\text{a multiple of } 5) = \frac{9}{49}$$

(iii)

$$\text{Number of perfect squares} = \{1,4,9,16,25,36,49\}$$

$n(\text{a perfect square}) = 7$

$$P(\text{a perfect square}) = \frac{7}{49} = \frac{1}{7}$$

(iv)

$$\text{Number of even prime number} = \{2\}$$

$n(\text{an even prime number}) = 1$

$$P(\text{an even prime number}) = \frac{1}{49}$$

Question 49

A box contains 20 cards numbered from 1 to 20. A card is drawn at random from the box. Find the probability that the number on the drawn card is

i. divisible 2 or 3
ii. a prime number

Solution 49

There are 20 cards in the box out of which one card can be drawn in 20 ways.

$\therefore$ Total number of elementary events = 20

(i) From numbers 1 to 20, numbers divisible by 2 or 3 are as follows:

2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20

$\therefore$ Favourable number of elementary events = 13

Hence, required probability = $\frac{13}{20}$

(ii) From numbers 1 to 20, prime numbers are as follows:

1, 3, 5, 7, 11, 13, 17, 19

$\therefore$ Favourable number of elementary events = 8

Hence, required probability = $\frac{8}{20} = \frac{2}{5}$

Question 50

In a simultaneous throw of a pair of dice, find the probability of getting:

(i) 8 as the sum
(ii) a doublet
(iii) a doublet of prime numbers
(iv) a doublet of odd numbers
(v) a sum greater than 9
(vi) an even number on first
(vii) an even number on one and a multiple of 3 on the other
(viii) neither 9 nor 11 as the sum of the 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
(xiii) a number other than 5 on any dice.
(xiv) An even number on each dice
(xv) 5 as the sum

Solution 50

When a pair of dice is thrown, the possible outcomes are

$$\begin{Bmatrix} (1,1)(2,1)(3,1)(4,1)(5,1)(6,1) \\ (1,2)(2,2)(3,2)(4,2)(5,2)(6,2) \\ (1,3)(2,3)(3,3)(4,3)(5,3)(6,3) \\ (1,4)(2,4)(3,4)(4,4)(5,4)(6,4) \\ (1,5)(2,5)(3,5)(4,5)(5,5)(6,5) \\ (1,6)(2,6)(3,6)(4,6)(5,6)(6,6) \end{Bmatrix}$$

Number of possible outcomes = 36

(i) Favourable outcomes of getting 8 as the sum = 5 $\{(2,6)(3,5)(4,4)(5,3)(6,2)\}$

Probability of getting 8 as the sum = $\frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{5}{36}$

(ii)

Favourable outcomes of a doublet = 6 $\{(1,1)(2,2)(3,3)(4,4)(5,5)(6,6)\}$

Probability of getting a doublet = $\frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{6}{36} = \frac{1}{6}$

(iii)

Favourable outcomes of a doublet of prime numbers = 3 $\{(2,2)(3,3)(5,5)\}$

Probability of gettinga doublet of prime numbers = $\frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{3}{36} = \frac{1}{12}$

(iv)

Favourable outcomes of a doublet of odd numbers = 3 $\{(1,1)(3,3)(5,5)\}$

Probability of getting a doublet of odd numbers = $\frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{3}{36} = \frac{1}{12}$

(v)

Favourable outcomes of getting a sum greater than 9 = 6 $\{(4,6)(5,5)(5,6)(6,4)(6,5)(6,6)\}$

Probability of getting a sum greater than 9 = $\frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{6}{36} = \frac{1}{6}$

(vi)

Favourable outcome of an even number on first throw = 18 $\begin{Bmatrix}(2,1)(2,2)(2,3)(2,4)(2,5)(2,6)\\(4,1)(4,2)(4,3)(4,4)(4,5)(4,6)\\(6,1)(6,2)(6,3)(6,4)(6,5)(6,6)\end{Bmatrix}$

Probability of an even number on first $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{18}{36} = \frac{1}{2}$

(vii)

Favourable outcome of an even number on one and a multiple of 3 on other = 11

$\begin{Bmatrix}(2,3)(2,6)(4,3)(4,6)(6,3)(6,6)\\(3,2)(3,4)(3,6)(6,2)(6,4)\end{Bmatrix}$

∴ probabilityof an even number on one and a multiple of 3 on other

$= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{11}{36}$

(viii)

Favourable outcome of 9 nor 11 as the sum of numbers=6 $\{(3,6)(4,5)(5,4)(6,3)(5,6)(6,5)\}$

Favourable outcome of neither 9 nor 11 as the sum of the numbers=36-6=30

∴ Required probability $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{30}{36} = \frac{5}{6}$

(ix)

Favourable outcome of a sum less than 6=10 $\begin{Bmatrix}(1,1)(1,2)(1,3)\\(1,4)(2,1)(2,2)\\(2,3)(3,1)(3,2)(4,1)\end{Bmatrix}$

∴ Required probability $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{10}{36} = \frac{5}{18}$

(x)

Favourable outcomes of a sum less than 7 = 15 $\begin{Bmatrix}(1,1)(1,2)(1,3)(1,4)(1,5)\\(2,1)(2,2)(2,3)(2,4)(3,1)\\(3,2)(3,3)(4,1)(4,2)(5,1)\end{Bmatrix}$

$\therefore$ Required probability $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{15}{36} = \frac{5}{12}$

(xi)

Favourable outcomes of a sum more than 7 = 15 $\begin{Bmatrix}(2,6)(3,5)(3,6)(4,4)(4,5)\\(4,6)(5,3)(5,4)(5,5)(5,6)\\(6,2)(6,3)(6,4)(6,5)(6,6)\end{Bmatrix}$

$\therefore$ Required probability $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{15}{36} = \frac{5}{12}$

(xii)

Favourable outcomes of at least one 1 = 11 $\begin{Bmatrix}(1,1)(1,2)(1,3)(1,4)(1,5)\\(1,6)(2,1)(3,1)(4,1)(5,1)(6,1)\end{Bmatrix}$

$\therefore$ probability of at least one 1 $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{11}{36}$

(xiii)

Favourable outcomes of a number other than 5 on any dice = 25 $\begin{Bmatrix}(1,1)(1,2)(1,3)(1,4)(1,6)\\(2,1)(2,2)(2,3)(2,4)(2,6)\\(3,1)(3,2)(3,3)(3,4)(3,6)\\(4,1)(4,2)(4,3)(4,4)(4,6)\\(6,1)(6,2)(6,3)(6,4)(6,6)\end{Bmatrix}$

$\therefore$ probability of a number other than 5 on any dice $= \frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{25}{36}$

(xiv)

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore n(\textit{Total number of throws}) = 36$

Getting an even number on each dice can be selected as listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, $n(\textit{Favourable events}) = 9$

$P(\textit{getting an even number on each dice})$

$$= \frac{\textit{getting even number on each dice}}{\textit{Total number of throws}}$$

$$= \frac{9}{36}$$

$$= \frac{1}{4}$$

(xv)

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore n(Total\ number\ of\ throws) = 36$

Number of pairs in *getting* 5 *as the sum* can be selected as listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, $n(Favourable\ events) = 4$

$P(getting\ 5\ as\ the\ sum)$

$$= \frac{number\ of\ pairs\ in\ getting\ 5\ as\ the\ sum}{Total\ number\ of\ throws}$$

$$= \frac{4}{36}$$

$$= \frac{1}{9}$$

Question 50(xvi)

In a simultaneous throw of a pair of dice, find the probability that:
2 will come up at least once

Solution 50(xvi)

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore$ n(Total number of throws) = 36

Number of pairs of getting 2 at least once are listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, n(Favourable events) = 11

$$\text{P(getting 2 at least once)} = \frac{\text{Number of pairs of getting 2 at least once}}{\text{Total number of throws}} = \frac{11}{36}$$

Question 50(xvii)

In a simultaneous throw of a pair of dice, find the probability that:
2 will not come either time

Solution 50(xvii)

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore$ n(Total number of throws) = 36

Number of pairs of not getting 2 either time:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, n(Favourable events) = 25

$$\text{P(not getting 2 either time)} = \frac{\text{Number of pairs of not getting 2 either time}}{\text{Total number of throws}} = \frac{25}{36}$$

Question 51

What is the probability that an ordinary year has 53 Sundays?

Solution 51

An ordinary year has 365 days which means 52 complete weeks and one day.

If 52 weeks ends in Mon, then next day will be = Tue

If 52 weeks ends in Tue, then next day will be = Wed

If 52 weeks ends in Wed, then next day will be = Thu

If 52 weeks ends in Thu, then next day will be = Fri

If 52 weeks ends in Fri, then next day will be = Sat

If 52 weeks ends in Sat, then next day will be = Sun

If 52 weeks ends in Sun, then next day will be = Mon

$\therefore$ Total number of outcomes = 7
Number of favourable outcomes = 1

$\therefore$ Probability that an ordinary year has 53 Sundays = $\frac{1}{7}$

Question 52

What is the probability that a leap year has 53 Sundays and 53 Mondays?

