Probability

Selected NCERT Questions

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

Sol. As we know that,

$$P(E) + P(\text{not } E) = 1$$

$$P(\text{not } E) = 1 - P(E) = 1 - 0.05 = 0.95$$

2. 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?

Sol. **(*i*)** As the bag contains only lemon flavoured candies. So, the event related to the experiment of taking out an orange flavoured candy is an impossible event. So, its probability is 0.

(*ii*) As the bag contains only lemon flavoured candies. So, the event related to the experiment of taking out lemon flavoured candies is sure event. So, its probability is 1.

3. 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.

Sol. Here, total number of pens = 132 + 12 = 144

$\therefore$ Total number of elementary outcomes = 144

Now, favourable number of elementary events = 132

$\therefore$ Probability that a pen taken out is good one $= \frac{132}{144} = \frac{11}{12}$.

4. 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. **[*CBSE* 2019(30/1/2)]**

Sol. We have, the total number of possible outcomes associated with the random experiment of throwing a die is 6 (*i.e.*, 1, 2, 3, 4, 5, 6).

(*i*) Let E denotes the event of getting a prime number.

So, favourable number of outcomes = 3 (*i.e.*, 2, 3, 5)

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

(*ii*) Let E be the event of getting a number lying between 2 and 6.

$\therefore$ Favourable number of elementary events (outcomes) = 3 (*i.e.*, 3, 4, 5)

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

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

$\therefore$ Favourable number of elementary events = 3 (*i.e.*, 1, 3, 5)

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

5. 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?

Sol. Here, the total number of possible outcomes = 5.

(*i*) Since, there is only one queen.

$\therefore$ Favourable number of elementary events = 1

$\therefore$ Probability of getting the card of queen = $\frac{1}{5}$

(*ii*) Now, the total number of possible outcomes = 4.

(*a*) Since, there is only one ace.

$\therefore$ Favourable number of elementary events = 1

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

(*b*) Since, there is no queen (as queen is put aside).

$\therefore$ Favourable number of elementary events = 0

$\therefore$ Probability of getting a queen = $\frac{0}{4} = 0$.

6. 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.**

Sol. Here, total number of possible outcomes = 52

(*i*) As we know that there are two suits of red cards, *i.e.,* diamond and heart and each suit contains one king.

$\therefore$ Favourable number of outcomes = 2

$\therefore$ Probability of getting a king of red colour = $\frac{2}{52} = \frac{1}{26}$

(*ii*) As we know that kings, queens and jacks are called face cards *i.e.*, there are 12 face cards.

$\therefore$ Favourable number of elementary events = 12

$\therefore$ Probability of getting a face card = $\frac{12}{52} = \frac{3}{13}$

(*iii*) As we know there are two suits of red cards, *i.e.,* diamond and heart and each suit contains 3 face cards.

$\therefore$ Favourable number of elementary events = $2 \times 3 = 6$

$\therefore$ Probability of getting red face card = $\frac{6}{52} = \frac{3}{26}$

(*iv*) Since, there is only one jack of hearts.

$\therefore$ Favourable number of elementary events = 1

$\therefore$ Probability of getting the jack of heart = $\frac{1}{52}$.

(*v*) Since, there are 13 cards of spade.

$\therefore$ Favourable number of elementary events = 13

$\therefore$ Probability of getting a spade = $\frac{13}{52} = \frac{1}{4}$.

(*vi*) Since, there is only one queen of diamonds.

$\therefore$ Favourable number of outcomes (elementary events) = 1

$\therefore$ Probability of getting a queen of diamonds = $\frac{1}{52}$.

7. 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 Fig. 14.1), 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?

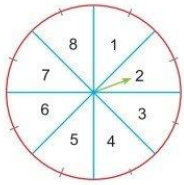


Fig. 14.1

Sol. Here, total number of elementary events (possible outcomes) = 8

(*i*) We have only one '8' on the spining plant.

$\therefore$ Favourable number of outcomes = 1

Hence, the probability that arrow points at 8 = $\frac{1}{8}$.

(*ii*) We have four odd points (*i.e.*, 1, 3, 5 and 7)

$\therefore$ Favourable number of outcomes = 4

Hence, probability that arrow points at an odd number = $\frac{4}{8} = \frac{1}{2}$.

(*iii*) We have 6 numbers greater than 2, *i.e.*, 3, 4, 5, 6, 7 and 8.

Therefore, favourable number of outcomes = 6

Probability that arrow points at a number greater than 2 = $\frac{6}{8} = \frac{3}{4}$.

(*iv*) We have 8 numbers less than 9, *i.e*, 1, 2, 3, ... 8.

$\therefore$ Favourable number of outcomes = 8

Hence, probability that arrow points at a number less than 9 = $\frac{8}{8} = 1$.

8. 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?

Sol. The experiment "tossing a coin" have equally likely outcomes head and tail. So, the result of a coin toss is completely unpredictable.

9. 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. What is the probability that the fish taken out is a male fish?

Sol. Let S be sample space and E, getting male fish, be event corresponding to given experiment.

