CHAPTER – 22

PROBABILITY

<u>Exercise – 22.1</u>

1. A bag contains a red ball, a blue ball and a yellow ball, all the balls being of the same size. Anjali takes out a ball from the bag without looking into it. What is the probability that she takes out

(i) Yellow ball?

(ii) Red ball?

(iii) Blue ball?

Solution:

Anjali takes out a ball from the bag without looking into it. So, it is equally likely that she takes out any one of them.

Let Y be the event 'the ball taken out is yellow',

B be the event 'the ball taken out is blue', and R be the event 'the ball taken out is red'.

Now, the number of possible outcomes = 3.

(i) The number of outcomes favorable to the event Y = 1.

So, P(Y) = $\frac{1}{3}$

(ii) Similarly P(R) = $\frac{1}{3}$

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

2. A box contains 600 screws, one-tenth are rusted. One screw is taken out at random from this box. Find the probability that it is a good screw.

Solution:

Total number of screws = 600

Number of possible outcomes = 600

Number of rusted screws = one tenth of 600 = $\left(\frac{1}{10}\right) \times 600 = 60$

Number of remaining good screws = 600 – 60 = 540

Number of favorable outcomes = 540

Probability of a good screw, P (E)

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$P(E) = \frac{540}{600} = \frac{54}{60} = \frac{9}{10}.$$

Hence the required probability is $\frac{9}{10}$.

3. In a lottery, there are 5 prized tickets and 995 blank tickets. A person buys a lottery ticket. Find the probability of his winning a prize.

Solution:

Number of prized tickets = 5

Number of blank tickets = 995

Total number of tickets = 5 + 995 = 1000

The probability of winning a prize, P (E)

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$P(E) = \frac{5}{1000} = \frac{1}{200}$.

Hence the required probability is $\frac{1}{200}$.

4. 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:

Number of defective pens = 12

Number of good pens = 132

Total number of pens = 132 + 12 = 144

The probability of getting a good pen, P (E)

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$

$P(E) = \frac{132}{144} = \frac{11}{12}$.

Hence the required probability is $\frac{11}{12}$.

5. If the probability of winning a game is $\frac{5}{11}$, what is the probability of losing?

Solution:

Given probability of winning the game, P (E) = $\frac{5}{11}$

We know that,

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

Probability of losing game,

$P(\overline{E}) = 1 - P(E)$

$= 1 - \frac{5}{11}$

$= \frac{(11-5)}{11}$

$= \frac{6}{11}$

Hence the probability of losing game is $\frac{6}{11}$.

6. Two players, Sania and Sonali play a tennis match. It is known that the probability of Sania winning the match is 0.69. What is the probability of Sonali winning?

Solution:

Probability of Sania winning the match, P (E) = 0.69

Probability of Sonali winning = Probability of Sania losing,

$P(\overline{E}) = 1 - P(E)$

$= 1 - 0.69$

$= 0.31$

Hence the probability of Sonali winning is 0.31.

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

(i) Red?

(ii) Not red?

Solution:

(i) Number of red balls = 3

Number of black balls = 5

Total number of balls = 3 + 5 = 8

Probability that the ball drawn is red.

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

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

Hence the probability that the ball drawn is red is $\frac{3}{8}$.

(ii) Probability that the ball drawn is not red,

$$P(\overline{E}) = 1 - P(E)$$

$$= 1 - \left(\frac{3}{8}\right)$$

$$= \frac{(8-3)}{8}$$

$$= \frac{5}{8}$$

Hence the probability that the ball drawn is not red is $\frac{5}{8}$.

8. There are 40 students in Class X of a school of which 25 are girls and the other are boys. The class teacher has to select one students as a class representative. She writes the name of each students on a separate card, the cards being identical. Then she puts cards in a bag and stirs then thoroughly. She then draws one card from the bag. What is the probability that the name written on the card is the name of

(i) A girl?

(ii) A boy?

Solution:

Total number of students = 40

Number of girls = 25

Number of boys = 40 – 25 = 15

(i) Probability of getting a girl,

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$

$P(E) = \frac{25}{40} = \frac{5}{8}$

Hence the probability of getting a girl is $\frac{5}{8}$.

(ii) Probability of getting a boy,

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$

$P(E) = \frac{15}{40} = \frac{3}{8}$

Hence the probability of getting a boy is $\frac{3}{8}$.

9. A letter is chosen from the word 'TRIANGLE'. What is the probability that it sis a vowel?

Solution:

Number of vowels in the word 'TRIANGLE' = 3

Total number of letters = 8

Probability that the letter chosen is a vowel,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

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

Hence the probability that the letter chosen is a vowel is $\frac{3}{8}$.

10. A letter of English alphabet is chosen at random. Determine the probability that the letter is a consonant.

Solution:

Total number of alphabets = 26

Number of vowels = 5

Total number of consonants = 26 – 5 = 21

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$P(E) = \frac{21}{26}$$

Hence the required probability is $\frac{21}{26}$.

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

(i) Red

(ii) Black or white

(iii) Not black.