Solution 52

A leap year has 366 days which means 52 complete weeks and 2 days

If 52 weeks end in Mon, then 2 days will be = Tue,Wed

If 52 weeks end in Tue, then 2 days will be = Wed,Thu

If 52 weeks end in Wed, then 2 days will be = Thu,Fri

If 52 weeks end in Thu, then 2 days will be = Fri,Sat

If 52 weeks end in Fri, then 2 days will be = Sat,Sun

If 52 weeks end in Sat, then 2 days will be = Sun,Mon

If 52 weeks end in Sun, then 2 days will be = Mon,Tue

Total number of outcomes = 7

Number of favourable outcomes = 1

Probability that a leap year has 53 Sundays and 53 Mondays = $\frac{1}{7}$

Question 53

A black die and a white die are thrown at the same time.

Write all the possible outcomes. What is the probability?

(i) that the sum of the two numbers that turn up is 8 ?

(ii) of obtaining a total of 6?

(iii) of obtaining a total of 10?

(iv) of obtaining the same number on both dice?

(v) of obtaining a total more than 9?

(vi) that the sum of the two numbers appearing on the top of the dice is 13?

(vii) that the sum of the two numbers appearing on the top of the dice is less than or equal to 12?

(viii) that the product of numbers appearing on the top of the dice is less than 9.

(ix) that the difference of the numbers appearing on the top of the two dice is 2.

(x) that the numbers obtained have a product less than 16.

(viii)A black dice and a white dice are thrown at the same time. Write all the possible outcomes. What is the probability that the product of the numbers appearing on the top of the dice is less than 9?

(ix)A black dice and a white dice are thrown at the same time. Write all the possible outcomes. What is the probability that the difference of the numbers appearing on the top of the two die is 2.

Solution 53

When a pair of dice is thrown, the possible outcomes are

$$\begin{Bmatrix} (1,1)(2,1)(3,1)(4,1)(5,1)(6,1) \\ (1,2)(2,2)(3,2)(4,2)(5,2)(6,2) \\ (1,3)(2,3)(3,3)(4,3)(5,3)(6,3) \\ (1,4)(2,4)(3,4)(4,4)(5,4)(6,4) \\ (1,5)(2,5)(3,5)(4,5)(5,5)(6,5) \\ (1,6)(2,6)(3,6)(4,6)(5,6)(6,6) \end{Bmatrix}$$

Number of possible outcomes = 36

(i) Favourable outcomes of the sum 8 = 5

$$\begin{Bmatrix} (2,6)(3,5)(4,4) \\ (5,3)(6,2) \end{Bmatrix}$$

$$\text{Probability of getting sum 8} = \frac{\text{favourable outcome}}{\text{Total outcome}}$$

$$= \frac{5}{36}$$

(ii) Favourable outcomes of a total of 6 = 5

$$\begin{Bmatrix} (1,5)(2,4)(3,3) \\ (4,2)(5,1) \end{Bmatrix}$$

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

(iii) Favourable outcomes of 10 = 3

$$\{(4,6)(5,5)(6,4)\}$$

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

(iv) Favourable outcomes of obtaining the same number on both dice = 6

$$\{(1,1)(2,2)(3,3)\ (4,4)(5,5)(6,6)\}$$

Probability of obtaining the same number on both dice $= \frac{6}{36} = \frac{1}{6}$

(v) Favourable outcomes of obtaining a total more than 9 = 6

$$\{(4,6)(5,5)(6,4)\ (5,6)(6,5)(6,6)\}$$

Probability of obtaining a total more than 9 $= \frac{6}{36} = \frac{1}{6}$

(vi) Getting a sum of the numbers appearing on the top of the two dice as 13 is an impossible event because the maximum sum is 12. So, the required probability is 0.

(vii) Since, the sum of the numbers appearing on the top of the two dice is always less than or equal to 12, it is a sure event. So, the required probability is 1.

(*viii*)

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore n(\textit{Total number of throws}) = 36$

Number of pairs such that the product of the number on each dice is less than 9 are as listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, $n(\textit{Favourable events}) = 16$

$n(\textit{Total number of outcomes}) = 36$

$P(\textit{getting } 9 \text{ as the product})$

$$= \frac{\textit{number of pairs in getting 9 as the product}}{\textit{Total number of throws}}$$

$$= \frac{16}{36}$$

$$= \frac{4}{9}$$

$P(\textit{Product of the numbers appearing on the top of the dice is less than } 9) = \frac{4}{9}$

(*ix*)

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore n(\textit{Total number of throws}) = 36$

Number of pairs such that difference of the numbers appearing on top of the two die is 2 can be selected as listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, $n(\textit{Favourable events}) = 8$

P(difference of the numbers is 2)

$$= \frac{\text{Number of pairs such that difference of the numbers Appearing on the top of the two dice is 2}}{\textit{Total number of throws}}$$

$$= \frac{8}{36}$$

$$= \frac{2}{9}$$

Question 54

A bag contains cards which are numberered from 2 to 90. A card is drawn at random from the bag. Find the probability that it bears (i) a two digit number (ii) a number which is a perfect square

Solution 54

Total cards = 89

$\{2, 3 \ldots\ldots, 90\}$

(i) Favourable outcomes of a two digit number card = 81

$\{10, 11, 12 \ldots\ldots, 90\}$

Probability of getting a two digit number card $= \frac{81}{89}$

(ii) Favourable outcomes of perfect square number card = 8

$\{4, 9, 16, 25, 36, 49, 64, 81\}$

Probability of getting a perfect square number card $= \frac{8}{89}$

Question 55

The faces of a red cube and a yellow cube are numbered from 1 to 6. Both cubes are rolled. What is the probability that the top face of each cube will have the same number?

Solution 55

Total number of outcomes for two cubes = 36

$$\begin{Bmatrix} (1,1)(2,1)(3,1)(4,1)(5,1)(6,1) \\ (1,2)(2,2)(3,2)(4,2)(5,2)(6,2) \\ (1,3)(2,3)(3,3)(4,3)(5,3)(6,3) \\ (1,4)(2,4)(3,4)(4,4)(5,4)(6,4) \\ (1,5)(2,5)(3,5)(4,5)(5,5)(6,5) \\ (1,6)(2,6)(3,6)(4,6)(5,6)(6,6) \end{Bmatrix}$$

Favourable outcome that the top face of each cube will have the same number = 6

$$\begin{Bmatrix} (1,1)(2,2)(3,3) \\ (4,4)(5,5)(6,6) \end{Bmatrix}$$

Probability of same number on both cube $= \frac{6}{36}$

$= \frac{1}{6}$

Question 56

The probability of selecting a green marble at random from a jar that contains only green, white and yellow marbles is 1/4. The probability of selecting a white marble at random from the same jar is 1/3. If this jar contains 10 yellow marbles. What is the total number of marbles in the jar?

Solution 56

Let number of green marbles $= x$

Let number of white marbles $= y$

Given number of yellow marbles $= 10$

Total number of marbles $= x + y + 10$

Given

$$p(\text{green marble}) = \frac{1}{4} \text{ and } p(\text{white marble}) = \frac{1}{3}$$

$$\Rightarrow \quad \frac{x}{x+y+10} = \frac{1}{4} \quad \text{and} \quad \frac{y}{x+y+10} = \frac{1}{3}$$

$$\Rightarrow \quad 4x = x + y + 10 \quad \text{and} \quad 3y = x + y + 10$$

$$\Rightarrow \quad 3x - y = 10 \quad ---(i) \quad \text{and} \quad -x + 2y = 10$$

$$\Rightarrow \quad -3x + 6y = 30 \quad ----(ii) \qquad [\text{multiply by } 3]$$

Add both equations

$$3x - y - 3x + 6y = 10 + 30$$

$$\Rightarrow \quad 5y = 40$$

$$\Rightarrow \quad y = \frac{40}{5} = 8$$

put value of y in equation (i)

$$3x - 8 = 10$$

$$\Rightarrow \quad 3x = 18$$

$$\Rightarrow \quad x = \frac{18}{3} = 6$$

$$\therefore \quad \text{Total number of marbles} = x + y + 10$$

$$= 6 + 8 + 10$$

$$= 24$$

Question 57

(i) A lot of 20 bulbs contain 4 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective?
(ii) Suppose the bulb drawn in (i) is not defective and is not replaced. Now one bulb is drawn at random from the rest. What is the probability that this bulb is not defective?

Solution 57

(i)Total number of bulbs = 20

Total number of defective bulb = 4

$$P(\text{getting a defective bulb}) = \frac{\text{Number of defective bulbs}}{\text{Total number of bulbs}} = \frac{4}{20} = \frac{1}{5}$$

(ii) Remaining number of bulbs = 19

Total non defective bulbs = 20 − 4 = 16 and from this 1 is drawn.

Remaining total number of non-defective bulbs = 16 − 1 = 15

$$P(\text{getting a not defective bulb}) = \frac{15}{19}$$

Question 58

A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears

(i) a two-digit number

(ii) a perfect square number

(iii) a number divisible by 5

Solution 58

Total number of discs = 90

(i) Total number of two digit numbers between 1 and 90 = 81

$$P(\text{getting a two digit number}) = \frac{81}{90} = \frac{9}{10}$$

(ii) Perfect squares between 1 and 90 are 1, 4, 9, 16, 25, 36, 49, 64, and 81.

