

# Assignments in Mathematics Class X (Term II)

## 15. PROBABILITY

### IMPORTANT TERMS, DEFINITIONS AND RESULTS

- The science which measures the degree of uncertainty is called **probability**.
  - There are two types of approaches to the study of probability. These are experimental or empirical approach and theoretical approach.
  - In the experimental approach to probability, we find the probability of the occurrence of an event by actually performing the experiment a number of times and record the happening of an event.
  - In the theoretical approach to probability, we predict the results without actually performing the experiment.
  - The observations of an experiment are called its **outcomes**.
  - An experiment in which all possible outcomes are known and the exact outcome cannot be predicted in advance, is called a **random experiment**.
  - The word **unbiased** means each outcome is equally likely to occur. For example, an unbiased die indicates that each of the outcomes 1, 2, 3, 4, 5 or 6 has equal chances to occur. Throughout this chapter, we shall assume that all the experiments have equally likely outcomes.
  - The theoretical probability of an event E, written as P(E) is defined as
- An event having only one outcome of the experiment is called an elementary event.
  - The sum of the probabilities of all the elementary events of an experiment is 1.  
In general for any event E  
 $P(E) = 1 - P(\text{not } E) = 1 - P(\bar{E})$   
or  $P(\bar{E}) = 1 - P(E)$   
or  $P(E) + P(\bar{E}) = 1$   
Here the event  $\bar{E}$ , representing not E, is called the compliment of the event E.
  - The probability of the event which is impossible to occur is 0. Such an event is called an **impossible event**.
  - The probability of an event which is sure (or certain) to occur is 1. Such an event is called a **sure** or a **certain event**.
  - For an event E, we have  $0 \leq P(E) \leq 1$ .
  - A die is a well balanced cube with its six faces marked with numbers or dots 1 to 6. When we throw a die we are interested in the number that occurs on the top face.
  - The pack or deck of playing cards consists of 52 cards, 26 of red colour and 26 of black colour. There are four suits each of 13 cards namely hearts (♥), spades (♠), diamonds (♦) and clubs (♣).  
Each suit contains ace, king, queen, jack or knave, 10, 9, 8, 7, 6, 5, 4, 3, 2.  
There are 4 aces, 4 kings, 4 queens, 4 jacks, 4 tens, and so on in a pack.  
Kings, queens, and jacks are called face cards.

$$P(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Total number of all possible outcomes of the experiment}}$$

### SUMMATIVE ASSESSMENT

#### MULTIPLE CHOICE QUESTIONS

[1 Mark]

#### A. Important Questions

1. The theoretical probability P(E) of an event E is defined as :  
(a)  $P(E) = \frac{\text{No. of all possible outcomes of the experiment}}{\text{No. of outcomes favourable to E}}$   
(b)  $P(E) = \text{No. of outcomes favourable to E} \times \text{No. of all possible outcomes of the experiment}$   
(c)  $P(E) = \frac{\text{No. of outcomes favourable to E}}{\text{No. of all possible outcomes of the experiment}}$   
(d) none of these
2. Which of the following can be the probability of an event?  
(a) - 0.02 (b) 1.4 (c)  $\frac{25}{26}$  (d)  $\frac{5}{4}$
3. Which of the following cannot be the probability of an event?  
(a)  $\frac{1}{3}$  (b) 0.2 (c) 4% (d)  $\frac{17}{15}$
4. Getting a number 8 in a single throw of a die is :

- (a) a certain event      (b) an impossible event  
(c) neither certain nor-impossible event  
(d) none of these
5. An event is very unlikely to happen. Its probability is closest to :  
(a) 0.0001 (b) 0.001 (c) 0.01 (d) 0.1
6. If we throw a die, all the possible outcomes are :  
(a) 1 (b) 2, 4, 6  
(c) 1, 3, 5 (d) 1, 2, 3, 4, 5, 6
7. How many cards are of red colour in a pack of playing cards?  
(a) 4 (b) 13  
(c) 26 (d) none of these
8. How many face cards are there in a pack of playing cards?  
(a) 4 (b) 12 (c) 13 (d) 26
9. The probability expressed as a percentage of a particular occurrence can never be :  
(a) less than 100  
(b) less than 0  
(c) greater than 1  
(d) anything but a whole number
10. How many suits are there in a pack of playing cards?  
(a) 4 (b) 13  
(c) 26 (d) none of these
11. If  $P(E) = 0.35$ , then  $P(\text{not } E)$  is given by :  
(a)  $-0.35$  (b)  $0.65$   
(c)  $-0.65$  (d) none of these
12. An event is very likely to happen. Its probability is closest to :  
(a) 0.999 (b) 0.990 (c) 0.909 (d) 0.099
13. If  $P(\text{not } E) = \frac{1}{6}$ , then  $P(E)$  is given by :  
(a)  $\frac{5}{6}$  (b)  $-\frac{5}{6}$   
(c)  $-\frac{1}{6}$  (d) none of these
14. Two coins are tossed simultaneously. All the possible outcomes are :  
(a) H, T (b) HH, TT  
(c) HT, TT (d) HH, HT, TH, TT
15. In a throw of a die, the probability of getting an odd number is :  
(a) 0 (b)  $\frac{1}{6}$  (c)  $\frac{2}{6}$  (d)  $\frac{3}{6}$
16. A card is selected at random from a well shuffled deck of 52 playing cards. The probability of its being a face card is :  
(a)  $\frac{3}{13}$  (b)  $\frac{4}{13}$  (c)  $\frac{6}{13}$  (d)  $\frac{9}{13}$
17. The probability that a non-leap year selected at random will contain 53 sundays is :  
(a)  $\frac{1}{7}$  (b)  $\frac{2}{7}$  (c)  $\frac{3}{7}$  (d)  $\frac{5}{7}$
18. When a die is thrown, the probability of getting an odd number less than 3 is :  
(a)  $\frac{1}{6}$  (b)  $\frac{1}{3}$  (c)  $\frac{1}{2}$  (d) 0
19. A bag contains 3 red balls, 5 white balls and 7 black balls. What is the probability that a ball drawn from the bag at random will be neither red nor black?  
(a)  $\frac{1}{5}$  (b)  $\frac{1}{3}$  (c)  $\frac{7}{15}$  (d)  $\frac{8}{15}$
20. A card is drawn from a pack of 52 playing cards. The probability that it is a queen is :  
(a)  $\frac{1}{52}$  (b)  $\frac{1}{13}$  (c)  $\frac{4}{13}$  (d)  $\frac{1}{4}$
21. Two dice are thrown simultaneously. The probability of getting a doublet is :  
(a) 0 (b)  $\frac{1}{3}$  (c)  $\frac{1}{6}$  (d)  $\frac{5}{6}$
22. A school has five houses A, B, C, D and E. A class has 23 students, 4 from house A, 3 from house B, 5 from house C and rest from house E. A single student is selected at random to be the class monitor. The probability that the selected student is not from A, B and C is :  
(a)  $\frac{4}{23}$  (b)  $\frac{6}{23}$  (c)  $\frac{8}{23}$  (d)  $\frac{17}{23}$
23. A card is drawn from a pack of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is :  
(a) 4 (b) 13 (c) 48 (d) 51
24. One ticket is drawn at random from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is :  
(a)  $\frac{1}{5}$  (b)  $\frac{3}{5}$  (c)  $\frac{4}{5}$  (d)  $\frac{1}{3}$
25. One card is accidentally dropped from a pack of 52 playing cards. The probability that it is a card of red colour is :  
(a)  $\frac{1}{2}$  (b)  $\frac{1}{4}$  (c)  $\frac{1}{26}$  (d)  $\frac{1}{13}$
26. The probability of drawing a rotten egg from a lot of 400 is  $\frac{7}{200}$ . The number of rotten eggs in the lot is :  
(a) 7 (b) 14 (c) 21 (d) 28