Solution:

Number of black balls = 5

Number of red balls = 7

Number of white balls = 3

Total number of balls = $5 + 7 + 3 = 15$

(i) Probability that the ball drawn is red,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{7}{15}$$

(ii) Probability of black or white balls ,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{(5+3)}{15}$$

$$= \frac{8}{15}$$

(iii) Probability of not black = Probability of red and black

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{(7+5)}{15}$$

$$= \frac{12}{15}$$

$$= \frac{4}{5}$$

12. A box contains 7 blue, 8 white and 5 black marbles. If a marble is drawn at random from the box, what is the probability that it will be

(i) Black?

(ii) **Blue or Black?**

(iii) **Not Black?**

(iv) **Green?**

Solution:

Number of blue marbles = 7

Number of white marbles = 8

Number of black marbles = 5

Total number of marbles = $7 + 8 + 5 = 20$

(i) Probability of getting black,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{5}{20}$$

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

Hence the probability of getting black is $\frac{1}{4}$.

(ii) Probability of blue or black,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{(7+5)}{20}$$

$$= \frac{12}{20}$$

$$= \frac{3}{5}$$

Hence the probability of blue or black is $\frac{3}{5}$.

(iii) Probability of not black = Probability of white and blue

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{(7+8)}{20}$

$= \frac{15}{20}$

$= \frac{3}{4}$

Hence the probability of not black is $\frac{3}{4}$.

(iv) Since there are no green marbles in the box, the probability of green is 0.

13. A bag contains 6 red balls, 8 white balls, 5 green balls and 3 black balls. One ball is drawn at random from the bag. Find the probability that the ball is:

(i) White

(ii) Red or black

(iii) Not green

(iv) Neither white nor black

Solution:

Number of red balls = 6

Number of white balls = 8

Number of green balls = 5

Number of black balls = 3

Total number of marbles = $6 + 8 + 5 + 3 = 22$

(i) Probability of white balls,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{8}{22}$

$= \frac{4}{11}$

Hence the probability of white balls is $\frac{4}{11}$.

(ii) Probability of red or black,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{(6+3)}{22}$

$= \frac{9}{22}$

Hence the probability of red or black is $\frac{9}{22}$.

(iii) Probability of not green = Probability of getting red, white and black

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{(6+8+3)}{22}$

$= \frac{17}{22}$

Hence the probability of not green is $\frac{17}{22}$.

(iv) Probability of neither white nor black = Probability of red and green

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{(6+5)}{22}$

$= \frac{11}{22}$

$= \frac{1}{2}$

Hence the probability of neither white nor black is $\frac{1}{2}$.

14. A piggy bank contains hundred 50 p coins, fifty Rs. 1 coins, twenty Rs. 2 coins and ten Rs. 5 coins. It is equally likely that one of the coins will fall down when the bank is turned upside down, what is the probability that the coin

(i) Will be a 50 p coin?

(ii) Will not be Rs. 5 coin?

Solution:

Number of 50 paisa coins = 100

Number of 1 rupee coins = 50

Number of 2 rupee coins = 20

Number of 5 rupee coins = 10

Total number of coins = $100 + 50 + 20 + 10 = 180$

(i) Probability of getting a 50 paisa coin.

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{100}{180}$

$= \frac{5}{9}$

(ii) Probability that coin will not be Rs. 5 coin,

$= \frac{(100+50+20)}{180}$

$= \frac{170}{180}$

$= \frac{17}{18}$

15. A carton consist of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects, Peter, a trader, will only accept the shirts which are good, but Salim, another trader, will only reject the shirts which have major defects. One shirts is drawn at random from the carton. What is the probability that

(i) It is acceptable to Peter?

(ii) It is acceptable to Salim?

Solution:

Total number of shirts = 100

Number of good shirts = 88

Number of shirts with minor defects = 8

Number of shirts with major defects = 4

Peter accepts only good shirts. So number of shirts he accepts = 88

Salim will reject shirts with only major defects. So number of shirts he accepts

= 88 + 8 = 96

(i) Probability that it is acceptable to Peter,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{88}{100}$$

$$= \frac{22}{25}$$

Hence the probability that the shirt is acceptable to Peter is $\frac{22}{25}$.

(ii) Probability that it is acceptable to Salim,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$$= \frac{96}{100}$$

$$= \frac{24}{25}$$

Hence the probability that the shirt is acceptable to Salim is $\frac{24}{25}$.

16. A die is thrown once. What is the probability that the

(i) Number is even

(ii) Number is greater than 2?

Solution:

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

So sample space = {1,2,3,4,5,6}

Number of possible outcomes = 6

Even numbers are (2, 4, and 6)

Number of favourable outcomes = 3

(i) Probability that the number is even,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{3}{6}$

$= \frac{1}{2}$

Hence the required probability is $\frac{1}{2}$.

(ii) When the number is greater than 2, the possible outcomes are 3, 4, 5, 6

Number of favourable outcomes = 4

Probability that the number is greater than 2,

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

$= \frac{4}{6}$

$= \frac{2}{3}$

Hence the required probability is $\frac{2}{3}$.

17. In a single throw of a die, find the probability of getting:

(i) an odd number

(ii) a number less than 5

(iii) a number greater than 5

(iv) a prime number

(v) a number less than 8

(vi) a number divisible by 3

(vii) a number between 3 and 6

(viii) a number divisible by 2 or 3

Solution:

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

Number of possible outcomes = 6

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of Possible outcomes}}$$

(i) Let E be the event of getting an odd number.