From equation

$n(S) = 5 + 8 = 13$ (number of fish)

$n(E) = 5$ (number of male fish)

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{5}{13}$

10. A piggy bank contains hundred 50 P coins, fifty ₹1 coins, twenty ₹2 coins and ten ₹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 ₹5 coin?

Sol. Let S be the sample space of corresponding experiment.

Here, $n(S)$ = Total number of coins

$= 100 + 50 + 20 + 10 = 180$

(*i*) Let E be the event of falling a coin of 50 P

Here, $n(E)$ = Number of 50 P coins = 100

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{100}{180} = \frac{5}{9}$

(*ii*) Let E be the event that falling coin is not a ₹5 coin

Here, $n(E)$ = Number of coins except ₹5 coin = 100 + 50 + 20

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{170}{180} = \frac{17}{18}$

11. 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?

[*Competency Based Question*]

Sol. Let E be the event of having the same birthday.

Therefore, $\overline{E}$ is the event of not having the same birthday.

i.e., $P(\overline{E}) = 0.992$ (Given)

Now, we have

$$P(E) + P(\overline{E}) = 1 \Rightarrow P(E) = 1 - P(\overline{E}) = 1 - 0.992 = 0.008.$$

Multiple Choice Questions

Choose and write the correct option in the following questions.

1. A bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the ball drawn is not black, is **[*CBSE* 2020 (30/4/1)]**

(*a*) $\frac{1}{3}$ (*b*) $\frac{9}{15}$ (*c*) $\frac{5}{10}$ (*d*) $\frac{2}{3}$

2. If $P(A)$ denotes the probability of an event A, then **[*NCERT Exemplar*]**

(*a*) $P(A) < 0$ (*b*) $P(A) > 1$ (*c*) $0 \le P(A) \le 1$ (*d*) $-1 \le P(A) \le 1$

3. Which of the following cannot be the probability of an event? **[*NCERT Exemplar*]**

(*a*) $\frac{1}{3}$ (*b*) 0.1 (*c*) 3% (*d*) $\frac{17}{16}$

4. Kirti has a box containing four cards labelled *A*, *B*, *C* and *D*. She randomly picks a card from the box, records the label on the card and put it back in the box. She repeats this experiment 80 times and records her observation in the table shown below.

Card *A*	11
Card *B*	16
Card *C*	25
Card *D*	28

Which of the following shows the empirical probability and theoretical probability of picking Card *C* the next time?

(*a*) Empirical probability $= \frac{5}{11}$
Theoretical probability $= \frac{1}{2}$

(*b*) Empirical probability $= \frac{5}{11}$
Theoretical probability $= \frac{1}{4}$

(*c*) Empirical probability $= \frac{5}{16}$
Theoretical probability $= \frac{1}{2}$

(*d*) Empirical probability $= \frac{5}{16}$
Theoretical probability $= \frac{1}{4}$

5. Romy is blindfolded and asked to pick one ball from each of the jars.

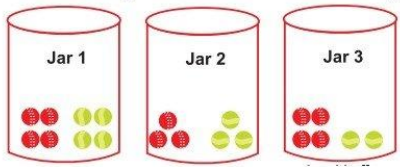


Fig. 14.2

The chance of Romy picking a red ball is same in [*CBSE Question Bank*]

(*a*) jars 2 and 3 (*b*) jars 1 and 3 (*c*) jars 1 and 2 (*d*) All the three jars

6. If the probability of an event is p, the probability of its complementary event will be [*NCERT Exemplar*]

(*a*) $p - 1$ (*b*) $1 - p$ (*c*) $1 - \frac{1}{p}$ (*d*) p

7. A card is selected from a deck of 52 cards. The probability of being a red face card is [*NCERT Exemplar*]

(*a*) $\frac{3}{26}$ (*b*) $\frac{3}{13}$ (*c*) $\frac{2}{13}$ (*d*) $\frac{1}{2}$

8. If a card is drawn from a deck of cards, what is the probability of a card drawn to be a red or a black card and what can we say about that event?

(*a*) 0 and it is a sure event. (*b*) 1 and it is a sure event.

(*c*) 0 and it is an impossible event. (*d*) 1 and it is an impossible event.

9. To win a prize in a game, you need to first choose one of the 4 doors, 1, 2, 3, 4 and then need to choose one of the three boxes *A*, *B*, *C* and then need to choose between two colours red and green. How many of the possible outcomes of this game include selecting box *A* and red colour?