27. One card is drawn at random from a box containing cards numbered from 1 to 100. The probability that the drawn card has a prime number is :  
 (a)  $\frac{1}{5}$  (b)  $\frac{1}{4}$  (c)  $\frac{3}{5}$  (d)  $\frac{3}{4}$
28. Gurmeet calculates that the probability of his winning the first prize in a lottery is  $\frac{2}{25}$ . If 1600

tickets are sold, how many has he bought ?

- (a) 40 (b) 240 (c) 480 (d) 750

29. Two dice are thrown simultaneously. The event E, is getting the same number on each dice. The number of outcomes favourable to E is :

- (a) 2 (b) 4 (c) 6 (d) 36

## B. Questions From CBSE Examination Papers

1. If a letter of English alphabet is chosen at random, then the probability that the letter is a consonant is : **[2011 (T-II)]**  
 (a)  $\frac{5}{26}$  (b)  $\frac{21}{26}$  (c)  $\frac{10}{13}$  (d)  $\frac{11}{13}$
2. If two coins are tossed simultaneously, then the probability of getting at least one head is : **[2011 (T-II)]**  
 (a)  $\frac{3}{4}$  (b)  $\frac{1}{2}$  (c)  $\frac{1}{4}$  (d) 1
3. Two dice are thrown simultaneously. Probability of getting a prime number on both dice is : **[2011 (T-II)]**  
 (a)  $\frac{5}{18}$  (b)  $\frac{2}{9}$  (c)  $\frac{1}{3}$  (d)  $\frac{1}{4}$
4. Two coins are tossed together. The probability of getting head on both is : **[2011 (T-II)]**  
 (a) 0 (b)  $\frac{1}{4}$  (c)  $\frac{1}{2}$  (d)  $\frac{3}{4}$
5. The probability that a leap year has 53 Sundays is **[2011 (T-II)]**  
 (a)  $\frac{1}{7}$  (b)  $\frac{2}{7}$  (c)  $\frac{3}{7}$  (d)  $\frac{4}{7}$
6. The probability of getting a number between 3 and 100 which is divisible by 7 is **[2011 (T-II)]**  
 (a)  $\frac{29}{98}$  (b)  $\frac{1}{7}$  (c)  $\frac{25}{98}$  (d)  $\frac{23}{98}$
7. In a throw of a pair of dice, what is the probability of getting a doublet ? **[2011 (T-II)]**  
 (a)  $\frac{1}{3}$  (b)  $\frac{1}{6}$  (c)  $\frac{5}{12}$  (d)  $\frac{2}{3}$
8. A bag contains cards which are numbered from 2 to 90. A card is drawn at random from the bag. The probability that it bears a two digit number is : **[2011 (T-II)]**  
 (a)  $\frac{88}{92}$  (b)  $\frac{88}{90}$  (c)  $\frac{81}{89}$  (d)  $\frac{89}{90}$
9. Which of the following cannot be the probability of an event ? **[2011 (T-II)]**  
 (a) 0 (b)  $\frac{1}{5}$  (c)  $\frac{5}{4}$  (d) 1
10. Which of the following cannot be the probability

of an event ? **[2011 (T-II)]**

- (a)  $\frac{2}{3}$  (b) -1.5 (c) 15% (d) 0.7

11. From a pack of 52 playing cards, a card is drawn at random. The probability, that the drawn card is not a face card is : **[2011 (T-II)]**

- (a)  $\frac{3}{13}$  (b)  $\frac{9}{13}$  (c)  $\frac{10}{13}$  (d)  $\frac{3}{4}$

12. The probability of getting a prime number in single throw of a dice is : **[2011 (T-II)]**

- (a) zero (b)  $\frac{1}{3}$  (c)  $\frac{1}{2}$  (d)  $\frac{1}{4}$

13. The probability of drawing a green coloured ball from a bag containing 6 red and 5 black balls is : **[2011 (T-II)]**

- (a) 0 (b) 1 (c)  $\frac{5}{11}$  (d)  $\frac{6}{11}$

14. The sum of probability of all the events of an experiment is : **[2011 (T-II)]**

- (a)  $\frac{2}{3}$  (b) 3 (c) 1 (d) 2

15. The probability of guessing the correct answer to certain question is  $\frac{p}{12}$ . If the probability of not

guessing the correct answer to same question is  $\frac{3}{4}$ , the value of  $p$  is : **[2011 (T-II)]**

- (a) 3 (b) 4 (c) 2 (d) 1

16. The probability of getting a bad egg from a lot of 400 eggs is 0.035. The number of bad eggs in the lot is **[2011 (T-II)]**

- (a) 7 (b) 14 (c) 21 (d) 28

17. If a die is thrown once, the probability of getting a number less than 3 and greater than 2 is **[2011 (T-II)]**

- (a) 0 (b) 1 (c)  $\frac{1}{3}$  (d)  $\frac{2}{3}$

18. If the probability of winning a game is 0.995, then the probability of losing it is : **[2011 (T-II)]**

- (a) 1 (b) 0.05 (c) 0.0050 (d) 0.0

19. Someone is asked to select a number from 1 to 30. The probability that the selected number is a prime number is : **[2011 (T-II)]**