∴ Total number of perfect squares between 1 and 90 is 9.

$$P(\text{getting a perfect square}) = \frac{9}{90} = \frac{1}{10}$$

(iii) Numbers between 1 and 90 that are divisible by 5 are 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, and 90.

∴ Total numbers divisible by 5 = 18

$$\text{Probability of getting a number divisible by 5} = \frac{18}{90} = \frac{1}{5}$$

Question 59

Two dice, one blue and one grey, are thrown at the same time. Complete the following table:

Event: 'Sum on two dice'	2	3	4	5	6	7	8	9	10	11	12
Probability											

From the above table a student argues that there are 11 possible outcomes 2,3,4,5,6,7,8,9,10,11 and 12. Therefore, each of them has a probability $\frac{1}{11}$. Do you agree with this argument?

Solution 59

Total possible outcomes = 6×6 = 36

(i) To get sum as 2, possible outcome is (1, 1).
To get sum as 3, possible outcomes are (2, 1) and (1, 2).
To get sum as 4, possible outcomes are (3, 1), (1, 3), (2, 2).
To get sum as 5, possible outcomes are (4, 1), (1, 4), (2, 3), (3, 2).
To get sum as 6, possible outcomes are (5, 1), (1, 5), (2, 4), (4, 2), (3, 3).
To get sum as 7, possible outcomes are (6, 1), (1, 6), (2, 5), (5, 2), (3, 4) (4, 3).
To get sum as 8, possible outcomes are (6, 2), (2, 6), (3, 5), (5, 3), (4, 4).
To get sum as 9, possible outcomes are (3, 6), (6, 3), (4, 5), (5, 4).
To get sum as 10, possible outcomes are (4, 6), (6, 4), (5, 5).
To get sum as 11, possible outcomes are (5, 6), (6, 5).
To get sum as 12, possible outcome is (6, 6).

Event: Sum of two dice	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$	$\frac{2}{36}$	$\frac{3}{36}$	$\frac{4}{36}$	$\frac{5}{36}$	$\frac{6}{36}$	$\frac{5}{36}$	$\frac{4}{36}$	$\frac{3}{36}$	$\frac{2}{36}$	$\frac{1}{36}$

(ii) Since, the sums 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 are not equally likely, so the probability of each of the sums will not be $\frac{1}{11}$.

Question 60

A bag contains 6 red balls and some blue balls. If the probability of drawing a blue ball from the bag is twice that of a red ball, find the number of blue balls in the bag.

Solution 60

Red balls = 6

Let blue balls = x

Total balls = $6 + x$

Given,

$$p(\text{blue ball}) = 2 \times p(\text{red ball})$$

$$\Rightarrow \quad \frac{x}{6+x} = 2 \times \frac{6}{6+x}$$

$$\Rightarrow \quad \frac{x}{6+x} = \frac{12}{6+x}$$

$$\Rightarrow \quad x = 12$$

$\therefore$ Number of blue balls = 12

Question 61

The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards.Find the probability of getting a card of
(i) heart (ii) queen (iii) clubs.
(iv) card (v) diamond

Solution 61

Total cards = 52

The king, queen and jack of clubs are removed

∴ Number of remaining cards = 52 – 3 = 49

(i)

Favourable outcome of a heart = 13

Probability of a heart $= \frac{13}{49}$

(ii)

Favourable outcome of a queen = 3 [since queen of clubs is removed]

Probability of a queen $= \frac{3}{49}$

(iii)

Favourable outcome of a clubs = 10 [since 3 card of clubs are removed]

Probability of a club card $= \frac{10}{49}$

Question 62

Two dice are thrown simultaneously. What is the probability that:
(i) 5 will not come up on either of them?
(ii) 5 will come up on at least one?
(iii) 5 will come up at both dice?

Solution 62

Total outcome when two dice are thrown = 36

$$\begin{Bmatrix} (1,1)(2,1)(3,1)(4,1)(5,1)(6,1) \\ (1,2)(2,2)(3,2)(4,2)(5,2)(6,2) \\ (1,3)(2,3)(3,3)(4,3)(5,3)(6,3) \\ (1,4)(2,4)(3,4)(4,4)(5,4)(6,4) \\ (1,5)(2,5)(3,5)(4,5)(5,5)(6,5) \\ (1,6)(2,6)(3,6)(4,6)(5,6)(6,6) \end{Bmatrix}$$

(i)

Favourable outcome that 5 will not come up on either of them = 25

$\therefore$ required probability $= \frac{25}{36}$

(ii)

Favourable outcome that 5 will come up on at least one = 11

$\therefore$ required probability $= \frac{11}{36}$

(iii)

Favourable outcome that 5 will come up at both dice = 1

$\therefore$ required probability $= \frac{1}{36}$

Question 63

A number is selected at random from first 50 natural numbers. Find the probability that it is a multiple of 3 and 4.

Solution 63

Total number of outcomes = 50 {1, 2, 3, ... 50}

Favourable outcomes = 4 {12, 24, 36, 48}

Required probability $= \frac{\text{number of favourable outcomes}}{\text{number of total possible outcomes}} = \frac{4}{50} = \frac{2}{25}$

Question 64

A dice is rolled twice. Find the probability that
(i) 5 will not come up either time.
(ii) 5 will come up exactly once.

Solution 64

Consider the set of ordered pairs

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Clearly, there are 36 elementary events.

$\therefore$ n(Total number of throws) = 36

(i)

Number of pairs such that 5 will not come up either time can be selected as listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

Therefore, n(Favourable events) = 25

P(5 will not come up either time)

$$= \frac{\text{Number of pairs such that 5 will not come up either time}}{\text{Total number of throws}}$$

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

(ii)

Number of pairs such that 5 will come up exactly one time can be selected as listed below:

$$\begin{Bmatrix} (1,1) & (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,2) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,3) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,4) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,5) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) & (6,6) \end{Bmatrix}$$

$\Rightarrow$ n(5 will come up exactly one time) = 10

$\Rightarrow$ P(5 will come up exactly on time) $= \frac{10}{36} = \frac{5}{18}$

Question 65

All the black face cards are removed from a pack of 52 cards. The remaining cards are well shuffled and then a card is drawn at random. Find the probability of getting a

(i) Face card
(ii) Red card
(iii) Black card
(iv) King

Solution 65

The number of black face cards = 6

$Since, all\ the\ black\ face\ cards\ have\ been\ removed, therefore$

$the\ remaining\ number\ of\ cards = 52 - 6 = 46$

$n(total\ number\ of\ cards\ remaining) = 46$

$(i) Total$ number of face cards = 6 + 6 = 12

$When$ removing all black face cards, there are 6 red face cards.

$\Rightarrow n(getting\ a\ face\ card) = 6$

$$\Rightarrow P(getting\ a\ face\ card) = \frac{6}{46} = \frac{3}{23}$$

$(ii) Total$ number of red card = 26

$\Rightarrow n(getting\ a\ red\ card) = 26$

$$\Rightarrow P(getting\ a\ red\ card) = \frac{26}{46} = \frac{13}{23}$$

$(iii) Number$ of black face cards = 6

Total number of black cards = 26

Remaining number of black cards = 26 − 6 = 20

$\Rightarrow n(getting\ a\ black\ card) = 20$

$$\Rightarrow P(getting\ a\ black\ card) = \frac{20}{46} = \frac{10}{23}$$

$(iv) Number$ of black king cards = 2

Total number of king cards = 4

Remaining number of red king cards = 2

$\Rightarrow n(getting\ a\ king) = 2$

$$\Rightarrow P(getting\ a\ king) = \frac{2}{46} = \frac{1}{23}$$

Question 66

Cards numbered from 11 to 60 are kept in a box. If a card is drawn at random from the box, find the probability that the number on the drawn cards is

(i) an odd number
(ii) a perfect square number
(iii) divisible by 5
(iv) a prime number less than 20

Solution 66

Consider the sample space

$$S = \begin{Bmatrix} 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, \\ 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, \\ 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, \\ 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, \\ 51, 52, 53, 54, 55, 56, 57, 58, 59, 60 \end{Bmatrix}$$

$n(\text{total number of cards}) = 50$

(i)

$$\text{List of odd numbered cards} = \begin{Bmatrix} 11, 13, 15, 17, 19, 21, 23, 25, 27, \\ 29, 31, 33, 35, 37, 39, 41, 43, \\ 45, 47, 49, 51, 53, 55, 57, 59 \end{Bmatrix}$$

$\Rightarrow n(\text{an odd number}) = 25$

$$\Rightarrow P(\text{an odd number}) = \frac{25}{50} = \frac{1}{2}$$

(ii)

$$\text{List of odd numbered cards} = \{16, 25, 36, 49\}$$

$\Rightarrow n(\text{a perfect square number}) = 4$

$$\Rightarrow P(\text{a perfect square number}) = \frac{4}{50} = \frac{2}{25}$$

(iii)

$$\text{List of numbers divisible by 5} = \{15, 20, 25, 30, 35, 40, 45, 50, 55, 60\}$$

$\Rightarrow n(\text{divisible by 5}) = 10$

$$\Rightarrow P(\text{divisible by 5}) = \frac{10}{50} = \frac{1}{5}$$

(iv)

$$\text{List of prime numbers less than 20} = \{11, 13, 17, 19\}$$

$\Rightarrow n(\text{a prime number less than 20}) = 4$

$$\Rightarrow P(\text{a prime number less than 20}) = \frac{4}{50} = \frac{2}{25}$$

*Note : Answer of sub part (iv) is incorrect in the book.