(*a*) 2 (*b*) 4 (*c*) 8 (*d*) 12

10. A card is drawn from a deck of 52 cards. The event *E* is that card is not an ace of hearts. The number of outcomes favourable to *E* is [*NCERT Exemplar*]

(*a*) 4 (*b*) 13 (*c*) 48 (*d*) 51

11. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6,000 tickets are sold, how many tickets has she bought? [*NCERT Exemplar*]

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

12. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is

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

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

(*a*) $\frac{7}{9}$ (*b*) $\frac{2}{9}$ (*c*) $\frac{4}{9}$ (*d*) none of these

14. If a number x is chosen from the numbers 1, 2, 3 and a number y is selected from the numbers 1, 4, 9. Then $P(xy < 9)$ is

(*a*) $\frac{3}{9}$ (*b*) $\frac{4}{9}$ (*c*) $\frac{1}{9}$ (*d*) $\frac{5}{9}$

15. A box has 10 equal size cards. Of the 10 cards, 4 are blue, 3 are green, 2 are yellow and 1 is red. If a card is randomly drawn from the box, which is the colour that the card is most likely to have?

(*a*) red (*b*) green (*c*) blue (*d*) yellow

16. Look at the numbers shown below.

(*i*)	–0.5	(*ii*)	0.00001	(*iii*)	$\frac{1}{2}$
(*iv*)	1	(*v*)	1.00001	(*vi*)	99%

Which of the above numbers represent probabilities of events? **[*CBSE Question Bank*]**

(*a*) only (*i*) and (*iii*) (*b*) only (*i*), (*ii*), (*iii*) and (*iv*)

(*c*) only (*ii*), (*iii*), (*iv*) and (*v*) (*d*) only (*ii*), (*iii*), (*iv*) and (*vi*)

17. Two identical fair dice have numbers 1 to 6 written on their faces. Both are tossed simultaneously. What is the probability that the product of the numbers that turn up is 12? [*CBSE Question Bank*]

(*a*) $\frac{1}{36}$ (*b*) $\frac{1}{9}$ (*c*) $\frac{1}{6}$ (*d*) $\frac{1}{3}$

18. Shown below is a board divided into 6 identical sectors, with a pointer that can be spun on it.

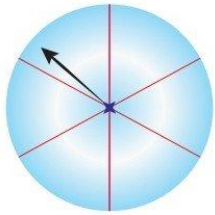


Fig. 14.3

When the pointer is spun, it spins for some time and comes to a stop on a sector. The chances of it stopping on any sector are equal. Arif wants to colour some sectors green. How many sectors should he colour green so that the probability of the pointer stopping on a green sector is 1/3? [*Competency Based Question*]

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

Answers

1. (*d*)	**2.** (*c*)	**3.** (*d*)	**4.** (*d*)	**5.** (*c*)	**6.** (*b*)	**7.** (*a*)
8. (*b*)	**9.** (*b*)	**10.** (*d*)	**11.** (*c*)	**12.** (*b*)	**13.** (*a*)	**14.** (*d*)
15. (*c*)	**16.** (*d*)	**17.** (*b*)	**18.** (*b*)			

Very Short Answer Questions

Each of the following questions are of* 1 *mark.

1. A die is thrown once. What is the probability of getting a prime number? [*CBSE* 2020(30/2/1)]

Sol. When a die is thrown once total number of possible outcomes = 6

We have prime numbers on a die = {2, 3, 5}

∴ Number of favourable outcomes = 3

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

2. Find the probability of getting a black queen when a card is drawn at random from a well-shuffled pack of 52 cards. [*CBSE Sample Paper* 2021]

Sol. Probability of getting a black queen = $\frac{2}{52} = \frac{1}{26}$ **1**

[*Marking Scheme CBSE Sample Paper* 2021]

3. The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow? [*CBSE* 2020 (30/3/1)]

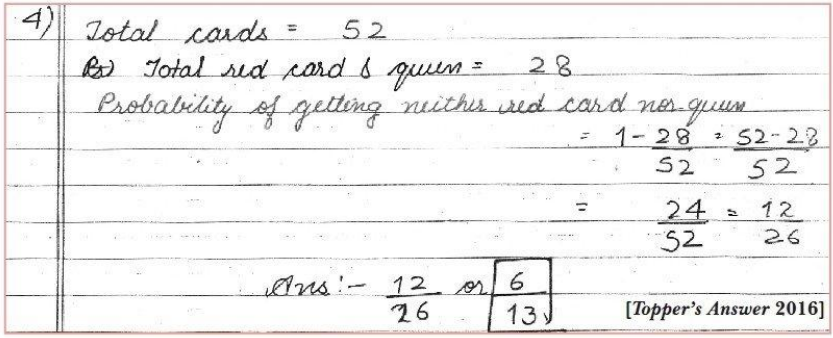
Sol. Given probability that it will rain tomorrow is 0.85 *i.e.*, $P = 0.85$

∴ Probability that it will not rain tomorrow $= 1 - P$

$= 1 - 0.85 = 0.15$

4. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting neither a red card nor a queen. **[*CBSE (AI)* 2016 (30/2)]**

Sol.



[*Topper's Answer* 2016]

5. 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7. **[*CBSE (F)* 2016]**

Sol. $n(S) = 20$, multiples of 3 or 7, A: {3, 6, 9, 12, 15, 18, 7, 14}, $n(A) = 8$

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

6. A number is chosen at random from the numbers −3,−2,−1,0,1,2,3. What will be the probability that square of this number is less than or equal to 1 ? **[*CBSE Delhi* 2017]**

Sol. Favourable outcomes are –1, 0, 1 = 3

Total outcomes = 7

$\therefore$ Required probability $= \frac{3}{7}$

7. Cards marked with number 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect square number. **[*CBSE Delhi* 2016]**

Sol. Possible outcomes are 4, 9, 16, 25, 36, 49, *i.e.*, 6.