- (a)  $\frac{1}{5}$       (b)  $\frac{2}{7}$       (c)  $\frac{1}{3}$       (d)  $\frac{7}{16}$

20. In a throw of two dice, the probability of getting a sum of 10 is : **[2011 (T-II)]**

- (a)  $\frac{1}{12}$       (b)  $\frac{1}{36}$       (c)  $\frac{1}{6}$       (d)  $\frac{1}{4}$

21. The probability that a non leap year selected at random will have 53 Tuesdays is : **[2011 (T-II)]**

- (a)  $\frac{1}{7}$       (b)  $\frac{2}{7}$       (c)  $\frac{3}{7}$       (d)  $\frac{4}{7}$

## SHORT ANSWER TYPE QUESTIONS

**[2 Marks]**

### A. Important Questions

1. In an experiment there are only two possible outcomes. The probability of each outcome is  $\frac{1}{2}$ . Is it true? Give reason.

**[HOTS]**

2. Two dice are thrown simultaneously. List the sample space for this experiment.

**[HOTS]**

3. The king, Queen and Jack of clubs are removed from a deck of 52 playing cards and then well shuffled. One card is selected from the remaining cards. What is the probability of getting a heart?

4. A girl tosses a coin 3 times and gets a tail each time. Do you think that the outcome of next toss will be a tail? Justify your answer.

5. I toss three coins together. The possible outcomes are no heads, 1 head, 2 heads and 3 heads. So, I say that probability of no heads is  $\frac{1}{4}$ . What is wrong with this conclusion?

6. A card is drawn at random from an ordinary pack of 52. What is the probability that the card is a black king?

7. One number is chosen at random from the whole numbers 1 to 100 inclusive. What is the probability that the number has two digits?

8. Two dice are thrown together. Find the probability that the sum of the digits showing on the top faces of the dice is less than 5.

9. Find the probability that the month of February may have 5 Sundays in a leap year.

10. A girl throws a die and squares the number that appears on it. A boy throws two dice once and computes the product of numbers appearing on the dice. Who has the better chance of getting the numbers 36. Give reason.

11. A coin is tossed 6 times and on each occasion a head is obtained. Can we say that the probability of getting a head is 1? Give reasons.

12. Three unbiased coins are tossed together. Find the probability of getting either all heads or all tails.

13. Two dice are thrown simultaneously. Find the probability that the difference of the numbers on the two dice is 2.

14. A coin is tossed two times. Find the probability of getting at most one head.

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

### B. Questions From CBSE Examination Papers

1. A bag contains 14 balls, of which  $x$  are white. If 6 more white balls are added to the bag, the probability of drawing a white ball is  $\frac{1}{2}$ . Find the value of  $x$ . **[2011 (T-II)]**

2. 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 is : **[2011 (T-II)]**

- (a) divisible by 5  
(b) a number which is a perfect square.

3. A die is thrown once. Find the probability of getting : **[2011 (T-II)]**

- (a) a prime number

- (b) a number less than 6

4. 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 and these are equally likely outcomes. What is the probability that it will point at **[2011 (T-II)]**

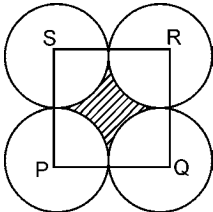
- (a) a prime number ?      (b) a factor of 8 ?

5. A card is drawn at random from a pack of well shuffled deck of playing cards. Find the probability that the card is : **[2011 (T-II)]**

- (a) a king or a jack  
(b) a card of spade or an ace

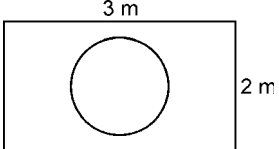
6. A bag contains 2 green, 3 red and 4 black balls. A ball is taken out of the bag at random. Find the probability that the selected ball is (a) not green (b) not black. **[2011 (T-II)]**
7. A bag contains cards numbered from 2 to 26. One card is drawn from the bag at random. Find the probability that it has a number divisible by both 2 and 3. **[2011 (T-II)]**
8. In a leap year, find the probability that there are 53 Tuesdays in the year. **[2011 (T-II)]**
9. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting a red face card. **[2011 (T-II)]**
10. Two dice are thrown simultaneously. Find the probability that the sum of the two numbers appearing on their tops is less than or equal to 10. **[2011 (T-II)]**
11. A card is drawn at random from a well shuffled pack of 52 cards. Find the probability that the card drawn is neither a red card nor a queen. **[2011 (T-II)]**
12. A bag contains 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag. Find the probability of getting neither a green ball nor a red ball. **[2011 (T-II)]**
13. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag. **[2011 (T-II)]**
14. Two dice are thrown once. Find the probability of obtaining : **[2011 (T-II)]**  
 (a) a total of 6 of numbers on both dice.  
 (b) the same number on both dice.
15. From a group of 2 boys and 2 girls, two children are selected at random. What is the sample space representing the event. Find the probability that one boy and one girl is selected. **[2011 (T-II)]**
16. A letter is chosen at random from the English alphabet. Find the probability that it is **[2011 (T-II)]**  
 (a) a vowel (b) a consonant
17. A fair coin is tossed thrice. Find the probability of getting. **[2011 (T-II)]**  
 (a) No heads (b) at least one head.
18. A box contains cards numbered from 1 to 17. If one card is drawn at random from the box, find the probability that it bears a prime number. **[2011 (T-II)]**
19. From a deck of playing cards all spades are removed, a card is drawn at random from the remaining cards. Find the probability that it is a : **[2011 (T-II)]**  
 (a) red card (b) black face card
20. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability that card drawn is : **[2011 (T-II)]**  
 (a) spade or an ace  
 (b) neither king nor queen
21. From a deck of playing cards all aces and clubs are removed, a card is drawn at random from the remaining cards. Find the probability that it is : **[2011 (T-II)]**  
 (a) a black face card. (b) a red card
22. A bag contains cards numbered 3 to 102, one card is drawn at random. Find the probability that it is : **[2011 (T-II)]**  
 (a) an even number  
 (b) a number divisible by 5
23. Two dice are thrown together. Determine the probability of 2 coming on the first die and multiple of 3 on other die. **[2011 (T-II)]**
24. Geeta and Sita are friends. What is the probability that both will have **[2011 (T-II)]**  
 (a) different birthdays ? (b) the same birthday ? (ignoring a leap year)
25. 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 : **[2011 (T-II)]**  
 (a) black or white (b) not black
26. Cards marked with numbers 3, 4, 5, ....., 50 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 drawn card is : **[2011 (T-II)]**  
 (a) divisible by 7.  
 (b) is a perfect square.
27. Cards, marked with numbers 5 to 50, are placed in a box and mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the taken card is :  
 (a) a prime number less than 10  
 (b) a number which is a perfect square. **[2008]**
28. Two dice are thrown simultaneously. Find the probability that the sum of the two numbers appearing on the top is less than or equal to 10. **[2008C]**
29. A die is thrown once. What is the probability of getting a number greater than 4? **[2010]**