Question 67

All kings and queens are removed from a pack of 52 cards. The remaining cards are well-shuffled and then a card is randomly drawn from it. Find the probability that this card is
(i) a red face card
(ii) a black card

Solution 67

Face cards queen and king, that is 4 *queens*
and 4 *kings are removed*.
Thus, in total 4 + 4 = 8 cards are removed.
The remaining number of cards $= 52 - 8 = 44$
$n(\text{total remaning cards}) = 44$
(*i*)
Total number of face cards = 6 + 6 = 12
Number of red face cards = 2 + 2 + 2 = 6
When we remove four red face cards queen and king,
two jack red face cards are remaining.
$\Rightarrow n(\text{a red face card}) = 2$
$\Rightarrow P(\text{a red face card}) = \frac{2}{44} = \frac{1}{22}$
(*ii*)
When we remove four black face cards queen and king,
the number of balck cards is $26 - 4 = 22$
$\Rightarrow n(\text{a black card}) = 22$
$\Rightarrow P(\text{a black card}) = \frac{22}{44} = \frac{1}{2}$

Question 68

All jacks, queens and kings are removed from a pack of 52 cards. The remaining cards are well-shuffled and then a card is randomly drawn from it. Find the probability that this card is
(i) a black face card
(ii) a red card

Solution 68

Face cards are jack, queen and king.

4 *jacks*, 4 *queens and* 4 *kings are removed*.

Thus, in total 4 + 4 + 4 = 12 cards are removed.

The remaining number of cards = 52 − 12 = 40

$n(\text{total remaning cards}) = 40$

(*i*)

When we remove all the face cards, both black and red, the number of black face cards is zero.

$\Rightarrow n(\text{black face card}) = 0$

$\Rightarrow P(\text{black face card}) = \frac{0}{40} = 0$

(*ii*)

There are 26 red cards and in that there are 6 face cards

When we remove all the face cards, the number of red cards is 26 − 6=20

$\Rightarrow n(\text{a red card}) = 20$

$\Rightarrow P(\text{a red card}) = \frac{20}{40} = \frac{1}{2}$

Question 69

Red queens and black jacks are removed from a pack of 52 playing is drawn at random from the remaining cards, after reshuffling them. Find the probability that the card drawn is

(i) a king

(ii) of red colour

(iii) a face card

(iv) a queen

Solution 69

Since red queens and black cards are removed from a pack of 52 cards, remaining cards $= 44 - 4 = 48$

$n(\text{total number of cards}) = 48$

$n(\text{a king}) = 4$

$n(\text{of red colour}) = 24$

$n(\text{a face card}) = 8$

$n(\text{a queen}) = 2$

$(i) P(\text{a king}) = \frac{4}{48} = \frac{1}{12}$

$(ii) P(\text{of red colour}) = \frac{24}{48} = \frac{1}{2}$

$(iii) P(\text{a face card}) = \frac{8}{48} = \frac{1}{6}$

$(iv) P(\text{a queen}) = \frac{2}{48} = \frac{1}{24}$

Question 70

In a bag there are 44 identical cards with figure of circle or square on them. There are 24 circles, of which 9 are blue and rest are green and 20 squares of which 11 are blue and rest are green. One card is drawn from the bag at random. Find the probability that it has the figure

i. square
ii. green colour,
iii. blue circle and
iv. green square.

Solution 70

Number of identical cards = 44
Out of 44 cards, one card can be drawn in 44 ways.
∴ Total number of elementary events = 44

Number of circles = 24
Number of blue circles = 9
∴ Number of green circles = 24 − 9 = 15

Number of squares = 20
Number of blue squares = 11
∴ Number of green squares = 20 − 11 = 9

(i) Number of squares = 20
∴ Favourable number of elementary events = 20
Hence, required probability = $\frac{20}{44} = \frac{5}{11}$

(ii) Number of green figures = Number of green circles + Number of green squares
= 15 + 9
= 24
∴ Favourable number of elementary events = 24
Hence, required probability = $\frac{24}{44} = \frac{6}{11}$

(iii) Number of blue circles = 9
∴ Favourable number of elementary events = 9
Hence, required probability = $\frac{9}{44}$

(iv) Number of green squares = 9
∴ Favourable number of elementary events = 9
Hence, required probability = $\frac{9}{44}$

Question 71

All red face cards are removed from a pack of playing cards. The remaining cards are well shuffled and then a card is drawn at random from them. Find the probability that the drawn card is

i. a red card
ii. a face card and
iii. a card of clubs.

Solution 71

Total number of cards = 52
Number of red face cards = 6
Hence, remaining number of cards = 52 – 6 = 46
Out of 46 cards, one card can be drawn in 46 ways.
∴ Total number of elementary events = 46

(i) Number of red cards in a pack of 52 cards = 26
When 6 red face cards removed, number of red cards left = 26 – 6 = 20
∴ Favourable number of elementary events = 20
Hence, required probability = $\frac{20}{46} = \frac{10}{23}$

(ii) Number of face cards in a pack of 52 cards = 12
When 6 red face cards removed, number of face cards left = 12 – 6 = 6
∴ Favourable number of elementary events = 6
Hence, required probability = $\frac{6}{46} = \frac{3}{23}$

(iii) Number of club cards in a pack of 52 cards = 13
∴ Favourable number of elementary events = 13
Hence, required probability = $\frac{13}{46}$

Question 72

Two customers are visiting a particular shop in the same week (Monday to Saturday). Each is equally likely to visit the shop on any day as on another day. What is the probability that both will visit the shop on (i) the same day? (ii) different days? (iii) consecutive days?

Solution 72

Total number of days to visit the shop = 6

Two customers can visit the shop on two days in $6 \times 6 = 36$ ways

So total number of outcomes = 36

(i) Two customers can visit the shop on same day of the week in 6 ways

i.e. (M, M), (T, T), (W, W), (Th, Th), (F, F), (S, S)

Favorable number of ways = 6

$\therefore$ P(both will reach on same day) $= \frac{6}{36} = \frac{1}{6}$

(ii) We know, probability of occurrence of an event and probability of non occurrence of event = 1

$P(E) + P(\bar{E}) = 1$

P(both will reach on same day) $= \frac{1}{6}$

$\Rightarrow \frac{1}{6} + P(\bar{E}) = 1$

$\Rightarrow P(\bar{E}) = 1 - \frac{1}{6}$

$\Rightarrow P(\bar{E}) = \frac{5}{6}$

Hence, P(both will reach on different day) $= \frac{5}{6}$

(iii) Two customers can visit the shop on consecutive days in 5 ways

i.e. (M, T), (T, W), (W, Th), (Th, F), (F, S)

Favorable number of ways = 5

P(both will reach on consecutive days) $= \frac{5}{36}$

Question 3(i)

Three coins are tossed together. Find the probability of getting :Exactly two heads

Solution 3(i)

Sample space when three coins are tossed together is
S = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}
n(S) = 8
Let A be the event ofgetting exactly two heads.
A = {HHT, THH, HHT}
n (A) = 3

P(A) = $\frac{n(A)}{n(S)} = \frac{3}{8}$

Question 3(ii)

Three coins are tossed together. Find the probability of getting :At most two heads

Solution 3(ii)

Sample space when three coins are tossed together is
S = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}
n(S) = 8
Let A be the event of getting at most two heads.
A = {TTT, HTT, THT, TTH, HHT, THH, HHT}
n (A) = 7

P(A) = $\frac{n(A)}{n(S)} = \frac{7}{8}$

Question 3(iii)

Three coins are tossed together. Find the probability of getting :At least one head and one tail.

Solution 3(iii)

Sample space when three coins are tossed together is
S = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}
n(S) = 8
Let A be the event of getting at least one head and one tail.
A = {HHT, HTH, THH, HTT, THT, TTH }
n (A) = 6

P(A) = $\frac{n(A)}{n(S)} = \frac{6}{8} = \frac{3}{4}$

Question 3(iv)

Three coins are tossed together. Find the probability of getting :No tails

Solution 3(iv)

Sample space when three coins are tossed together is
S = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}
n(S) = 8
Let A be the event ofgetting no tails.
A = {HHH}
n (A) = 1

P(A) = $\frac{n(A)}{n(S)} = \frac{1}{8}$

Question 53(i)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :
The sum of the two numbers that turn up is 8?