$\therefore$ P (perfect square number) $= \frac{6}{48}$ or $\frac{1}{8}$

8. Two dice are thrown simultaneously. What is the probability that the sum of the two numbers appearing on the top is 13? **[*CBSE* 2020 (30/4/1)]**

Sol. When two dice are thrown simultaneously, the maximum sum of the numbers on both the dice is 12, *i.e.* 6 on each die.

$\therefore$ Probability of getting sum 13 on both dice = 0.

Short Answer Questions–I

Each of the following questions are of 2 marks.

1. Cards numbered 7 to 40 were put in a box. Poonam selects a card at random. What is the probability that Poonam selects a card which is a multiple of 7? **[*CBSE* 2019 (30/3/1)]**

Sol. Total number of possible outcomes = 34 ½

Favourable number of outcomes is (7, 14, 21, 28 and 35) = 5 1

P(multiple of 7) $= \frac{5}{34}$ ½

[*CBSE Marking Scheme* 2019 (30/3/1)]

2. A child has a die whose six faces show the letters as shown below:

A	B	C	D	E	A

The die is thrown once. What is the probability of getting (*i*) *A* (*ii*) *D* ? **[*CBSE* 2020 (30/2/1)]**

Sol. When a die is thrown once.

The total number of possible outcomes = 6

(*i*) There are two faces which show a letter *A*.

$\therefore$ No. of favourable outcomes = 2

$\therefore$ Probability of getting a letter $A = \frac{2}{6} = \frac{1}{3}$

(*ii*) There is only one face showing *D*.

$\therefore$ No. of favourable outcomes = 1

$\therefore$ Probability of getting a letter $D = \frac{1}{6}$

3. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is a prime number. **[*NCERT Exemplar*]**

Sol. Product of the number on the dice is prime number, *i.e.*, 2, 3, 5.

The possible ways are (1, 2), (2, 1), (1, 3), (3, 1), (5, 1), (1, 5).

So, number of favourable ways = 6

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

4. Rahim tosses two different coins simultaneously. Find the probability of getting at least one tail. **[*CBSE Delhi* 2014]**

Sol. The sample space is {*HH, HT, TH, TT*}

Total number of outcomes = 4

Favourable outcomes for getting at least one tail is {*HT, TH, TT*}.

Number of favourable outcomes = 3

$\therefore$ Probability of getting at least one tail $= \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{3}{4}$

5. Find the probability that a leap year selected at random will contain 53 Sundays and 53 Mondays.

Sol. We know that a leap year has 366 days.

So in 366 days, there are 52 weeks and 2 days.

Now two days may be

(*i*) Sunday and Monday

(*ii*) Monday and Tuesday

(*iii*) Tuesday and Wednesday

(*iv*) Wednesday and Thursday

(*v*) Thursday and Friday

(*vi*) Friday and Saturday

(*vii*) Saturday and Sunday

Now in total 7 possibilities, Sunday and Monday both come together is only one time

$\therefore$ Required probability $= \frac{1}{7}$

6. Tree Plantation Drive

A Group Housing Society has 600 members, who have their houses in the campus and decided to hold a tree plantation drive on the occasion of new year. Each household was given the

choice of planting a sampling of its choice. The number of different types of samplings planted were :

(*i*) Neem - 125 **(*ii*) Peepal - 165**

(*iii*) Creepers - 50 **(*iv*) Fruit plants - 150**

(*v*) Flowering plants - 110

On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.

What is the probability that the selected plant is

(*i*) a fruit plant or a flowering plant?

(*ii*) either a Neem plant or a Peepal plant? **[*Competency Based Question*, *CBSE* 2020(30/4/1)]**

Sol. Total number of trees planted = 600

$\therefore$ No. of total possible outcomes = 600

(*i*) The probability that the selected plant is a fruit plant or a flowering plant

$$= \frac{150+110}{600} = \frac{260}{600} = \frac{13}{30}$$

(*ii*) Probability that selected plant is either a Neem plant or a Peepal plant $= \frac{125+165}{600}$

$$= \frac{290}{600} = \frac{29}{60}$$

7. An integer is chosen at random between 1 and 100. Find the probability that it is :

(*i*) divisible by 8. **(*ii*) not divisible by 8.** **[*CBSE* 2018 (30/1)]**

Sol.

12) Integers, 1 to 100. (between)

=) total = 98 possible outcomes.

i) divisible by 8 → 12 numbers. (8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96).

=) Probability = $\frac{\text{Favorable outcome}}{\text{Total outcome}} = \frac{12}{98} = \boxed{\frac{6}{49}}$

ii) not divisible by 8 → 98 - 12 = 86 numbers.