A. Important Questions

- Two dice are thrown simultaneously. What is the probability that the sum of the numbers appearing on the dice is:
  - 7?
  - a prime number?
  - 1?
- A bag contains 5 red balls, 8 white balls, 4 green balls and 7 black balls. If one ball is drawn at random, find the probability that it is :
  - black
  - red
  - not green
- A dice has its six faces marked 0, 1, 1, 1, 6, 6. Two such dice are thrown together and the total score is recorded.
  - How many different score-s are available?
  - What is the probability of getting a total of 7?
- What is the probability that a number selected at random from the numbers 1, 2, 2, 3, 3, 2, 3, 4, 4, 4, 4 will be their average? **[HOTS]**
- In the figure, each circle touch other two circles externally. The circles are congruent. If a point is selected at random from the interior of square PQRS, find the probability that it will not be in the shaded region. **[HOTS]**

- A child's game has 8 triangles, of which 3 are blue and rest are red, and 10 squares of which 6 are blue and rest are red. One piece is lost at random. Find the probability that it is a : **[HOTS]**
  - triangle
  - square
  - square of blue colour.
- The number of matchsticks in 10 boxes is as follows :
 

48, 46, 46, 45, 48, 47, 46, 44, 49, 45

 one box is selected at random. Find the probability of the box containing : **[HOTS]**
  - 49 matchsticks
  - 46 matchsticks
  - more than 47 matchsticks.
- A box contains 5 red balls, 3 yellow balls, 3 white balls and 2 black balls. A ball is drawn from the box. Find the probability that it is:
  - a white ball

- a yellow or a black ball
  - a ball which is not red.
- A bag contains 24 balls of which  $x$  are red,  $2x$  are white and  $3x$  are blue. A ball is selected at random. What is the probability that it is :
    - not red?
    - white?
  - In my house the geyser is kept *on* 24 hours a day. Because of the thermostat setting, it automatically *turns off* for a total of  $4\frac{1}{2}$  hours a day. A red light is shown when the power is *on*. What is the probability that the light will be
    - off*
    - on* if it is looked at random
  - Suppose you drop a die at random on the rectangular region shown in figure. What is the probability that it will land inside the circle with diameter 1 m? **[HOTS]**

  - A lot consists of 48 mobile phones of which 42 are good, 3 have only minor defects and 3 have major defects. Saroj will buy a phone if it is good but the trader will buy a mobile if it has no major defect. One phone is selected at random from the lot. What is the probability that it is **[HOTS]**
    - acceptable to Saroj?
    - acceptable to the trader?
  - A die is thrown twice. What is the probability that
    - 5 will not come up either time?
    - 5 will come up at least once?
  - In a single throw of two dice, find the probability of getting
    - a total of 11
    - doublets
    - 6 as a product
  - Two dice are numbered 1, 2, 3, 4, 5, 6 and 1, 1, 2, 2, 3, 3 respectively. They are thrown and the sum of the numbers on them is noted. Find the probability getting each sum from 2 to 9 separately. **[HOTS]**

## B. Questions From CBSE Examination Papers

1. Three coins are tossed simultaneously. Find the probability of getting. [2011 (T-II)]  
(a) three heads (b) exactly 2 heads  
(c) at least 2 heads
2. A box contains 17 cards numbered 1, 2, 3, ..... 16, 17. A card is drawn at random from the box. Find the probability that the number on the drawn card is : [2011 (T-II)]  
(a) odd (b) even and prime (c) divisible by 3
3. King, queen and jack of hearts are removed from a pack of 52 playing cards and then the pack is well shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of [2011 (T-II)]  
(a) hearts (b) a queen (c) not a king
4. All the three face cards of spades are removed from a wellshuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting [2011 (T-II)]  
(a) a black face card (b) a queen  
(c) a black card
5. A bag contains cards numbered from 1 to 25, one card is drawn at random from the bag. Find the probability that this card has a number which is divisible by both 2 and 3. [2011 (T-II)]
6. Cards numbered from 1 to 64 are placed in a box. A card is drawn at random from the box. Find the probability that the card number on the card drawn is a perfect cube. [2011 (T-II)]
7. A box contains 20 balls, bearing numbers 1, 2, 3, 4, .....20. A ball is drawn at random from the box. What is the probability that the number on the drawn ball is : [2011 (T-II)]  
(a) an odd number (b) divisible for 2 or 3  
(c) prime number (d) not divisible by 10
8. Two dice are thrown at the same time. Write down all the possible outcomes. What is the probability that the two numbers appearing on the top of the dice [2011 (T-II)]  
(a) are prime ?  
(b) has the sum less than or equal to 12 ?
9. Two dice are thrown together. Find the probability that the product of the numbers on the top of the dice is : [2011 (T-II)]  
(a) 6 (b) 12 (c) 7
10. A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is : [2011 (T-II)]  
(a) white or blue (b) not white  
(c) neither white nor black
11. Two dice are thrown simultaneously. Find the probability of getting : [2011 (T-II)]  
(a) same number on both dice.  
(b) different numbers on both the dice.
12. 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 drawn card is : [2011 (T-II)]  
(a) divisible by 5  
(b) a number which is a perfect square.
13. Two customers Shyam and Ekta are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any day. What is the probability that both will visit the shop on [2011 (T-II)]  
(a) the same day ? (b) consecutive days ?
14. All the face cards of spades are removed from a pack of 52 playing cards and then the pack is shuffled well. A card is then drawn at random from the remaining pack of cards. Find the probability of getting (a) a black face card, (b) a queen. [2011 (T-II)]
15. An urn contains 8 red, 6 white and 4 black balls. A ball is drawn at random from the urn. Find the probability that the drawn ball is : [2011 (T-II)]  
(a) red or white  
(b) neither black nor white
16. A child has a die whose six faces show the letters as given below :  