Solution 53(i)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event that the sum of two numbers which turn up is 8.
A = {(2,6),(3,5),(4,4),(5,3),(6,2)}
n(A) = 5

P(A) = $\frac{n(A)}{n(S)} = \frac{5}{36}$

Question 53(ii)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :
Of obtaining a total of 6?

Solution 53(ii)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event that the sum of two numbers which turn up is 6.
A = {(1,5),(2,4),(3,3),(4,2),(5,1)}
n(A) = 5

P(A) = $\frac{n(A)}{n(S)} = \frac{5}{36}$

Question 53(iii)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :Of obtaining a total of 10?

Solution 53(iii)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event that the sum of two numbers which turn up is 10.
A = {(4,6),(6,4),(5,5)}
n(A) = 3

P(A) = $\frac{n(A)}{n(S)} = \frac{3}{36} = \frac{1}{12}$

Question 53(iv)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :Of obtaining the same number on both dice?

Solution 53(iv)

When a black die and a white die are thrown at the same time, the sample space is given by

S = {(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)}
n(S) = 36
Let A be the event of obtaining the same number on both dice.
A = {(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)}
n(A) = 6

P(A) = $\frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

Question 53(v)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that : Of obtaining a total more than 9?

Solution 53(v)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event of obtaining a total more than 9.
A = {(4,6),(5,5),(5,6),(6,4),(6,5),(6,6)}
n(A) = 6

P(A) = $\frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

Question 53(vi)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :That the sum of the numbers appearing on the top of the dice is 13?

Solution 53(vi)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event that the sum of the numbers appearing on the top of the dice is 13.
The maximum total of the numbers on the dice is 12.
Hence, n(A) = 0

P(A) = $\frac{n(A)}{n(S)} = \frac{0}{36} = 0$

Question 53(vii)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :That the sum of the numbers appearing on the top of the dice is less than or equal to 12?

Solution 53(vii)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event that the sum of the numbers appearing on the top of the dice is less than or equal to 12.
The maximum total of the numbers on the dice is 12.
Hence, n(A) = 36

P(A) = $\frac{n(A)}{n(S)} = \frac{36}{36} = 1$

Question 53(viii)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :That the product of numbers appearing on the top of dice is less than 9.

Solution 53(viii)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36
Let A be the event that the product of numbers appearing on the top of the dice is less than 9.
A = {(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),
(2,1)(2,2),(2,3),(2,4), (3,1),(3,2),
(4,1),(4,2),(5,1),(6,1)}
n(A) = 16

P(A) = $\frac{n(A)}{n(S)} = \frac{16}{36} = \frac{4}{9}$

Question 53(ix)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that :That the difference of the numbers appearing on the top of the two dice is 2.

Solution 53(ix)

When a black die and a white die are thrown at the same time, the sample space is given by
S = {(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)}
n(S) = 36

Let A be the event that the difference of the numbers appearing on the top of the two dice is 2.
A = {(1,3),(2,4),(3,1),(3,5),(4,2),(4,6),(5,3),(6,4)}
}
n(A) = 8

P(A) = $\frac{n(A)}{n(S)} = \frac{8}{36} = \frac{2}{9}$

Question 53(x)

A black die and a white die are thrown at the same time. Write all the possible outcomes. What is the probability that : That the numbers obtained have a product less than 16.

Solution 53(x)

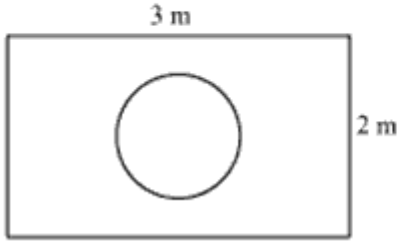
When a black die and a white die are thrown at the same time, the sample space is given by
S = {(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),
(2,1)(2,2),(2,3),(2,4),(2,5),(2,6),
(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),
(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),
(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),
(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)}
n(S) = 36
Let A be the event that the numbers obtained have a product less than 16.
A = {{(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),
(4,1),(4,2),(4,3), (5,1),(5,2),
(5,3),(6,1),(6,2)}}
n(A) = 25

P(A) = $\frac{n(A)}{n(S)} = \frac{25}{36}$

Chapter 16 - Probability Exercise Ex. 16.2

Question 1

Suppose you drop a die at random on the rectangular region shown in the given figure. What is the probability that it will land inside the circle with diameter 1 m?



Solution 1

Area of the rectangle $= l \times b = 3m \times 2m = 6m^2$

Diameter of the circle $= 1$

$\therefore$ Radius of the circle $= \frac{1}{2}$

Area of the circle $= \pi r^2 = \pi\left(\frac{1}{2}\right)^2 = \frac{\pi}{4}m^2$

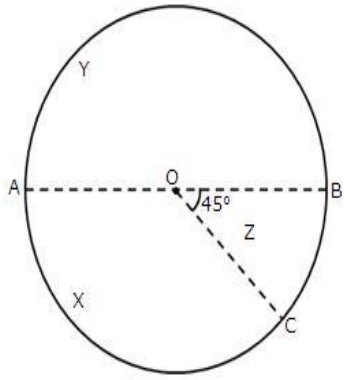
$\therefore$ P(die will land inside the circle) $= \frac{\text{Area of the circle}}{\text{Area of the rectangle}}$

$$= \frac{\frac{\pi}{4}}{6}$$

$$= \frac{\pi}{24}$$

Question 2

In the accompanying diagram a fair spinner is placed at the centre O of the circle. Diameter AOB and radius OC divide the circle into three regions labelled X, Y and Z. If $\angle BOC = 45°$. What is the probability that the spinner will land in the region X? (See figure).



Solution 2

Given

$\angle BOC = 45°$

then $\angle AOC = 180° - 45°$

$= 135°$

Area of circle $= \pi r^2$

Area of region $X = \frac{\theta}{360°} \pi r^2$

$= \frac{135°}{360°} \pi r^2$

$= \frac{3}{8} \pi r^2$

$\therefore$ Probability that the spinner will land in the region X

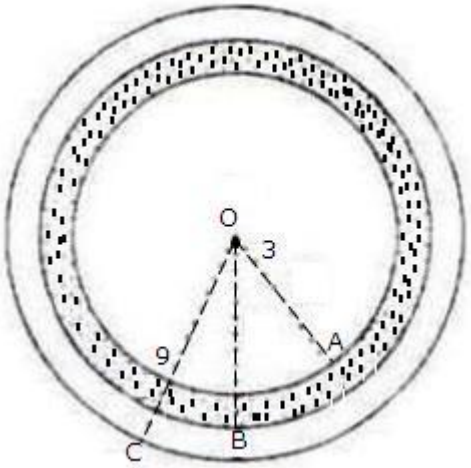
$= \frac{\text{Area of region } X}{\text{Area of circle}}$

$= \frac{\frac{3}{8} \pi r^2}{\pi r^2}$

$= \frac{3}{8}$

Question 3

A target shown in Fig. 16.11 consists of three concentric circles of radii 3, 7 and 9 cm respectively. A dart is thrown and lands on the target. What is the probability that the dart will land on the shaded region?



Solution 3

Assume first circle to be the circle with the smallest radius, that is 3. Similarly, second circle to be the circle with radius 7 and third circle to be the circle with radius 9.

Radius of first circle = 3 cm
Radius of second circle = 7 cm
Radius of third circle = 9 cm

Area of third circle = $\pi(9)^2$

$= 81\pi \text{ cm}^2$

Area shaded region = area of second circle – area of first circle

$= \pi(7)^2 - \pi(3)^2$

$= 49\pi - 9\pi$

$= 40\pi \text{ cm}^2$

∴ Probability that the dart will land on the shaded region.

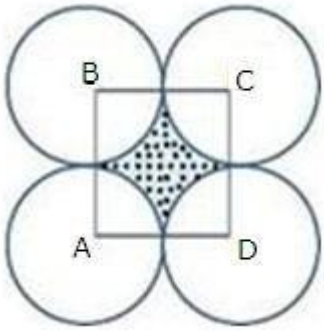
$= \frac{\text{area of shaded region}}{\text{area of third circle}}$

$= \frac{40\pi}{81\pi}$

$= \frac{40}{81}$

Question 4

In Fig. 16.12, points A, B, C and D are the centres of four circles that each have a radius of length one unit. If a point is selected at random from the interior of square ABCD. What is the probability that the point will be chosen from the shaded region?



Solution 4

Radius of 1 circle $= 1$ cm

$\therefore$ side of square $ABCD = 1 + 1 = 2$ cm

area of square $ABCD = 2 \times 2 = 4\ \text{cm}^2$

Area of shaded region = area of square $- 4 \times$ area of quadrant

$$= 4 - 4 \times \frac{90^0}{360^0} \pi (1)^2$$

$$= (4 - \pi)\ \text{cm}^2$$

$\therefore$ Probability that the point will be chosen from the shaded region $= \dfrac{\text{Area of shaded region}}{\text{Area of square } ABCD}$

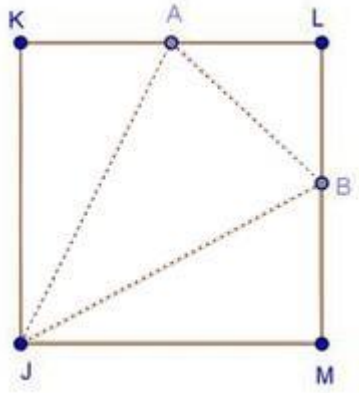
$$= \frac{4 - \pi}{4}$$

$$= \frac{4}{4} - \frac{\pi}{4}$$

$$= \left(1 - \frac{\pi}{4}\right)$$

Question 5

In the fig., JKLM is a square with sides of length 6 units. Points A and B are the mid-points of sides KL and LM respectively. If a point is selected at random from the interior of the square. What is the probability that the point will be chosen from the interior of ΔJAB?