Outcomes favorable to E are 1, 3, 5

Number of favorable outcomes = 3

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

Hence the probability of getting an odd number is $\frac{1}{2}$.

(ii) Let E be event of getting a number less than 5.

Outcomes favorable to E are 1, 2, 3, 4

Number of favorable outcomes = 4

$$\mathrm{P(E)} = \frac{4}{6} = \frac{3}{2}$$

Hence the probability of getting a number less than 5 is $\frac{2}{3}$.

(iii) Let E be event of getting a number greater than 5.

Outcomes favorable to E is 6.

Number of favorable outcomes = 1

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

Hence the probability of getting a number greater than 5 is $\frac{1}{6}$.

(iv) Let E be event of getting a prime number.

Outcomes favorable to E are 2, 3, 5.

Number of favorable outcomes = 3

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

Hence the probability of getting a prime number is $\frac{1}{2}$.

(v) Let E be event of getting a number less than 8.

Outcomes favorable to E are 1, 2, 3, 4, 5, 6

Number of favorable outcomes = 6

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

Hence the probability of getting a number less than 8 is 1.

(vi) Let E be event of getting a number divisible by 3.

Outcomes favorable to E are 3, 6.

Number of favorable outcomes = 2

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

Hence the probability of getting a number divisible by 3 is $\frac{1}{3}$.

(vii) Let E be event of getting a number between 3 and 6.

Outcomes favorable to E are 4, 5.

Number of favorable outcomes = 2

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

Hence the probability of getting a number between 3 and 6 is $\frac{1}{3}$.

(viii) Let E be event of getting a number divisible by 2 or 3.

Outcomes favorable to E are 2, 3, 4, 6.

Number of favorable outcomes = 4

$P(E) = \frac{4}{6} = \frac{2}{3}$

Hence the probability of getting a number divisible by 2 or 3 is $\frac{2}{3}$.

18. A die has 6 faces marked by the given numbers as shown below:

1	**2**	**3**	**– 1**	**– 2**	**– 3**

The die is thrown once. What is the probability of getting?

(i) A positive integer.
(ii) An integer greater than – 3.
(iii) The smallest integer?

Solution:

When a die is thrown, the possible outcomes are $\{1, 2, 3, -1, -2, -3\}$

Number of possible outcomes = 6

(i) Let E be the event of getting a positive integer.

Outcomes favorable to E are {1, 2, 3}

Number of favorable outcomes = 3

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Hence the probability of getting a positive integer is $\frac{1}{2}$.

(ii) Let E be the event of getting an integer greater than – 3.

Outcomes favorable to E are {-2,-1,1, 2, 3}

Number of favorable outcomes = 5

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Hence the probability of getting an integer greater than – 3 is $\frac{5}{6}$.

(iii) Let E be the event of getting the smallest integer.

Outcomes favorable to E are – 3.

Number of favorable outcomes = 1

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Hence the probability of getting the smallest integer is $\frac{1}{6}$.

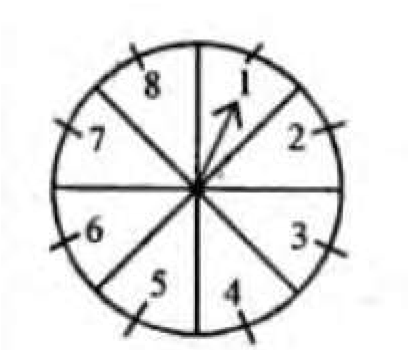
19. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 (shown in the adjoining figure) and these are equally likely outcomes. What is the probability that it will point at

(i) 8?

(ii) An odd number?

(iii) A number greater than 2?

(iv) A number less than 9?



Solution:

The possible outcomes of the game are $\{1, 2, 3, 4, 5, 6, 7, 8\}$

Number of possible outcomes = 8

(i) Let E be the event of arrow pointing 8.

Outcomes favorable to E is 8.

Number of favorable outcomes = 1

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\mathrm{P(E)} = \frac{1}{8}$$

Hence the probability of arrow pointing 8 is $\frac{1}{8}$.

(ii) Let E be the event of arrow pointing at odd number.

Outcomes favorable to E is {1, 3, 5, 7}.

Number of favorable outcomes = 4

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{4}{8} = \frac{1}{2}$$

Hence the probability of arrow pointing at odd number is $\frac{1}{2}$.

(iii) Let E be the event of arrow pointing a number greater than 2.

Outcomes favorable to E is {3, 4, 5, 6, 7, and 8}.

Number of favorable outcomes = 6

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of arrow pointing a number greater than 2 is $\frac{3}{4}$.

(iv) Let E be the event of arrow pointing a number less than 9.

Outcomes favorable to E is {1, 2, 3, 4, 5, 6, 7, and 8}.

Number of favorable outcomes = 8

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{8}{8} = 1$$

Hence the probability of arrow pointing a number less than 9 is 1.

20. Find the probability that the month of January may have 5 Mondays in

(i) A leap year

(ii) A non-leap year.

Solution:

For a leap year there are 366 days.

Number of days in January = 31

Total number of January moths with 5 Mondays = 3

(i) Probability that the month of January have 5 Mondays in leap year = $\frac{3}{7}$.

(ii) Probability that the month of January have 5 Mondays in a non-leap year = $\frac{3}{7}$.