A	B	C	D	E	A
---	---	---	---	---	---

  
The die is thrown at random once. What is the probability of getting (a) A (b) E. [2011 (T-II)]
17. From a well shuffled pack of 52 cards, two black kings and two black jacks are removed. From the remaining cards, a card is drawn at random. Find the probability that the drawn card is not a king. [2011 (T-II)]
18. 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 : **[2011 (T-II)]**
- (a) a two-digit number.  
 (b) a perfect square number.  
 (c) a number divisible by 5.
- 19.** A pair of dice is thrown once. **[2011 (T-II)]**
- (a) Write sample space for the experiment.  
 (b) Find the probability of getting an odd number on each dice.
- 20.** From a bag containing 5 red, 6 black and 7 yellow balls, a ball is drawn at random. Find the probability that it is : **[2011 (T-II)]**
- (a) not yellow ball (b) neither black nor red  
 (c) either black or yellow
- 21.** A bag contains 18 balls, out of which  $x$  balls are red. **[2011 (T-II)]**
- (a) If one ball is drawn at random from the bag, what is probability that it is a red ball.  
 (b) If 2 more red balls are put in the bag, the probability of drawing a red ball will be  $\frac{9}{8}$  times that of the probability of red ball coming in part (a). Find  $x$ .
- 22.** Three unbiased coins are tossed. What is the probability of getting **[2011 (T-II)]**
- (a) two heads  
 (b) at least two heads  
 (c) at most two heads
- 23.** From a well shuffled pack of 52 playing cards, black jacks, black kings and black aces are removed. A card is then drawn at random from the remaining pack. Find the probability of getting : **[2011 (T-II)]**
- (a) a red card (b) not a diamond card
- 24.** A box contains 12 balls out of which  $x$  are black. If one ball is drawn at random from the box, what is the probability that it will be a black ball ? If 6 more black balls are put in the box, the probability of drawing a black ball now is double of what it was before. Find  $x$ . **[2011 (T-II)]**
- 25.** A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is : **[2006]**
- (a) white or blue  
 (b) red or black  
 (c) not white  
 (d) neither white nor black.
- 26.** A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is : **[2006]**
- (a) a king or a jack (b) a non-ace  
 (c) a red card  
 (d) neither a king nor a queen.
- 27.** Find the probability that a number selected at random from the number 1, 2, 3, ..., 35 is a **[2006C]**
- (a) prime number (b) multiple of 7  
 (c) multiple of 3 or 5.
- 28.** 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 : **[2006C]**
- (a) a black queen (b) a red card  
 (c) a black jack  
 (d) a picture card (jacks, queens and kings are picture cards)
- 29.** A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag. **[2007]**
- 30.** A box contains 5 red balls 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is : **[2007]**
- (a) white  
 (b) neither red nor white
- 31.** 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 **[2007]**
- (a) a black face card (b) a queen  
 (c) a black card.
- 32.** A box has cards numbered 14 to 99. Cards are mixed thoroughly and a card is drawn from the bag at random. Find the probability that the number on the card, drawn from the box is : **[2009]**
- (a) an odd number  
 (b) a perfect square number  
 (c) a number divisible by 7.



## B. FORMATIVE ASSESSMENT

### Activity

**Objective :** To find the probability of an outcome and compare it with its theoretical probability.

**Materials Required :** Geometry box, thick white card sheet, sketch pens.

**Procedure :**

1. On a piece of thick card sheet, draw a circle of radius 5 cm. Now using your compasses, divide the circle into 8 equal parts by marking off angles of  $45^\circ$  at the centre of the circle. Mark points A, B, C, ..., H on the circle and join AB, BC, CD, ..., GH to get a regular octagon.

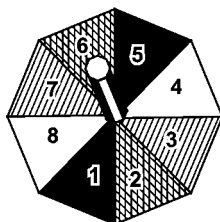


Figure 1

2. Cut off the octagon ABCDEFGH. Insert a small piece of pencil stub to make a top as shown in figure 1. Number the triangles 1, 2, 3, ..., 8. Number the triangles 1, 2, 3, ..., 8.
3. Spin the top 40 times and record in table 1, the frequency with which each of the numbers 1 to 8 touches the table or floor.
4. Calculate the experimental probability of obtaining each number.
5. Calculate the theoretical probability of obtaining each score.
6. Draw a combined bar graph to compare the probabilities obtained in steps 4 and 5 above. Write your observations.

**Table 1**

Number	Tally-marks	Frequency
1		3
2	✓	4
3	/	8
4	✓	5
5		8
6	✓	2
7	/	5
8		5
Total		40

**Table 2**

Number	Experimental Probability	Theoretical Probability
1	$\frac{3}{40}$	$\frac{5}{40}$
2	$\frac{4}{40}$	$\frac{5}{40}$
3	$\frac{8}{40}$	$\frac{5}{40}$
4	$\frac{5}{40}$	$\frac{5}{40}$
5	$\frac{8}{40}$	$\frac{5}{40}$
6	$\frac{2}{40}$	$\frac{5}{40}$
7	$\frac{5}{40}$	$\frac{5}{40}$
8	$\frac{5}{40}$	$\frac{5}{40}$

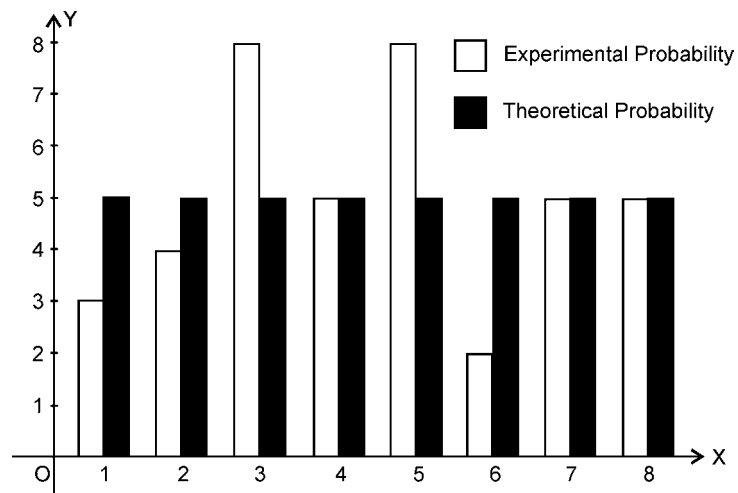


Figure 2

**Observations :** The experimental and theoretical probabilities are equal in three out of eight cases as seen in table 2 and figure 2. Thus, there is a wide difference between the experimental and theoretical probability of an event in the activity performed above.