=) Probability = $\frac{\text{Favorable outcome}}{\text{Total outcome}} = \frac{86}{98} = \boxed{\frac{43}{49}}$

[*Topper's Answer* 2018]

Short Answer Questions–II

Each of the following questions are of* 3 *marks.

1. Read the following passage and answer the questions given at the end:

Diwali Fair

A game in a booth at a Diwali Fair involves using a spinner first. Then, if the spinner stops on an even number, the player is allowed to pick a marble from a bag. The spinner and the marbles in the bag are represented in Fig, 14.4. Prizes are given, when a black marble is picked. Shweta plays the game once.

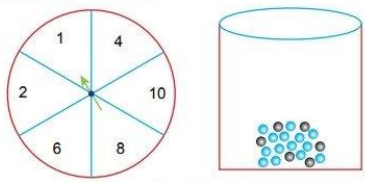


Fig. 14.4

(i) What is the probability that she will be allowed to pick a marble from the bag?

(ii) Suppose she is allowed to pick a marble from the bag, what is the probability of getting a prize, when it is given that the bag contains 20 balls out of which 6 are black?

[*Competency Based Question*] [*CBSE* 2020 (30/5/1)]

Sol. (i) It is clear that if the spinner stops on an even number, then she will be allowed to pick a marble.

$\therefore$ Probability that she will be allowed to pick a marble from the bag is equal to probability that spinner stops on an even number.

Required probability $= \frac{5}{6}$

(ii) Now,

Probability of getting a prize = probability of getting a black marble

$$= \frac{6}{20} = \frac{3}{10}$$

2. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag.

[*CBSE* (*AI*) 2017 (30/1)]

Sol.

12. Let there be x black balls and 15 white balls.

Total balls $= n(S) = 15 + x$

P(drawing black ball) $= 3 \times$ P(drawing white ball).

$\Rightarrow \frac{x}{(15+x)} = 3 \times \frac{15}{(15+x)}$

$x = 3 \times 15 \times \frac{(15+x)}{(15+x)}$

$x = 45$

$\therefore$ There are 45 black balls in the bag.

[*Topper's Answer* 2017]

3. Two different dice are thrown together. Find the probability that the numbers obtained

(i) have a sum less than 7 (ii) have a product less than 16

(iii) is a doublet of odd numbers [*CBSE Delhi* 2017]

Sol. Total number of outcomes = 36

(i) Favourable outcomes are (1, 1,) (1, 2) (1, 3) (1, 4) (1, 5) (2, 1) (2, 2) (2, 3) (2, 4) (3, 1) (3, 2) (3, 3) (4, 1) (4, 2) (5, 1) *i.e.*, 15.

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

(ii) Favourable outcomes are (1, 1) (1, 2) (1, 3) (1, 4) (1, 5) (1, 6) (2, 1) (2, 2) (2, 3) (2, 4) (2, 5) (2, 6) (3, 1) (3, 2) (3, 3) (3, 4) (3, 5) (4, 1) (4, 2) (4, 3) (5, 1) (5, 2) (5, 3) (6, 1) (6, 2) *i.e.*, 25.

$\therefore$ P (product less than 16) $= \frac{25}{36}$

(iii) Favourable outcomes are (1, 1) (3, 3) (5, 5) *i.e.*, 3.

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

4. A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, find the probability of losing the game.

[*CBSE* 2019(30/1/1)]

Sol. Total number of outcomes = 8

Favourable number of outcomes (HHH, TTT) = 2

Prob. (getting success) $= \frac{2}{8}$ or $\frac{1}{4}$

$\therefore$ Prob. (losing the game) $= 1 - \frac{1}{4} = \frac{3}{4}$.

[*CBSE Marking Scheme* 2019 (30/1/1)]

5. From a pack of 52 playing cards, Jacks, Queens and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that drawn card is:

(*i*) a black King (*ii*) a card of red colour (*iii*) a card of black colour **[*CBSE* 2016 (30/2)]**

Sol.

20) Total cards = 52

Cards removed = 6

Card left = 52 − 6 = 46

Total black king = 2.

Probability of drawing black king = $\frac{2}{46} = \boxed{\frac{1}{23}}$

Total red card = 26 − 6

= 20

Probability of drawing red colour card = $\frac{20}{46} = \boxed{\frac{10}{23}}$

Total card of black colour = 26

Probability of drawing black colour card = $\frac{26}{46} = \boxed{\frac{13}{23}}$

[*Topper's Answer* 2016]

6. A die is thrown once. Find the probability of getting a number which (*i*) is a composite number (*ii*) lies between 1 and 4.

Sol. Total number of outcomes = 6.

(*i*) Prob. (getting a composite number (4, 6)) $= \frac{2}{6}$ or $\frac{1}{3}$

(*ii*) Prob. (getting a number between 1 and 4 (2, 3)) $= \frac{2}{6}$ or $\frac{1}{3}$.