Solution 5

Side of square = 6 units

Since A and B are the mid-points of KL and LM,

$KA = AL = LB = BM = 3$ units

$\therefore$ Area of square $= 6 \times 6 = 36$ sq. units

Area of ΔAJB = area of square − area of ΔAKJ − area of ΔALB − area of ΔBMJ

$$= 36 - \frac{1}{2} \times 6 \times 3 - \frac{1}{2} \times 3 \times 3 - \frac{1}{2} \times 6 \times 3$$

$$= 36 - 9 - 4.5 - 9$$

$$= 13.5 \text{ square units}$$

$\therefore$ Probability that the point will be chosen from the interior of $\Delta AJB = \frac{\text{Area } \Delta JAB}{\text{Area of square}}$

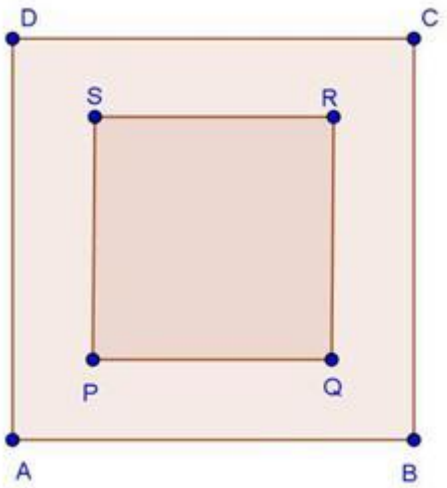
$$= \frac{13.5}{36}$$

$$= \frac{135}{360}$$

$$= \frac{3}{8}$$

Question 6

In the fig., a square dart board is shown. The length of a side of the larger square is 1.5 times the length of a side of the smaller square. If a dart is thrown and lands on the larger square. What is the probability that it will land in the interior of the smaller square?



Solution 6

Let a side of small square = x cm

then a side of big square = $1.5x$ cm

$\therefore$ Probability that dart will land in the interior of the

Smaller square = $\frac{\text{Area of small square}}{\text{Area of big square}}$

$= \frac{(x)^2}{(1.5x)^2}$

$= \frac{(x)^2}{(2.25)x^2}$

$= \frac{1}{2.25}$

$= \frac{100}{225} = \frac{4}{9}$

Chapter 16 - Probability Exercise 16.35

Question 1

If a digit is chosen at random from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9, then the probability that it is odd, is

(a) $\frac{4}{9}$

(b) $\frac{5}{9}$

(c) $\frac{1}{9}$

(d) $\frac{2}{3}$

Solution 1

n(E) = total numbers

= 9

n(0) = odd numbers {1, 3, 5, 7, 9}

= 5

P(E) = Probability that number is odd

$= \frac{n(0)}{n(E)}$

$= \frac{5}{9}$

So, the correct option is (b).

Question 2

In Q. No. 1, the probability that the digit is even, is

(a) $\frac{4}{9}$

(b) $\frac{5}{9}$

(c) $\frac{1}{9}$

(d) $\frac{2}{3}$

Solution 2

n(E) = 9

n(4) = no. is even {2, 4, 6, 8}

= 4

P(E) = Probability that number is even

$= \frac{n(A)}{n(E)}$

$= \frac{4}{9}$

So, the correct option is (a).

Chapter 16 - Probability Exercise 16.36

Question 3

In Q. No. 1, the probability that the digit is a multiple of 3 is

(a) $\frac{1}{3}$

(b) $\frac{2}{3}$

(c) $\frac{1}{9}$

(d) $\frac{2}{9}$

Solution 3

n(E) = 9

n(A) = no. is multiple of 3 {3, 6, 9}

= 3

$P(E) = \frac{n(A)}{n(E)}$

$= \frac{3}{9}$

$= \frac{1}{3}$

So, the correct option is (a).

Question 4

If three coins are tossed simultaneously, then the probability of getting at least two heads, is

(a) $\frac{3}{4}$

(b) $\frac{3}{8}$

(c) $\frac{1}{2}$

(d) $\frac{1}{4}$

Solution 4

3 coins are tossed simultaneously.

Hence sample space = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}

Event (E) = at least two Heads

= {HHH, HHT, HTH, THH}

n(s) = 8

n(E) = 4

$P(E) = \frac{n(E)}{n(S)}$

$= \frac{4}{8} = \frac{1}{2}$

So, the correct option is (c).

Question 5

In a single throw of a die, the probability of getting a multiple of 3 is

(a) $\frac{1}{2}$

(b) $\frac{1}{3}$

(c) $\frac{1}{6}$

(d) $\frac{2}{3}$

Solution 5

sample space (s) = {1, 2, 3, 4, 5, 6}
n(s) = 6
Event (E) = getting a multiple of 3
= {3, 6}
n(E) = 2

$$P(E) = \frac{n(E)}{n(S)}$$

$$= \frac{2}{6}$$

$$= \frac{1}{3}$$

So, the correct option is (b).

Question 6

The probability of guessing the correct answer to a certain test questions is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$, then x =

(a) 2
(b) 3
(c) 4
(d) 6

Solution 6

We know that, for any question, either he gives the answer correctly or incorrectly.
So,

$$P(\text{correct answer}) + P(\text{wrong answer}) = 1 \quad \text{.....(1)}$$

It is given that

$$P(\text{correct answer}) = \frac{x}{12} \quad \text{.....(2)}$$

$$P(\text{wrong answer}) = \frac{2}{3} \quad \text{.....(3)}$$

from (1), (2) & (3)

$$\frac{x}{12} + \frac{2}{3} = 1$$

$$\frac{x}{12} = \frac{1}{3}$$

$$x = 4$$

So, the correct option is (c).

Question 7

A bag contains three green marbles, four blue marbles, and two orange marbles. If a marble is picked at random, then the probability that it is not an orange marble is

(a) $\frac{1}{4}$

(b) $\frac{1}{3}$

(c) $\frac{4}{9}$

(d) $\frac{7}{9}$

Solution 7

Total Marbles $= 3$ green $+ 4$ blue $+ 2$ orange

$= 9$

Total orange marbles $= 2$

Probability that picked marble is an orange $P(0) = \frac{\text{orange marbles}}{\text{Total marble}}$

$= \frac{2}{9}$

Probability that picked marble is not orange $= 1 - P(0)$

$= 1 - \frac{2}{9}$

$= \frac{7}{9}$

So, the correct option is (d).

Question 8

A number is selected at random from the numbers 3, 5, 5, 7, 7, 7, 9, 9, 9, 9 The probability that the selected number is their average is

(a) $\frac{1}{10}$

(b) $\frac{3}{10}$

(c) $\frac{7}{10}$

(d) $\frac{9}{10}$

Solution 8

Sample space (s) $= \{3, 5, 5, 7, 7, 7, 9, 9, 9, 9\}$

$n(s) = 10$

average of these numbers $= \frac{3 + 5 + 5 + 7 + 7 + 7 + 9 + 9 + 9 + 9}{10}$

$= \frac{70}{10}$

$= 7$

so we have to find the probability that the picked number is 7

$= \frac{\text{frequency of } 7}{n(s)}$

$= \frac{3}{10}$

So, the correct option is (b).

Question 9

The probability of throwing a number greater than 2 with a fair dice is

(a) $\frac{3}{5}$

(b) $\frac{2}{5}$

(c) $\frac{2}{3}$

(d) $\frac{1}{3}$

Solution 9

Sample space (S) = {1, 2, 3, 4, 5, 6}
n(S) = 6
Event (E) = getting number greater than 2
= {3, 4, 5, 6}
n(E) = 4

$$P(E) = \frac{n(E)}{n(S)} = \frac{4}{6} = \frac{2}{3}$$

So, the correct option is (c).

Question 10

A card is accidently dropped from a pack of 52 playing cards. The probability that it is an ace is

(a) $\frac{1}{4}$

(b) $\frac{1}{13}$

(c) $\frac{1}{52}$

(d) $\frac{12}{13}$

Solution 10

n(S) = 52
no. of ace in a pack of 52 cards = 4
n(E) = 4

$$\text{Probability that dropped card is ace } P(E) = \frac{n(E)}{n(S)}$$

$$= \frac{4}{52} = \frac{1}{13}$$

So, the correct option is (b).