**Exercise 15.1****Question 1:**

Complete the following statements:

- (i) Probability of an event  $E$  + Probability of the event 'not  $E$ ' = \_\_\_\_\_.
- (ii) The probability of an event that cannot happen is \_\_\_\_\_. Such an event is called \_\_\_\_\_.
- (iii) The probability of an event that is certain to happen is \_\_\_\_\_. Such an event is called \_\_\_\_\_.
- (iv) The sum of the probabilities of all the elementary events of an experiment is \_\_\_\_\_.
- (v) The probability of an event is greater than or equal to \_\_\_\_\_ and less than or equal to \_\_\_\_\_.

Answer:

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

**Question 2:**

Which of the following experiments have equally likely outcomes? Explain.

- (i) A driver attempts to start a car. The car starts or does not start.
- (ii) A player attempts to shoot a basketball. She/he shoots or misses the shot.
- (iii) A trial is made to answer a true-false question. The answer is right or wrong.
- (iv) A baby is born. It is a boy or a girl.

Answer:

- (i) It is not an equally likely event, as it depends on various factors such as whether the car will start or not. And factors for both the conditions are not the same.
- (ii) It is not an equally likely event, as it depends on the player's ability and there is no information given about that.



(iii) It is an equally likely event.

(iv) It is an equally likely event.

**Question 3:**

Why is tossing a coin considered to be a fair way of deciding which team should get the ball at the beginning of a football game?

Answer:

When we toss a coin, the possible outcomes are only two, head or tail, which are equally likely outcomes. Therefore, the result of an individual toss is completely unpredictable.

**Question 4:**

Which of the following cannot be the probability of an event?

(A)  $\frac{2}{3}$  (B)  $-1.5$  (C)  $15\%$  (D)  $0.7$

Answer:

Probability of an event (E) is always greater than or equal to 0. Also, it is always less than or equal to one. This implies that the probability of an event cannot be negative or greater than 1. Therefore, out of these alternatives,  $-1.5$  cannot be a probability of an event.

Hence, (B)

**Question 5:**

If  $P(E) = 0.05$ , what is the probability of 'not E'?

Answer:

We know that,

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

$$\begin{aligned} P(\bar{E}) &= 1 - 0.05 \\ &= 0.95 \end{aligned}$$

Therefore, the probability of 'not E' is 0.95.

**Question 6:**

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?

Answer:

(i) The bag contains lemon flavoured candies only. It does not contain any orange flavoured candies. This implies that every time, she will take out only lemon flavoured candies. Therefore, event that Malini will take out an orange flavoured candy is an impossible event.

Hence,  $P(\text{an orange flavoured candy}) = 0$

(ii) As the bag has lemon flavoured candies, Malini will take out only lemon flavoured candies. Therefore, event that Malini will take out a lemon flavoured candy is a sure event.

$P(\text{a lemon flavoured candy}) = 1$

**Question 7:**

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?

Answer:

Probability that two students are not having same birthday  $P(\bar{E}) = 0.992$

Probability that two students are having same birthday  $P(E) = 1 - P(\bar{E})$

$= 1 - 0.992$

$= 0.008$

**Question 8:**

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?

Answer:

(i) Total number of balls in the bag = 8



$$\begin{aligned}\text{Probability of getting a red ball} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{3}{8}\end{aligned}$$

(ii) Probability of not getting red ball  
= 1 – Probability of getting a red ball

$$\begin{aligned}&= 1 - \frac{3}{8} \\ &= \frac{5}{8}\end{aligned}$$

**Question 9:**

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?

Answer:

$$\begin{aligned}\text{Total number of marbles} &= 5 + 8 + 4 \\ &= 17\end{aligned}$$

(i) Number of red marbles = 5

$$\begin{aligned}\text{Probability of getting a red marble} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{5}{17}\end{aligned}$$

(ii) Number of white marbles = 8

$$\begin{aligned}\text{Probability of getting a white marble} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{8}{17}\end{aligned}$$

(iii) Number of green marbles = 4



$$\begin{aligned}\text{Probability of getting a green marble} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{4}{17}\end{aligned}$$

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

**Question 10:**

A piggy bank contains hundred 50 p 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, what is the probability that the coin

(i) Will be a 50 p coin?

(ii) Will not be a Rs.5 coin?

Answer:

$$\begin{aligned}\text{Total number of coins in a piggy bank} &= 100 + 50 + 20 + 10 \\ &= 180\end{aligned}$$

(i) Number of 50 p coins = 100

$$\begin{aligned}\text{Probability of getting a 50 p coin} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{100}{180} = \frac{5}{9}\end{aligned}$$

(ii) Number of Rs 5 coins = 10

$$\begin{aligned}\text{Probability of getting a Rs 5 coin} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{10}{180} = \frac{1}{18}\end{aligned}$$

$$\begin{aligned}\text{Probability of not getting a Rs 5 coin} &= 1 - \frac{1}{18}\end{aligned}$$

$$= \frac{17}{18}$$

**Question 11:**

Gopi buys a fish from a shop for his aquarium. The shopkeeper takes out one fish at random from a tank containing 5 male fish and 8 female fish (see the given figure). What is the probability that the fish taken out is a male fish?



Answer:

Total number of fishes in a tank

= Number of male fishes + Number of female fishes

= 5 + 8 = 13

$$\begin{aligned}\text{Probability of getting a male fish} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{5}{13}\end{aligned}$$

**Question 12:**

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 (see the given figure), and these are equally likely outcomes. What is the probability that it will point at

(i) 8?

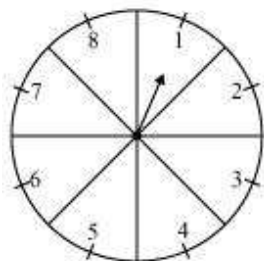
(ii) an odd number?

(iii) a number greater than 2?





(iv) a number less than 9?



Answer:

Total number of possible outcomes = 8

$$\text{Probability of getting 8} = \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} = \frac{1}{8}$$

(i)

(ii) Total number of odd numbers on spinner = 4

$$\begin{aligned} \text{Probability of getting an odd number} &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{4}{8} = \frac{1}{2} \end{aligned}$$

(iii) The numbers greater than 2 are 3, 4, 5, 6, 7, and 8.