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

Sol. When two coins are tossed simultaneously, the possible outcomes are (H, H), (H, T), (T, H), (T, T) which are all equally likely. Here (H, H) means head up on the first coin (say on ₹1) and head up on the second coin (₹2). Similarly (H, T) means head up on the first coin and tail up on the second coin and so on.

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

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

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

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

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

(*i*) red or white. (*ii*) not black. (*iii*) neither white nor black.

Sol. Total number of balls = 5 + 8 + 7 = 20

(*i*) P (red or white ball) = $\frac{5+8}{20} = \frac{13}{20}$

(*ii*) P (not black ball) = 1 – P (black ball) = $1 - \frac{7}{20} = \frac{13}{20}$

(*iii*) P (neither white nor black ball) = P (red ball) = $\frac{5}{20} = \frac{1}{4}$.

Long Answer Questions

Each of the following questions are of 5 marks.

1. Apoorv throws two dice once and computes the product of the numbers appearing on the dice. Peehu throws one die and squares the number that appears on it. Who has the better chance of getting the number 36? Why? [*NCERT Exemplar, Competency Based Question*]

Sol. Apoorv throws two dice once.

So, total number of outcomes, $n(S) = 36$.

Number of outcomes for getting product 36,

$n(E_1) = 1$ [(6×6)]

$\therefore$ Probability for Apoorv getting the number 36 = $\frac{n(E_1)}{n(S)} = \frac{1}{36}$

Also, Peehu throw one die.

So, total number of outcomes $n(S) = 6$

Number of outcomes for getting square of a number as 36.

$n(E_2) = 1$ ($\because 6^2 = 36$)

$\therefore$ Probability for Peehu getting the number 36 = $\frac{n(E_2)}{n(S)} = \frac{1}{6} = \frac{6}{36}$

Hence, Peehu has better chance of getting the number 36.

2. In Fig. 14.5, shown a disc on which a player spins an arrow twice. The function $\frac{a}{b}$ is formed, where '*a*' is the number of sector on which arrow stops on the first spin and '*b*' is the number of the sector in which the arrow stops on second spin. On each spin, each sector has equal chance of selection by the arrow. Find the probability that the fraction $\frac{a}{b} > 1$. [*CBSE (F)* 2016]

Sol. For $a/b > 1$, when $a = 1$, b can not take any value,

$a = 2$, b can take 1 value,

$a = 3$, b can take 2 values,

$a = 4$, b can take 3 values,

$a = 5$, b can take 4 values,

$a = 6$, b can take 5 values.

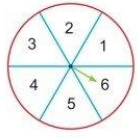


Fig. 14.5

Total possible outcomes = 36

$\therefore$ $P(a/b > 1) = \frac{1+2+3+4+5}{36} = \frac{15}{36}$ or $\frac{5}{12}$

3. **A number x is selected at random from the numbers 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability that product of x and y is less than 16.** **[*CBSE* 2016 (30/2)]**

Sol.

23) We have –

Total possible outcome = 1, 2, 3, 4 & 1, 4, 9, 16 = 16

	1	2	3	4
1	1	2	3	4
4	4	8	12	16
9	9	18	27	36
16	16	32	48	64

Total favourable event, having product less than 16
= 1, 2, 3, 4, 4, 8, 12, 9 = 7 + 1 = 8

Probability = $\frac{\text{Favourable (event) outcome}}{\text{Total event}}$

$P[E] = \frac{7+1}{16} = \frac{8}{16} = \frac{1}{2}$

Ans :- $\boxed{\frac{1}{2}}$ [*Topper's Answer* 2016]

4. **A bag contains cards numbered from 1 to 49. A card is drawn from the bag at random, after mixing the cards thoroughly. Find the probability that the number on the drawn card is:**

(*i*) an odd number. (*ii*) a multiple of 5. (*iii*) a perfect square. (*iv*) an even prime number.
[*CBSE Delhi* 2014]

Sol. Total number of cards = 49

$\therefore$ Total number of outcomes = 49

(*i*) Odd number

Favourable outcomes : 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49 *i.e.*, 25

Probability (E) = $\frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}} = \frac{25}{49}$

(*ii*) A multiple of 5

Favourable outcomes : 5, 10, 15, 20, 25, 30, 35, 40, 45 *i.e.*, 9

Probability (E) = $\frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}} = \frac{9}{49}$

(*iii*) A perfect square

Favourable outcomes : 1, 4, 9, 16, 25, 36, 49 *i.e.*; 7

Probability (E) = $\frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}} = \frac{7}{49} = \frac{1}{7}$

(*iv*) An even prime number

Favourable outcome : 2 *i.e.*, 1

Probability (E) = $\frac{\text{No. of favourable outcomes}}{\text{Total number of outcomes}} = \frac{1}{49}$

5. The probability of selecting a blue marble at random from a jar that contains only blue, black and green marbles is $\frac{1}{5}$. The probability of selecting a black marble at random from the same jar is $\frac{1}{4}$. If the jar contains 11 green marbles, find the total number of marbles in the jar.