Question 11

A number is selected from numbers 1 to 25. The probability that it is prime is

(a) $\frac{2}{3}$

(b) $\frac{1}{6}$

(c) $\frac{1}{3}$

(d) $\frac{5}{6}$

Solution 11

n(S) = 25
Event (E) = prime numbers between 1 to 25
= {2, 3, 5, 7, 11, 13, 17, 19, 23}
n(E) = 9

$$P(E) = \frac{n(E)}{n(S)}$$
$$= \frac{9}{25}$$

Note: The answer does not match the options in the question.

Question 12

Which of the following cannot be the probability of an event?

(a) $\frac{2}{3}$

(b) -1.5

(c) 15%

(d) 0.7

Solution 12

We know probability P(E) of an event lies between $0 < P(E) < 1$ .....(1)
(a), (c), (d) satisfies the (1) but (b) is a negative number. It can't be the probability of an event.
So, the correct option is (b).

Question 13

If P(E) = 0.05, then P(not E) =
(a) - 0.05
(b) 0.5
(c) 0.9
(d) 0.95

Solution 13

We know
P(E) + P(not E) = 1
given P(E) = 0.05
so P(not E) = 1 - 0.05
= 0.95
So, the correct option is (d).

Question 14

Which of the following cannot be the probability of occurrence of an event?
(a) 0.2
(b) 0.4
(c) 0.8
(d) 1.6

Solution 14

We know $0 < P(E) < 1$
(a), (b), (c) fullfill the condition. But (d) doesn't
Hence (d) is correct option.
So, the correct option is (d).

Question 15

The probability of a certain event is
(a) 0
(b) 1
(c) 1/2
(d) no existent

Solution 15

An event that is certain to occur is called Certain event.

Probability of certain event is 1.
Ex: If it is Monday, the probability that tomorrow is Tuesday is certain and therefore probability is 1.
So, the correct option is (b).

Chapter 16 - Probability Exercise 16.37

Question 16

The probability of an impossible event is
(a) 0
(b) 1
(c) 1/2
(d) non-existent

Solution 16

Events that are not possible are impossible event.
Probability of impossible event is 0.
So, the correct option is (a).

Question 17

Aarushi sold 100 lottery tickets in which 5 tickets carry prizes. If Priya purchased a ticket, what is the probability of Priya winning a prize?
(a) $\frac{19}{20}$
(b) $\frac{1}{25}$
(c) $\frac{1}{20}$
(d) $\frac{17}{20}$

Solution 17

$n(S) = 100$
Event (E) = winnig a prize
n(E) = There are only 5 tickets which carry prize.
so $n(E) = 5$

$$\text{so probability of priya winnig a prize} = \frac{n(E)}{n(S)}$$

$$= \frac{5}{100} = \frac{1}{20}$$

So, the correct option is (c).

Question 18

A number is selected from first 50 natural numbers. What is the probability that it is a multiple of 3 or 5 ?
(a) $\frac{13}{25}$
(b) $\frac{21}{50}$
(c) $\frac{12}{25}$
(d) $\frac{23}{50}$

Solution 18

n(s) = 50

If a number is a multiple of 5 = {5, 10, 15, 20, 25, 30, 35, 40, 45, 50}

n(E1) = 10

If a number is a multiple of 3 = {3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48}

n(E2) = 16

If a number is a multiple of both 3 and 5 = {15, 30, 45}

$n(E1 \cap E2) = 3$

Probability that a number is multiple of 3 or 5

$P(E1 \cup E2) = P(E1) + P(E2) - P(E1 \cap E2)$

$$= \frac{n(E1)}{n(S)} + \frac{n(E2)}{n(S)} - \frac{n(E1 \cap E2)}{n(S)}$$

$$= \frac{10}{50} + \frac{16}{50} - \frac{3}{50}$$

$$= \frac{23}{50}$$

So, the correct option is (d).

Question 19

A month is selected at random in a year. The probability that it is March or October, is

(a) $\frac{1}{12}$

(b) $\frac{1}{6}$

(c) $\frac{3}{4}$

(d) None of these

Solution 19

Total month in a year, n(S) = 12

Month is either march or october, n(E) = 2

$$P(E) = \frac{n(E)}{n(S)} = \frac{2}{12} = \frac{1}{6}$$

So, the correct option is (b).

Question 20

From the letter of the word "MOBILE", a letter is selected. The probability that the letter is a vowel, is

(a) $\frac{1}{3}$

(b) $\frac{3}{7}$

(c) $\frac{1}{6}$

(d) $\frac{1}{2}$

Solution 20

n(S) = 6

vowels in "MOBILE" = {O, I, E}

n(E) = 3

$$\text{Probability that letter is vowel} = \frac{n(E)}{n(S)}$$

$$= \frac{3}{6} = \frac{1}{2}$$

So, the correct option is (d).

Question 21

A die is thrown once. The probability of getting a prime number is

(a) $\frac{2}{3}$

(b) $\frac{1}{3}$

(c) $\frac{1}{2}$

(d) $\frac{1}{6}$

Solution 21

If a dice is thrown, possible outcomes = {1, 2, 3, 4, 5, 6}

n(S) = 6

prime numbers = {2, 3, 5}

n(E) = 3

$P(E) = \frac{n(E)}{n(S)}$

$= \frac{3}{6} = \frac{1}{2}$

So, the correct option is (c).

Question 22

The probability of getting an even number, when a die is thrown once is

(a) $\frac{1}{2}$

(b) $\frac{1}{3}$

(c) $\frac{1}{6}$

(d) $\frac{5}{6}$

Solution 22

n(S) = 6

Even number = {2, 4, 6}

n(E) = 3

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

So, the correct option is (a).

Question 23

A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, the probability that it bears a prime number less than 23, is

(a) $\frac{7}{90}$

(b) $\frac{10}{90}$

(c) $\frac{4}{45}$

(d) $\frac{9}{89}$

Solution 23

$n(S) = 90$

prime numbers less than $23 = \{2, 3, 5, 7, 11, 13, 17, 19\}$

$n(E) = 8$

$P(E) = \frac{8}{90}$

$= \frac{4}{45}$

So, the correct option is (c).

Question 24

The probability that a number selected at random from the number 1, 2, 3, ..., 15 is a mutiple of 4, is

(a) $\frac{4}{15}$

(b) $\frac{2}{15}$

(c) $\frac{1}{5}$

(d) $\frac{1}{3}$

Solution 24

$n(S) = 15$

selected number is multiple of $4 = \{4, 8, 12\}$

$n(E) = 3$

$P(E) = \frac{n(E)}{n(S)}$

$= \frac{3}{15} = \frac{1}{5}$

So, the correct option is (c).

Question 25

Two different coins are tossed simultaneously. The probability of getting at least one head is

(a) $\frac{1}{4}$

(b) $\frac{1}{8}$

(c) $\frac{3}{4}$

(d) $\frac{7}{8}$

Solution 25

sample space $(S) = \{HH, HT, TH, TT\}$

$n(S) = 4$

sample having at least one head $= \{HH, HT, TH\}$

$n(E) = 3$

$P(E) = \frac{n(E)}{n(S)}$

$= \frac{3}{4}$

So, the correct option is (c).

Question 26

If two different dice are rolled together, the probability of getting an even number on both dice, is

(a) $\frac{1}{36}$

(b) $\frac{1}{2}$

(c) $\frac{1}{6}$

(d) $\frac{1}{4}$

Solution 26

$n(S) = 36$

Event $(E) = \{(2, 2), (2, 4), (2, 6), (4, 2), (4, 4), (4, 6), (6, 2), (6, 4), (6,6)\}$

$n(E) = 9$

$P(E) = \frac{n(E)}{n(S)} = \frac{9}{36} = \frac{1}{4}$

So, the correct option is (d).

Question 27

A number is selected at random from the numbers 1 to 30. The probability that it is a prime number is

(a) $\frac{2}{3}$

(b) $\frac{1}{6}$

(c) $\frac{1}{3}$

(d) $\frac{11}{30}$

Solution 27

$n(S) = 30$

sample of prime number $= \{2, 3, 5, 7, 11, 13, 17, 19, 23, 29\}$

$n(E) = 10$

$P(E) = \frac{n(E)}{n(S)} = \frac{10}{30} = \frac{1}{3}$

So, the correct option is (c).

Chapter 16 - Probability Exercise 16.38

Question 28

A card is drawn at random from a pack of 52 cards. The probability that the drawn card is not an ace is

(a) $\frac{1}{13}$

(b) $\frac{9}{13}$

(c) $\frac{4}{13}$

(d) $\frac{12}{13}$

Solution 28

$n(S) = 52$

There are 4 ace in a pack of 52 cards

Hence $n(E) = 4$

Probability that drawn card is ace , $P(E) = \frac{n(E)}{n(S)} = \frac{4}{52} = \frac{1}{13}$

Probability that drawn card is not ace $= 1 -$ card is ace

$= 1 - P(E)$

$= 1 - \frac{1}{13}$

$= \frac{12}{13}$

So, the correct option is (d).