21. Find the probability that the month of February may have 5 Wednesdays in

(a) A leap year

(b) A non-leap year.

Solution:

There are 7 ways in which the month of February can occur, each starting with a different day of the week.

(i) Only 1 way is possible for 5 Wednesday to occur in February with 29 days, i.e. Month starts on Wednesday.

Probability that February have 5 Wednesday in a leap year = $\frac{1}{7}$.

(ii) In a non-leap year, it is not possible to have 5 Wednesdays for February. So the probability that February have 5 Wednesdays in a non – leap year = 0

22. Sixteen cards are labeled as a, b, c, …, m, n, o, p. They are put in a box and shuffled. A boy is asked to draw a card from the box. What is the probability that the card drawn is:

(i) A vowel

(ii) A consonant

(iii) None of the letters of the word median.

Solution:

The possible outcomes are {a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p,}

Number of possible outcomes = 16

(i) Let E be the event of getting a vowel.

Outcomes favorable to E is {a, e, i, o}.

Number of favorable outcomes = 4

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{4}{16} = \frac{1}{4}$$

Hence the probability of getting a vowel is $\frac{1}{4}$.

(ii) Let E be the event of getting a consonant.

Outcomes favorable to E is {b, c, d, f, g, h, j, k, l, m, n, p}.

Number of favorable outcomes = 12

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{12}{16} = \frac{3}{4}$$

Hence the probability of getting a consonant is $\frac{3}{4}$.

(iii) Let E be the event of getting none of the letters of word median.

Outcomes favorable to E is {b, c, f, g, h, j, k, l, o, p}.

Number of favorable outcomes = 10

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{10}{16} = \frac{5}{8}$$

Hence the probability of getting none of the letters of word median is $\frac{5}{8}$.

23. An integer is chosen between 0 and 100. What is the probability that it is

(i) Divisible by 7?

(ii) Not divisible by 7?

Solution:

Number of integers between 0 and 100 = 99

Number of possible outcomes = 99

(i) Let E be the event of getting an integer divisible by 7.

Outcomes favorable to E is

{7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, and 98}.

Number of favorable outcomes = 14

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{14}{99}$$

Hence the probability of getting an integer divisible by 7 is $\frac{14}{99}$.

(ii) Let E be the event of getting an integer not divisible by 7.

Number of favorable outcomes = 99 – 14 = 85

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{85}{99}$$

Hence the probability of getting an integer not divisible by 7 is $\frac{85}{99}$.

24. Cards marked with numbers 1, 2, 3, 4… 20, are well shuffles and a card is drawn at random. What is the probability that the number on the card is

(i) A prime number

(ii) Divisible by 3

(iii) A perfect square?

(iv)

Solution:

The possible outcomes are {1, 2, 3 … 20}

Number of possible outcomes = 20

(i) Let E be the event of getting the number on the card is a prime number.

Outcomes favourable to E are {2, 3, 5, 7, 11, 13, 17, and 19}

Number of favourable outcomes = 8

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{8}{20} = \frac{2}{5}$$

Hence the probability of getting the number on the card is a prime number is $\frac{2}{5}$.

(ii) Let E be the event of getting the number on the card is divisible by 3.

Outcomes favourable to E are {3, 6, 9, 12, 15, and 18}

Number of favourable outcomes = 6

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\mathrm{P(E)} = \frac{6}{20} = \frac{3}{10}.$$

Hence the probability of getting the number on the card is divisible by 3 is $\frac{3}{10}$.

(iii) Let E be the event of getting the number on the card is a perfect square.

Outcomes favourable to E are {1, 4, 9, 16}

Number of favourable outcomes = 6

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\mathrm{P(E)} = \frac{4}{20} = \frac{1}{5}.$$

Hence the probability of getting the number on the card is a perfect square is $\frac{1}{5}$.

25. A box contains 25 cards numbered 1 to 25. A card is drawn from the box at random. Find the probability that the number on the card is:

(i) Even

(ii) Prime

(iii) Multiple of 6.

Solution:

The possible outcome are {1, 2, 3, 4 … 25}

Number of possible outcomes = 25

(i) Let E be the event of getting the number on the card is an even number.

Outcomes favourable to E are {2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, and 24}

Number of favourable outcomes = 12

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{12}{25}.$$

Hence the probability of getting the number on the card is an even number is $\frac{12}{25}$.

(ii) Let E be the event of getting the number on the card is a prime number.

Outcomes favourable to E are {2, 3, 5, 7, 11, 13, 17, 19, and 23}

Number of favourable outcomes = 9

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$P(E) = \frac{9}{25}$.

Hence the probability of getting the number on the card is a prime number is $\frac{9}{25}$.

(iii) Let E be the event of getting the number on the card is a multiple of 6.

Outcomes favourable to E are {6, 12, 18, and 24}

Number of favourable outcomes = 4

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$P(E) = \frac{4}{25}$.

Hence the probability of getting the number on the card is a multiple of 6 is $\frac{4}{25}$.

26. A box contains 15 cards numbered 1, 2, 3 …., 15 which are mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the card is:

(i) Odd

(ii) Prime

(iii) Divisible by 3

(iv) Divisible by 3 and 2 both

Solution:

The possible outcomes are {1, 2, 3, 4 … 15}

Number of possible outcomes = 15

(i) Let E be the event of getting the number on the card is odd.