[*CBSE* 2019(30/2/1)]

Sol. $P(\text{blue marble}) = \frac{1}{5}$, $P(\text{black marble}) = \frac{1}{4}$

$\therefore\ P(\text{green marble}) = 1-\left(\frac{1}{5}+\frac{1}{4}\right) = \frac{11}{20}$

Let total number of marbles be x

Then $\frac{11}{20}\times x = 11 \Rightarrow x = 20$

[*CBSE Marking Scheme* 2019(30/2/1)]

Case Study-based Questions

Each of the following questions are of 4 marks.

1. Read the following and answer any four questions from (*i*) to (*v*).

On a weekend Rani was playing cards with her family. The deck has 52 cards. If her brother drew one card. **[*CBSE Question Bank*]**

Fig. 14.6

(*i*) The probability of getting a king of red colour is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{1}{4}$

(*ii*) The probability of getting a face card is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{2}{13}$ (*d*) $\frac{3}{13}$

(*iii*) The probability of getting a jack of hearts is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{52}$ (*c*) $\frac{3}{52}$ (*d*) $\frac{3}{26}$

(*iv*) The probability of getting a red face card is

(*a*) $\frac{3}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{1}{4}$

(*v*) The probability of getting a spade is

(*a*) $\frac{1}{26}$ (*b*) $\frac{1}{13}$ (*c*) $\frac{1}{52}$ (*d*) $\frac{1}{4}$

Sol. (*i*) Total no. of possible outcomes = 52

and no. of favourable outcomes = 2

$\therefore$ P(getting a king of red colour) = $\frac{2}{52} = \frac{1}{26}$

$\therefore$ Option (*a*) is correct.

(*ii*) We have, number of face card = 12

$\therefore$ P(getting a face card) = $\frac{12}{52} = \frac{3}{13}$

$\therefore$ Option (*d*) is correct.

(*iii*) There is only one jack of hearts.

$\therefore$ P(getting a jack of hearts) = $\frac{1}{52}$

$\therefore$ Option (*b*) is correct.

(*iv*) No. of red face card = 6

$\therefore$ P(getting a red face card) = $\frac{6}{52} = \frac{3}{26}$

$\therefore$ Option (*a*) is correct.

(*v*) No. of spade cards = 13

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

$\therefore$ Option (*d*) is correct.

2. Read the following and answer any four questions from (*i*) to (*v*).

Rahul and Ravi planned to play Business (board game) in which they were supposed to use two dice. **[*CBSE Question Bank*]**

Fig. 14.7

(*i*) Ravi got first chance to roll the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice as 8?

(*a*) $\frac{1}{26}$ (*b*) $\frac{5}{36}$ (*c*) $\frac{1}{18}$ (*d*) 0

(ii) Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice as 13?

(a) 1 (b) $\frac{5}{36}$ (c) $\frac{1}{18}$ (d) 0

(iii) Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice less than or equal to 12?

(a) 1 (b) $\frac{5}{36}$ (c) $\frac{1}{18}$ (d) 0

(iv) Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice equal to 7?

(a) $\frac{5}{9}$ (b) $\frac{5}{36}$ (c) $\frac{1}{6}$ (d) 0

(v) Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice greater than 8?

(a) 1 (b) $\frac{5}{36}$ (c) $\frac{1}{18}$ (d) $\frac{5}{18}$

Sol. (i) When two dice are rolled once, we have

Total number of possible outcomes = 36

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

$\therefore$ No. of favourable outcomes = 5

$\therefore$ Required probability = $\frac{5}{36}$

$\therefore$ Option (b) is correct.

(ii) Favourable outcomes for getting sum 13 = ϕ

$\therefore$ No. of favourable event = 0

$\therefore$ Required probability = $\frac{0}{36} = 0$

$\therefore$ Option (d) is correct.

(iii) No. of favourable outcomes of getting sum less than or equal to 12 = 36

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

$\therefore$ Option (a) is correct.

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

No. of favourable outcomes = 6

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

$\therefore$ Option (c) is correct.

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

No. of favourable outcomes = 10

$\therefore$ Required probability = $\frac{10}{36} = \frac{5}{18}$

$\therefore$ Option (d) is correct.

3. Two friends are travelling in a bus. They were feeling bored, so they started playing a game with a pair of dice that one of them had. Each of them started rolling the pair of dice one by one, stating one condition before rolling. If the person gets the numbers according to the condition stated by him, he wins and get a score.

Fig. 14.8

Based on the above information, answer the following questions.

(*i*) (*a*) First friend says, "a doublet". What is the probability of his winning?

(*b*) Second friend says, "sum less than 9". What is the probability of his winning?

(*ii*) (*a*) First one says, "6 will come up either time." What is the probability of his winning?

(*b*) Second one says, "sum is an even number". What is the probability of his losing?

Sol. (*i*) (*a*) Number of doublets are {(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)} *i.e.*, 6.

Total possible events = 36

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

(*b*) Possible cases of sum less than 9 are {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5)
(4, 1), (4, 2), (4, 3), (4, 4)
(5, 1), (5, 2), (5, 3)
(6, 1), (6, 2)} *i.e.*, 26.