Question 29

A number x is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3 the probability that $|x| < 2$ is

(a) $\frac{5}{7}$

(b) $\frac{2}{7}$

(c) $\frac{3}{7}$

(d) $\frac{1}{7}$

Solution 29

Sample space (s) = {-3, -2, -1, 0, 1, 2, 3}

n(s) = 7

Event (E) = $|x| < 2$

= {-1, 0, 1}

n(E) = 3

$P(E) = \frac{n(E)}{n(s)} = \frac{3}{7}$

So, the correct option is (c).

Question 30

If a number x is chosen from the numbers 1, 2, 3, and a number y is selected from the number 1, 4, 9. Then, $P(xy < 9)$

(a) $\frac{7}{9}$

(b) $\frac{5}{9}$

(c) $\frac{2}{3}$

(d) $\frac{1}{9}$

Solution 30

$x \in \{1, 2, 3\}$
$y \in \{1, 4, 9\}$
Now set $xy \in \{1 \times 1, 1 \times 4, 1 \times 9, 2 \times 1, 2 \times 4, 2 \times 9, 3 \times 1, 3 \times 4, 3 \times 9\}$
$xy \in \{1, 4, 9, 2, 8, 18, 3, 12, 27\}$
sample space $n(S)$, $xy \in \{1, 2, 3, 4, 8, 9, 12, 18, 27\}$
$n(S) = 9$
Event $(E) = xy < 9$
$= \{1, 2, 3, 4, 8\}$
$n(E) = 5$
$P(xy < a) = \frac{n(E)}{n(S)} = \frac{5}{9}$
So, the correct option is (b).

Question 31

The probability that a non-leap year has 53 Sundays, is
(a) $\frac{2}{7}$
(b) $\frac{5}{7}$
(c) $\frac{6}{7}$
(d) $\frac{1}{7}$

Solution 31

There are 365 days in a non-leap year.
52 complete weeks and 1 spare day.
so This day can be any out of 7 day of week.
Hence n(s) = 7
Now, year already have 52 Sundays. so for a total of 53 Sundays in a calendar year, this spare day must be a Sunday.
Hence n(E) = 1
$P(E) = \text{probability that non leap year has 53 sundays}$
$= \frac{1}{7}$
So, the correct option is (d).

Question 32

In a single throw of a pair of dice, the probability of getting the sum a perfect sqaure is
(a) $\frac{1}{18}$
(b) $\frac{7}{36}$
(c) $\frac{1}{6}$
(d) $\frac{2}{9}$

Solution 32

We know on throwing a pair of die there are a total of 36 possible outcomes.
n(S) = sum is a perfect square
= {(1, 3), (2, 2), (3, 1), (3, 6), (4, 5), (5, 4), (6, 3)}
n(E) = 7
$P(E) = \frac{n(E)}{n(S)} = \frac{7}{36}$

So, the correct option is (b).

Question 33

What is the probability that a non-leap year has 53 Sundays ?

(a) $\frac{6}{7}$

(b) $\frac{1}{7}$

(c) $\frac{5}{7}$

(d) None of these

Solution 33

There are 365 days in a non-leap year.
52 complete weeks and 1 spare day.
So this day can be any out of 7 day of a week.
Hence n(s) = 7
Now, a non-leap year already has 52 Sundays. So for a total of 53 Sundays in a calendar year, this spare day must be a Sunday.
Hence n(E) = 1

$P(E)$ = probability that non leap year has 53 sundays

$= \frac{1}{7}$

So, the correct option is (b).

Question 34

Two numbers 'a' and 'b' are selected successively without replacement in that order from the integers 1 to 10. The probability that $\frac{a}{b}$ is an integer, is

(a) $\frac{17}{45}$

(b) $\frac{1}{5}$

(c) $\frac{17}{90}$

(d) $\frac{8}{45}$

Solution 34

We have to select two numbers without replacement. 'a' can be selected by 10 ways and b by 9.
Hence total ways $= 10 \times 9$
$= 90$
$n(s) = 90$
Case 1 : If $a = 1$, b is selected from 2 to 10.
Hence $\frac{a}{b}$ can't be integer. No possible solution.
Case 2 : If $a = 2$, for $b = 1$
$\frac{a}{b}$ is an integer . 1 possible solution.
Case 3 : If $a = 3$ for $b = 1$
$\frac{a}{b}$ is an integer . 1 possible solution.
Case 4: If $a = 4$ for $b = 1, 2$
$\frac{a}{b}$ is an integer . 2 possible solutions.
Case 5: If $a = 5$ for $b = 1$
$\frac{a}{b}$ is an integer . 1 possible solution.
Case 6: If $a = 6$ for $b = 1, 2, 3$
$\frac{a}{b}$ is an integer . 3 possible solutions.
Case 7: If $a = 7$ for $b = 1$, 1 possible solution.
Case 8: If $a = 8$ for $b = 1, 2, 4$
$\frac{a}{b}$ is an integer . 3 possible solutions.
Case 9: If $a = 9$ for $b = 1, 3$
$\frac{a}{b}$ is an integer . 2 possible solutions.
Case 10: If $a = 10$ for $b = 1, 2, 5$
$\frac{a}{b}$ is an integer . 3 possible solutions.
for all 10 cases
$n(E) = 1 + 1 + 2 + 1 + 3 + 1 + 3 + 2 + 3$
$= 17$
Hence, $P(E) = \frac{n(E)}{n(S)}$
$= \frac{17}{90}$
So, the correct option is (c).

Question 35

Two dice are rolled simultaneously. The probability that they show different faces is

(a) $\frac{2}{3}$

(b) $\frac{1}{6}$

(c) $\frac{1}{3}$

(d) $\frac{5}{6}$

Solution 35

If two dices are rolled simultaneously there are 36 possible outcomes.

$n(S) = 36$

Event (E) = faces show same number

$= \{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)\}$

$n(E) = 6$

Probability that faces show same number $= \frac{n(E)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

Probability that faces show different $= 1 - P(E)$

$$= 1 - \frac{1}{6}$$

$$= \frac{5}{6}$$

So, the correct option is (d).

Question 36

What is the probability that a leap year has 52 Mondays?

(a) $\frac{2}{7}$

(b) $\frac{4}{7}$

(c) $\frac{5}{7}$

(d) $\frac{6}{7}$

Solution 36

A leap year has 366 days in which 52 weeks and 2 spare days.

So for a leap year to have 52 Mondays, non of the spare days can be a Monday.

Possible combinations for these two days

sample space (S) = {(Monday, Tuesday), (Tuesday, Wednesday), (Wednesday, Thursday), (Thursday, Friday), (Friday, Saturday), (Saturday, Sunday), (Sunday, Monday)}

$n(S) = 7$

Event that none of the combinations have monday

$n(E) = 5$

$P(E) = \frac{n(E)}{n(S)} = \frac{5}{7}$

So, the correct option is (c).

Question 37

If a two digit number is chosen at random, then the probability that the number chosen is a multiple of 3, is

(a) $\frac{3}{10}$

(b) $\frac{29}{100}$

(c) $\frac{1}{3}$

(d) $\frac{7}{25}$

Solution 37

two digit number is from 10 to 99
Hence n(S) = 90
If number choosen is a multiple of 3 then it starts from 12 to 99 at an interval of 3.
Hence order is 12, 15, 18, ... 99
It is an AP with a = 12 and d = 3, last term 99
a + (r − 1)d = 99
12 + (r − 1)3 = 99
(r − 1) 3 = 87
(r − 1) = 29
r = 30
Hence n(E) = 30
$P(E) = \frac{n(E)}{n(S)} = \frac{30}{90} = \frac{1}{3}$
So, the correct option is (c).

Question 38
Two dice are thrown together. The probability of getting the same number on both dice is

(a) $\frac{1}{2}$

(b) $\frac{1}{3}$

(c) $\frac{1}{6}$

(d) $\frac{1}{12}$

Solution 38
When we throw two dice together
n(S) = 36
Event that both dice have same number is
{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}
n(E) = 6
$P(E) = \frac{6}{36} = \frac{1}{6}$
So, the correct option is (c).

Chapter 16 - Probability Exercise 16.39
Question 39
In a family of 3 children, the probability of having at least one boy is

(a) $\frac{7}{8}$

(b) $\frac{1}{8}$

(c) $\frac{5}{8}$

(d) $\frac{3}{4}$

Solution 39

B − Boy

G − Girl

Possible combinations = {BBB, BBG, BGB, GBB, BGG, GBG, GGB, GGG}

n(S) = 8

probability having at least one boy = 1 − probability of having no boys

cases in which no boys, n(E) = 1

Probability of having no boys $= \frac{n(E)}{n(S)} = \frac{1}{8}$

probability having at least one boy $= 1 - \frac{1}{8}$

$= \frac{7}{8}$

So, the correct option is (a).

Question 40

A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is

(a) $\frac{1}{5}$

(b) $\frac{3}{25}$

(c) $\frac{4}{25}$

(d) $\frac{2}{25}$

Solution 40

n(S) = 25

numbers which are divisible by both 2 and 3 = {6, 12, 18, 24}

n(E) = 4

$P(E) = \frac{n(E)}{n(S)}$

$= \frac{4}{25}$

So, the correct option is (c).