Outcomes favourable to E are {1, 3, 5, 7, 9, 11, 13, 15}

Number of favourable outcomes = 8

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{8}{15}.$$

Hence the probability of getting the number on the card is odd is $\frac{8}{15}$.

(ii) Let E be the event of getting the number on the card is a prime.

Outcomes favourable to E are {2, 3, 5, 7, 11, 13}

Number of favourable outcomes = 6

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{6}{15} = \frac{2}{5}.$$

Hence the probability of getting the number on the card is a prime number is $\frac{2}{5}$.

(iii) Let E be the event of getting the number on the card is divisible by 3.

Outcomes favourable to E are {3, 6, 9, 12, 15}

Number of favourable outcomes = 5

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{5}{15} = \frac{1}{3}.$$

Hence the probability of getting the number on the card is a divisible by 3 is $\frac{1}{3}$.

(iv) Let E be the event of getting the number on the card is divisible by 3 and 2 both.

Outcomes favourable to E are {6, 12}

Number of favourable outcomes = 2

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{2}{15}.$$

Hence the probability of getting the number on the card is a divisible by 3 and 2 both is $\frac{2}{15}$.

(v) Let E be the event of getting the number on the card is divisible by 3 or 2.

Outcomes favourable to E are {2, 3, 4, 6, 8, 9, 10, 12, 14, and 15}

Number of favourable outcomes = 10

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{10}{15} = \frac{2}{3}.$$

Hence the probability of getting the number on the card is a divisible by 3 or 2 is $\frac{2}{3}$.

(vi) Let E be the event of getting the number on the card is a perfect square.

Outcomes favourable to E are {1, 4, 9}

Number of favourable outcomes = 3

$$\text{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\text{P(E)} = \frac{3}{15} = \frac{1}{5}.$$

Hence the probability of getting the number on the card is a perfect square is $\frac{1}{5}$.

27. A box contains 19 balls bearing numbers 1, 2, 3 …., 19. A balls is drawn at random from the box. Find the probability that the number on the ball is:

(i) A prime number

(ii) Divisible by 3 or 5

(iii) Neither divisible by 5 nor by 10

(iv) An even number.

Solution:

The possible outcomes are {1, 2, 3 …., 19}

Number of possible outcomes = 19

(i) Let E be the event of getting the number on the ball is a prime number.

Outcomes favourable to E are {2, 3, 5, 7, 11, 13, 17, and 19}

Number of favourable outcomes = 8

$$\text{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\text{P(E)} = \frac{8}{19}.$$

Hence the probability of getting the number on the number on the ball is a prime number is $\frac{8}{19}$.

(ii) Let E be the event of getting the number on the ball is divisible by 3 or 5.

Outcomes favourable to E are {3, 5, 6, 9, 10, 12, 15, and 18}

Number of favourable outcomes = 8

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{8}{19}.$$

Hence the probability of getting the number on the number on the ball is divisible by 3 or 5 is $\frac{8}{19}$.

(iii) Let E be the event of getting the number on the ball is neither divisible by 5 nor by 10.

Outcomes favourable to E are {1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 18, 19}

Number of favourable outcomes = 16

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{16}{19}.$$

Hence the probability of getting the number on the number on the ball is neither divisible by 5 nor by 10 is $\frac{16}{19}$.

(iv) Let E be the event of getting the number on the ball is an even number.

Outcomes favourable to E are {2, 4, 6, 8, 10, 12, 14, 16, and 18}

Number of favourable outcomes = 9

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{9}{19}.$$

Hence the probability of getting the number on the number on the ball is an even number is $\frac{9}{19}$.

28. Cards 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 the number on the card drawn is

(i) Divisible by 5

(ii) A perfect square number.

Solution:

The possible outcomes are {13, 14, 15 …, 60}

Number of possible outcomes = 48

(i) Let E be the event of getting the number on the card is divisible by 5.

Outcomes favourable to E are {15, 20, 25, 30, 35, 40, 45, 50, 55, and 60}

Number of favourable outcomes = 10

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{10}{48} = \frac{5}{24}.$$

Hence the probability of getting the number on the card is a divisible by 5 is $\frac{5}{24}$.

(ii) Let E be the event of getting the number on the card is a perfect square number.

Outcomes favourable to E are {16, 25, 36, 49}

Number of favourable outcomes = 4

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\mathrm{P(E)} = \frac{4}{48} = \frac{1}{12}.$$

Hence the probability of getting the number on the card is a perfect square number is $\frac{1}{12}$.

29. Tickets numbered 3, 5, 7, 9 …. 29 are placed in a box and mixed thoroughly. One ticket is drawn at random from the box. Find the probability that the number on the ticket is

(i) A prime number

(ii) A number less than 16

(iii) A number divisible by 3.

Solution:

The possible outcomes are {3, 5, 7, 9 …. 29}

Number of possible outcomes = 14

(i) Let E be the event of getting the number on the ticket is a prime number.

Outcomes favourable to E are {3, 5, 7, 11, 13, 17, 19, 23, 29}

Number of favourable outcomes = 9

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{9}{14}.$$

Hence the probability of getting the number on the number on the ticket is a prime number is $\frac{9}{14}$.