Therefore, total numbers greater than 2 = 6

Probability of getting a number greater than 2

$$= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} = \frac{6}{8} = \frac{3}{4}$$

(iv) The numbers less than 9 are 1, 2, 3, 4, 6, 7, and 8.

Therefore, total numbers less than 9 = 8

$$\text{Probability of getting a number less than 9} = \frac{8}{8} = 1$$

**Question 13:**

A die is thrown once. Find the probability of getting

(i) a prime number;



(ii) a number lying between 2 and 6;

(iii) an odd number.

Answer:

The possible outcomes when a dice is thrown = {1, 2, 3, 4, 5, 6}

Number of possible outcomes of a dice = 6

(i) Prime numbers on a dice are 2, 3, and 5.

Total prime numbers on a dice = 3

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

(ii) Numbers lying between 2 and 6 = 3, 4, 5

Total numbers lying between 2 and 6 = 3

Probability of getting a number lying between 2 and 6 =  $\frac{3}{6} = \frac{1}{2}$

(iii) Odd numbers on a dice = 1, 3, and 5

Total odd numbers on a dice = 3

Probability of getting an odd number =  $\frac{3}{6} = \frac{1}{2}$

**Question 14:**

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

(i) a king of red colour

(ii) a face card

(iii) a red face card

(iv) the jack of hearts

(v) a spade

(vi) the queen of diamonds

Answer:

Total number of cards in a well-shuffled deck = 52



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

$$\begin{aligned} P(\text{getting a king of red colour}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{2}{52} = \frac{1}{26} \end{aligned}$$

(ii) Total number of face cards = 12

$$\begin{aligned} P(\text{getting a face card}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{12}{52} = \frac{3}{13} \end{aligned}$$

(iii) Total number of red face cards = 6

$$\begin{aligned} P(\text{getting a red face card}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{6}{52} = \frac{3}{26} \end{aligned}$$

(iv) Total number of Jack of hearts = 1

$$\begin{aligned} P(\text{getting a Jack of hearts}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{1}{52} \end{aligned}$$

(v) Total number of spade cards = 13

$$\begin{aligned} P(\text{getting a spade card}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{13}{52} = \frac{1}{4} \end{aligned}$$

(vi) Total number of queen of diamonds = 1

$$P(\text{getting a queen of diamond}) = \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}}$$



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

**Question 15:**

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?

Answer:

(i) Total number of cards = 5

Total number of queens = 1

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

(ii) When the queen is drawn and put aside, the total number of remaining cards will be 4.

(a) Total number of aces = 1

$$P(\text{getting an ace}) = \frac{1}{4}$$

(b) As queen is already drawn, therefore, the number of queens will be 0.

$$P(\text{getting a queen}) = \frac{0}{4} = 0$$

**Question 16:**

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.

Answer:

$$\text{Total number of pens} = 12 + 132 = 144$$

$$\text{Total number of good pens} = 132$$

$$\begin{aligned} P(\text{getting a good pen}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{132}{144} = \frac{11}{12} \end{aligned}$$

**Question 17:**

(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?

Answer:

$$(i) \text{ Total number of bulbs} = 20$$

$$\text{Total number of defective bulbs} = 4$$

$$\begin{aligned} P(\text{getting a defective bulb}) &= \frac{\text{Number of favourable outcomes}}{\text{Number of total possible outcomes}} \\ &= \frac{4}{20} = \frac{1}{5} \end{aligned}$$

$$(ii) \text{ Remaining total number of bulbs} = 19$$

$$\text{Remaining total number of non-defective bulbs} = 16 - 1 = 15$$

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

**Question 18:**

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.

Answer:

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. Therefore, 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 that are between 1 and 90 and divisible by 5 are 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, and 90. Therefore, total numbers divisible by 5 = 18

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

**Question 19:**

A child has a die whose six faces shows the letters as given below:



The die is thrown once. What is the probability of getting (i) A? (ii) D?

Answer:

Total number of possible outcomes on the dice = 6

(i) Total number of faces having A on it = 2



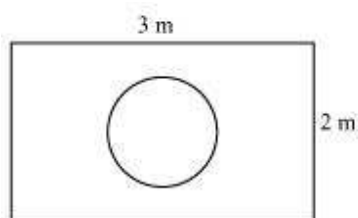
$$P(\text{getting A}) = \frac{2}{6} = \frac{1}{3}$$

(ii) Total number of faces having D on it = 1

$$P(\text{getting D}) = \frac{1}{6}$$

**Question 20:**

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?



Answer:

$$\text{Area of rectangle} = l \times b = 3 \times 2 = 6 \text{ m}^2$$

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

$$P(\text{die will land inside the circle}) = \frac{\frac{\pi}{4}}{6} = \frac{\pi}{24}$$

**Question 21:**

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?

Answer:

Total number of pens = 144

Total number of defective pens = 20



Total number of good pens =  $144 - 20 = 124$

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

P (Nuri buys a pen)  $= \frac{31}{36}$

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

### Question 22:

Two dice, one blue and one grey, are thrown at the same time.

(i) Write down all the possible outcomes and complete the following table:

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

(ii) 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?

Answer:

(i) It can be observed that,

To get the sum as 2, possible outcomes = (1, 1)

To get the sum as 3, possible outcomes = (2, 1) and (1, 2)

To get the sum as 4, possible outcomes = (3, 1), (1, 3), (2, 2)

To get the sum as 5, possible outcomes = (4, 1), (1, 4), (2, 3), (3, 2)

To get the sum as 6, possible outcomes = (5, 1), (1, 5), (2, 4), (4, 2), (3, 3)





To get the sum as 7, possible outcomes = (6, 1), (1, 6), (2, 5), (5, 2), (3, 4), (4, 3)

To get the sum as 8, possible outcomes = (6, 2), (2, 6), (3, 5), (5, 3), (4, 4)

To get the sum as 9, possible outcomes = (3, 6), (6, 3), (4, 5), (5, 4)

To get the sum as 10, possible outcomes = (4, 6), (6, 4), (5, 5)

To get the sum as 11, possible outcomes = (5, 6), (6, 5)

To get the sum as 12, possible outcomes = (6, 6)

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

(ii) Probability of each of these sums will not be  $\frac{1}{11}$  as these sums are not equally likely

**Question 23:**

A game consists of tossing a one rupee coin 3 times and noting its outcome each time. Hanif wins if all the tosses give the same result i.e., three heads or three tails, and loses otherwise. Calculate the probability that Hanif will lose the game.