(ii) Let E be the event of getting the number on the ticket is less than 16.

Outcomes favourable to E are {3, 5, 7, 9, 11, 13, 15}

Number of favourable outcomes = 7

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{7}{14} = \frac{1}{2}.$$

Hence the probability of getting the number on the number on the ticket is less than 16 is $\frac{1}{2}$.

(iii) Let E be the event of getting the number on the ticket is a number divisible by 3.

Outcomes favourable to E are {3, 9, 15, 21, 27}

Number of favourable outcomes = 5

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{5}{14}.$$

Hence the probability of getting the number on the number divisible by 3 is $\frac{5}{14}$.

30. 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:

The possible outcomes are {1, 2, 3 … 90}

Number of possible outcomes = 90

(i) Let E be the event of getting the number on the disc is a two-digit number.

Outcomes favourable to E are {10, 11, 12 … 90}

Number of favourable outcomes = 81

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{81}{90} = \frac{9}{10}.$$

Hence the probability of getting the number on the number on the disc is a two-digit number is $\frac{9}{10}$.

(ii) Let E be the event of getting the number on the disc is a perfect square number.

Outcomes favourable to E are {1, 4, 9, 16, 25, 36, 49, 64, 81}

Number of favourable outcomes = 9

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{9}{90} = \frac{1}{10}.$$

Hence the probability of getting the number on the number on the disc is a perfect square number is $\frac{1}{10}$.

(iii) Let E be the event of getting the number on the disc is a number divisible by 5.

Outcomes favourable to E are {5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90}

Number of favourable outcomes = 18

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{18}{90} = \frac{2}{10} = \frac{1}{5}.$$

Hence the probability of getting the number on the disc is a number divisible by 5 is $\frac{1}{5}$.

31. Cards marked with numbers 2 to 101 are placed in a box and mixed thoroughly. One card is drawn at random from this box. Find the probability that the number on the card is

(i) An even number

(ii) A number less than 14

(iii) A number which is a perfect square

(iv) A prime number less than 30.

Solution:

The possible outcomes are {2, 3 …. 101}

Number of possible outcomes = 100

(i) Let E be the event of getting the number on the card is an even number.

Outcomes favourable to E are {2, 4, 6, 8 … 100}

Number of favourable outcomes = 50

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{50}{100} = \frac{1}{2}.$$

Hence the probability of getting the number on the card is an even number is $\frac{1}{2}$.

(ii) Let E be the event of getting the number on the card is a number less than 14.

Outcomes favourable to E are {2, 3, 4 … 13}

Number of favourable outcomes = 12

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{12}{100} = \frac{3}{25}.$$

Hence the probability of getting the number on the card is a number less than 14 is $\frac{3}{25}$.

(iii) Let E be the event of getting the number on the card is a perfect square.

Outcomes favourable to E are {4, 9, 16, 25, 36, 49, 64, 81, 100}

Number of favourable outcomes = 9

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$\mathrm{P(E)} = \frac{9}{100}.$

Hence the probability of getting the number on the card is a perfect square is $\frac{3}{25}$.

(iv) Let E be the event of getting the number on the card is a prime number less than 30.

Outcomes favourable to E are {2, 3, 5, 7, 11, 13, 17, 19, 23, and 29}

Number of favourable outcomes = 10

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$\mathrm{P(E)} = \frac{10}{100} = \frac{1}{10}.$

Hence the probability of getting the number on the card is a prime number less than 30 is $\frac{1}{10}$.

32. A bag contains 15 balls of which some are white and others are red. If the probability of drawing a red ball is twice that of a white ball, find the number of white balls in the bag.

Solution:

Total number of balls in the bag = 15.

Let the number of white balls be x.

Then number of red balls = $15 - x$.

The probability of drawing a white ball = $\frac{x}{15}$.

Probability of drawing a red ball = $\frac{(15-x)}{15}$

Given probability of drawing a red ball is twice that of a white balls.

$\frac{(15-x)}{15} = 2 \times \left(\frac{x}{15}\right)$

$15 - x = 2x$

$3x = 15$

$x = \frac{15}{3} = 5$

Hence the number of white balls is 5.

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

Solution:

Number of red balls = 6

Let number of blue balls be x.

Total number of balls = $6 + x$

Probability of drawing a red ball = $\frac{6}{6+x}$

Probability of drawing a blue ball = $\frac{x}{6+x}$

Given the probability of drawing a blue ball is twice that of a red ball.

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

$x = 12.$

So total number of balls = $x + 6 = 12 + 6 = 18.$

Hence the total number of balls in the bag is 18.

34. A bag contains 24 balls of which x are red, $2x$ are white and $3x$ are blue. A ball is selected at random. Find the probability that it is

(i) White.

(ii) Not red.

Solution:

Total number of balls = 24

Number of red balls = x.

Number of white balls = $2x$.

Number of blue balls = $3x$.

$x + 2x + 3x = 24$

$6x = 24$

$x = \frac{24}{66} = 4$

Number of red balls = $x = 4$

Number of white balls = $2x = 2 \times 4 = 8$

Number of blue balls = $3x = 3 \times 4 = 12$

$\text{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

(i) Probability of getting a white ball = $\frac{8}{24} = \frac{1}{3}$

(ii) Probability of getting a ball which is not red = $\frac{(8+12)}{24} = \frac{20}{24} = \frac{5}{6}$

P (not red) means Probability of white and blue.

Hence the probability of getting a ball which is not red is $\frac{5}{6}$.

35. A card is drawn from a well-shuffled pack of 52 cards. Find the probability fo getting:

(i) '2' of spades

(ii) A jack.

(iii) A king of red colour

(iv) A card of diamond

(v) A king or a queen

(vi) A non-face card

(vii) A black face card

(viii) A black card

(ix) A non-ace

(x) Non-face card of black colour

(xi) Neither a spade nor a jack

(xii) Neither a heart nor a red king

Solution:

Total number of cards = 52.

So number of possible outcomes = 52.

(i) Let E be the event of getting '2' of spades.

There will be only one card of '2' of spades.

Number of favourable outcomes = 1

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of getting ‘2’ of spades is $\frac{1}{52}$.

(ii) Let E be the event of getting a jack.

There will be 4 card of jack.

Number of favourable outcomes = 4

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of getting a jack is $\frac{1}{13}$.

(iii) Let E be the event of getting a king of red colour.

There will be 2 card of a king of red colour.

Number of favourable outcomes = 2

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of getting a king of red colour is $\frac{1}{26}$.

(iv) Let E be the event of getting a card of diamond.

There will be 13 card of a card of diamond.

Number of favourable outcomes = 13

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of getting a card of diamond is $\frac{1}{4}$.

(v) Let E be the event of getting a king or a queen.

There will be 4 card of a king and 4 card of queen.

Number of favourable outcomes = 4 + 4 = 8

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$P(E) = \frac{8}{52} = \frac{2}{13}$.

Hence the probability of getting a king or a queen is $\frac{2}{13}$.

(vi) Let E be the event of getting a non-face card.

There will be 40 non-face cards.

Number of favourable outcomes = 40

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$P(E) = \frac{40}{52} = \frac{10}{13}$.

Hence the probability of getting a non-face card is $\frac{10}{13}$.

(vii) Let E be the event of getting a black face card.

There will be 6 black face cards.

Number of favourable outcomes = 6

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of getting a black face card is $\frac{3}{26}$.

(viii) Let E be the event of getting a black card.

There will be 26 black cards.

Number of favourable outcomes = 26

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Hence the probability of getting a black card is $\frac{1}{2}$.

(ix) Let E be the event of getting a non-ace card.

There will be 48 non-ace card.

Number of favourable outcomes = 48

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{48}{52} = \frac{24}{26} = \frac{12}{13}.$$

Hence the probability of getting a non-ace card is $\frac{12}{13}$.

(x) Let E be the event of getting a non-face of black colour card.

There will be 20 non-face of black colour card.

Number of favourable outcomes = 20

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$P(E) = \frac{20}{52} = \frac{5}{13}$.

Hence the probability of getting a non-face of black colour card is $\frac{5}{13}$.

(xi) Let E be the event of getting a neither a spade nor a jack.

There are 13 spades and 3 other jacks. So remaining card = 52 – 13 – 3 = 36

There will be 36 cards which are neither a spade nor a jack.

Number of favourable outcomes = 36

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$P(E) = \frac{36}{52} = \frac{9}{13}$.

Hence the probability of getting a neither a spade nor a jack is $\frac{9}{13}$.

(xii) Let E be the event of getting a neither a heart nor a red king.

There are 13 heart card and 1 other red king. So remaining card = 52 – 13 – 1 = 38

There will be 38 cards which are neither a heart nor a red king.

Number of favourable outcomes = 38

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Hence the probability of getting a neither a heart nor a red king is $\frac{19}{26}$.

36. All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting

(i) A black face card

(ii) A queen

(iii) A black card

(iv) A heart

(v) A spade

(vi) '9' of black colour.

Solution:

Total number of cards = 52 – 3 = 49.

[Since 3 face cards of spade are removed]

So number of possible outcomes = 49.

(i) Let E be the event of getting a black face card.

There will be 26 black face cards of clubs.

Number of favourable outcomes = 3

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{3}{49}.$$

Hence the probability of getting a black face card is $\frac{3}{49}$.

(ii) Let E be the event of getting a queen.

There will be 3 cards of queen.

Number of favourable outcomes = 3

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{3}{49}.$$

Hence the probability of getting a queen is $\frac{3}{49}$.

(iii) Let E be the event of getting a black card.

There will be 23 black face cards remaining since 3 spades are removed.

Number of favourable outcomes = 23

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{23}{49}.$$

Hence the probability of getting a black card is $\frac{23}{49}$.

(iv) Let E be the event of getting a heart.

There will be 13 hearts.

Number of favourable outcomes = 13

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{13}{49}.$$

Hence the probability of getting a heart is $\frac{13}{49}$.

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

There will be 10 spade.

Number of favourable outcomes = 10

$\text{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$\text{P(E)} = \frac{10}{49}.$

Hence the probability of getting a spade is $\frac{10}{49}$.

(vi) Let E be the event of getting '09' of black colour.

There will be 2 such cards.

Number of favourable outcomes = 2

$\text{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$\text{P(E)} = \frac{2}{49}.$

Hence the probability of getting '09' of black colour is $\frac{2}{49}$.