Answer:

The possible outcomes are

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

Number of total possible outcomes = 8

Number of favourable outcomes = 2 {i.e., TTT and HHH}

$$P(\text{Hanif will win the game}) = \frac{2}{8} = \frac{1}{4}$$



$$P(\text{Hanif will lose the game}) = 1 - \frac{1}{4} = \frac{3}{4}$$

**Question 24:**

A die is thrown twice. What is the probability that

(i) 5 will not come up either time?

(ii) 5 will come up at least once?

[**Hint:** Throwing a die twice and throwing two dice simultaneously are treated as the same experiment].

Answer:

Total number of outcomes =  $6 \times 6$

= 36

(i) Total number of outcomes when 5 comes up on either time are (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (1, 5), (2, 5), (3, 5), (4, 5), (6, 5)

Hence, total number of favourable cases = 11

$$P(\text{5 will come up either time}) = \frac{11}{36}$$

$$P(\text{5 will not come up either time}) = 1 - \frac{11}{36} = \frac{25}{36}$$

(ii) Total number of cases, when 5 can come at least once = 11

$$P(\text{5 will come at least once}) = \frac{11}{36}$$

**Question 25:**

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  $\frac{1}{2}$ .

Answer:

(i) Incorrect

When two coins are tossed, the possible outcomes are (H, H), (H, T), (T, H), and (T, T). It can be observed that there can be one of each in two possible ways – (H, T), (T, H).

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

It can be observed that for each outcome, the probability is not  $\frac{1}{3}$ .

(ii) Correct

When a dice is thrown, the possible outcomes are 1, 2, 3, 4, 5, and 6. Out of these, 1, 3, 5 are odd and 2, 4, 6 are even numbers.

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

**Exercise 15.2****Question 1:**

Two customers Shyam and Ekta are visiting a particular shop in the same week (Tuesday 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) consecutive days? (iii) different days?

Answer:

There are a total of 5 days. Shyam can go to the shop in 5 ways and Ekta can go to the shop in 5 ways.

Therefore, total number of outcomes =  $5 \times 5 = 25$

(i) They can reach on the same day in 5 ways.

i.e., (t, t), (w, w), (th, th), (f, f), (s, s)

$$P(\text{both will reach on same day}) = \frac{5}{25} = \frac{1}{5}$$

(ii) They can reach on consecutive days in these 8 ways - (t, w), (w, th), (th, f), (f, s), (w, t), (th, w), (f, th), (s, f).

$$\text{Therefore, } P(\text{both will reach on consecutive days}) = \frac{8}{25}$$

$$(iii) P(\text{both will reach on same day}) = \frac{1}{5} \text{ [(From (i))]$$

$$P(\text{both will reach on different days}) = 1 - \frac{1}{5} = \frac{4}{5}$$

**Question 2:**

A die is numbered in such a way that its faces show the number 1, 2, 2, 3, 3, 6. It is thrown two times and the total score in two throws is noted. Complete the following table which gives a few values of the total score on the two throws:



		Number in first throw					
		1	2	2	3	3	6
Number in second throw	1	1	2	2	3	3	6
	2	3	4	4	5	5	8
	2					5	
	3						
	3			5			9
	6	7	8	8	9	9	12

What is the probability that the total score is

(i) even? (ii) 6? (iii) at least 6?

Answer:

+	1 2 2 3 3 6
1	2 3 3 4 4 7
2	3 4 4 5 5 8
2	3 4 4 5 5 8
3	4 5 5 6 6 9
3	4 5 5 6 6 9
6	7 8 8 9 9 12

Total number of possible outcomes when two dice are thrown =  $6 \times 6 = 36$

(i) Total times when the sum is even = 18

$$P(\text{getting an even number}) = \frac{18}{36} = \frac{1}{2}$$

(ii) Total times when the sum is 6 = 4

$$P(\text{getting sum as 6}) = \frac{4}{36} = \frac{1}{9}$$

(iii) Total times when the sum is at least 6 (i.e., greater than 5) = 15



$$P(\text{getting sum at least } 6) = \frac{15}{36} = \frac{5}{12}$$

**Question 3:**

A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is *double* that of a red ball, determine the number of blue balls in the bag.

Answer:

Let the number of blue balls be  $x$ .

Number of red balls = 5

Total number of balls =  $x + 5$

$$P(\text{getting a red ball}) = \frac{5}{x+5}$$

$$P(\text{getting a blue ball}) = \frac{x}{x+5}$$

Given that,

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

$$10(x+5) = x^2 + 5x$$

$$x^2 - 5x - 50 = 0$$

$$x^2 - 10x + 5x - 50 = 0$$

$$x(x-10) + 5(x-10) = 0$$

$$(x-10)(x+5) = 0$$

$$\text{Either } x-10 = 0 \text{ or } x+5 = 0$$

$$x = 10 \text{ or } x = -5$$

However, the number of balls cannot be negative.

Hence, number of blue balls = 10

**Question 4:**



A box contains 12 balls out of which  $x$  are black. If one ball is drawn at random from the box, what is the probability that it will be a black ball?

If 6 more black balls are put in the box, the probability of drawing a black ball is now double of what it was before. Find  $x$ .

Answer:

Total number of balls = 12

Total number of black balls =  $x$

$$P(\text{getting a black ball}) = \frac{x}{12}$$

If 6 more black balls are put in the box, then

Total number of balls =  $12 + 6 = 18$

Total number of black balls =  $x + 6$

$$P(\text{getting a black ball now}) = \frac{x+6}{18}$$

According to the condition given in the question,

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

$$3x = x + 6$$

$$2x = 6$$

$$x = 3$$

**Question 5:**

A jar contains 24 marbles, some are green and others are blue. If a marble is drawn

at random from the jar, the probability that it is green is  $\frac{2}{3}$ . Find the number of blue balls in the jar.

Answer:

Total number of marbles = 24

Let the total number of green marbles be  $x$ .



Then, total number of blue marbles =  $24 - x$

$$P(\text{getting a given marble}) = \frac{x}{24}$$

According to the condition given in the question,

$$\frac{x}{24} = \frac{2}{3}$$
$$x = 16$$

Therefore, total number of green marbles in the jar = 16

Hence, total number of blue marbles =  $24 - x = 24 - 16 = 8$