37. From a pack of 52 cards, a blackjack, a red queen and two black kings fell down. A card was then drawn from the remaining pack at random. Find the probability that the card drawn is

(i) A black card

(ii) A king

(iii) A red queen.

Solution:

Total number of cards = 52 – 4 = 48 [∵ 4 cards fell down]

So number of possible outcomes = 48

(i) Let E be the event of getting a black card.

There will be 23 black face cards since a black jack and 2 black kings fell down.

Number of favourable outcomes = 23

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{23}{48}.$$

Hence the probability of getting a black card is $\frac{23}{48}$.

(ii) Let E be the event of getting a king.

There will be 2 kings remaining since 2 kings fell down.

Number of favourable outcomes = 2

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{2}{48} = \frac{1}{24}.$$

Hence the probability of getting a king is $\frac{1}{24}$.

(iii) Let E be the event of getting a red queen.

There will be 1 red queen.

Number of favourable outcomes = 1

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$P(E) = \frac{1}{48}.$$

Hence the probability of queen is $\frac{1}{48}$.

38. Two coins are tossed once. Find the probability of getting:

(i) 2 heads

(ii) At least one tail.

Solution:

When 2 coins are tossed, the possible outcomes are HH, HT, TH, and TT.

Number of possible outcomes = 4

(i) Let E be the event of getting 2 heads.

Favourable outcomes = HH

Number of favorable outcomes = 1

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Probability of getting 2 heads is $\frac{1}{4}$.

(ii) Let E be the event of getting at least one tail.

Favourable outcomes = HT, TH, TT

Number of favorable outcomes = 3

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Probability of getting at least one tail is $\frac{3}{4}$.

39. Two different coins are tossed simultaneously. Find the probability of getting:

(i) Two tails

(ii) One tails

(iii) No tails

(iv) At most one tail.

Solution:

When 2 coins are tossed, the possible outcomes are HH, HT, TH, and TT.

Number of possible outcomes = 4

(i) Let E be the event of getting 2 tail.

Favourable outcomes = TT

Number of favorable outcomes = 1

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

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

Probability of getting 2 tail is $\frac{1}{4}$.

(ii) Let E be the event of getting one tail.

Favourable outcomes = TH, HT

Number of favorable outcomes = 2

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$P(E) = \frac{2}{4} = \frac{1}{2}$.

Probability of getting one tail is $\frac{1}{2}$.

(iii) Let E be the event of getting no tail.

Favourable outcomes = HH

Number of favorable outcomes = 1

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Probability of getting no tail is $\frac{1}{4}$.

(iv) Let E be the event of getting almost one tail.

Favourable outcomes = TH, HT, TT

Number of favorable outcomes = 3

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Probability of getting almost one tail is $\frac{3}{4}$.

40. Two different dice are thrown simultaneously. Find the probability of getting:

(i) A number greater than 3 on each dice

(ii) An odd number on both dice.

Solution:

When two dice are thrown simultaneously, the sample space of the experiment is

{(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)}

So there are 36 equally likely outcomes.

Possible number of outcomes = 36.

(i) Let E be the event of getting a number greater than 3 on each dice.

Favourable outcomes = {(4, 4), (4, 5), (4, 6), (5, 4), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6)}

Number of favorable outcomes = 9

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

$\mathrm{P(E)} = \frac{9}{36} = \frac{1}{4}.$

Probability of getting a number greater than 3 on each dice is $\frac{1}{4}$.

(ii) Let E be the event of getting an odd number on both dice.

Favourable outcomes = {(1, 1), (1, 3), (1, 5), (3, 1), (3, 3), (3, 5), (5, 1), (5, 3), (5, 5)}

Number of favorable outcomes = 9

$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Probability of getting an odd number on both dice is $\frac{1}{4}$.

41. Two different dice are thrown at the same time. Find the probability of getting:

(i) A doublet

(ii) A sum of 8

(iii) Sum divisible by 5

(iv) Sum of at least 11.

Solution:

When two dice are thrown simultaneously, the sample space of the experiment is

{(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)}

So there are 36 equally likely outcomes.

Possible number of outcomes = 36.

(i) Let E be the event of getting a number greater than 3 on each dice.

Favourable outcomes = {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)}

Number of favorable outcomes = 6

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$

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

Probability of getting a doublet is $\frac{1}{6}$.

(ii) Let E be the event of getting a sum of 8.

Favourable outcomes = {(2, 6), (3, 5), (4, 4), (5, 3), (6, 2)}

Number of favorable outcomes = 5

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\mathrm{P(E)} = \frac{5}{36}.$$

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

(iii) Let E be the event of getting a sum divisible by 5.

Favourable outcomes = {(1, 4), (2, 3), (3, 2), (4, 1), (4, 6), (5, 5), (6, 4)}

Number of favorable outcomes = 7

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\mathrm{P(E)} = \frac{7}{36}.$$

Probability of getting a sum divisible by 5 is $\frac{7}{36}$.

(iv) Let E be the event of getting a sum of at least 11.

Favourable outcomes = {(5, 6), (6, 5), (6, 6)}

Number of favorable outcomes = 3

$$\mathrm{P(E)} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$P(E) = \frac{3}{36} = \frac{1}{12}$.

Probability of getting a sum of at least 11 is $\frac{1}{12}$.