$\therefore \; P(E) = \frac{26}{36} = \frac{13}{18}$

(*ii*) (*a*) Possible cases when 6 will come up either time are
{(1, 6), (2, 6), (3, 6), (4, 6), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)} *i.e.*, 11.

Number of favourable outcomes = 11.

$\therefore \; P(E) = \frac{11}{36}$.

(*b*) Possible cases for which sum is an even number are
{(1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (2, 6), (3, 1), (3, 3), (3, 5), (4, 2), (4, 4), (4, 6), (5, 1), (5, 3), (5, 5), (6, 2), (6, 4), (6, 6)} *i.e.*, 18.

$\therefore \; P(E) = \frac{18}{36} = \frac{1}{2}$.

Probability of his losing is $1 - \frac{1}{2} = \frac{1}{2}$

PROFICIENCY EXERCISE

■ Objective Type Questions: [1 mark each]

1. Choose and write the correct option in each of the following questions.

(*i*) The probability of getting exactly one head in tossing a pair of coins is

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

(*ii*) A spinner is shown below.

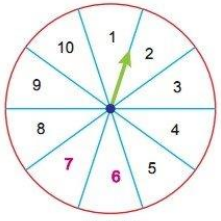


Fig. 14.9

Some of the events are listed below, when the spinner is spinned.

Event A: The spinner lands on a multiple of 11.

Event B: The spinner lands on a number less than 11.

Event C: The spinner lands on a number more than 10.

Which of the following statement is true about the three events?

(*a*) Probability of Event A is 1, so A is a sure event while the probabilities of Events B and C are 0, so they are impossible events.

(*b*) Probability of Event B is 1, so B is a sure event while the probabilities of Events A and C are 0, so they are impossible events.

(*c*) Probability of Event A is 1, so A is an impossible event while the probabilities of Events B and C are 0, so they are sure events.

(*d*) Probability of Event B is 1, so B is an impossible event while the probabilities of Events A and C are 0, so they are sure events.

(*iii*) A die is thrown once, the probability of getting a prime number is

(*a*) $\frac{2}{3}$ (*b*) $\frac{1}{3}$ (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{6}$

(*iv*) When four coins are tossed simultaneously, which of the following represents the sample space? **[*Competency Based Question*]**

(*a*)

HHHH	HHHT	HHTH	HTHH
THHH	HHTT	TTHH	HTTT
THTT	TTHT	TTTH	TTTT

(*b*)

HHHH	HHHT	HHTH	HTHH
THHH	THHT	HTTH	HTTT
THTT	TTHT	TTTH	TTTT

(*c*)

HHHH	HHHT	HHTH	HTHH
THHH	HHTT	HTHT	HTTH
THHT	THTH	TTHH	HTTT
THTT	TTHT	TTTH	TTTT

(*d*)

HHHH	HHHT	HHTH	HTHH
THHH	HHTT	HTHT	HTTH
HTTH	HTHT	TTHH	HTTT
THTT	TTHT	TTTH	TTTT

(*v*) Of 50 students in a class, 16 prefer cricket, 8 prefer football, 8 prefer basketball and rest of the students prefer either tennis or hockey. There are twice as many students who prefer tennis as the number of students who prefer hockey. A student is randomly selected from the class. Which statement is correct?

(*a*) The probability of selecting a student who prefer hockey is more than that of selecting a student who prefer football.

(*b*) The probability of selecting a student who prefer tennis is more than that of selecting a student who prefer football.

(*c*) The probability of selecting a student who prefer hockey is more than that of selecting a student who prefer tennis.

(*d*) The probability of selecting a student who prefer basketball is more than that of selecting a student who prefer cricket.

■ Very Short Answer Questions: [1 mark each]

2. In a single throw of a die, what is the probability of getting a prime number?
3. A number is chosen from the numbers 1 to 50. What is the probability that the selected number is multiple of 5?
4. The probability of getting a bad egg in a lot of 400 is 0.035. What is the number of bad eggs in the lot?
5. A number x is chosen at random from the numbers $-3, -2, -1, 0, 1, 2, 3$. What is the probability that $|x| < 2$?
6. A bag contains 3 black marbles, 5 red marbles and 6 white marbles. If a marble is picked at random, then what is the probability that it is not a white marble?
7. Avni and Arushi draws one ball each from a bag containing 2 red and 3 green balls. Avni draws a red ball first which is not put back. What is the probability that Arushi who draws next also gets a red ball?
8. A letter of English alphabet is chosen at random. What is the probability that it is a letter of the word 'MATHEMATICS'?
9. A bag contains 3 red and 5 black balls. A ball is drawn at random from the bag. What is the probability that the drawn ball is not red? **[*CBSE Delhi* 2017 *(C)*]**

■ Short Answer Questions–I: [2 marks each]

10. Two different dice are tossed together. Find the probability:
    (*i*) of getting a doublet
    (*ii*) of getting a sum 10, of the numbers on the two dice. **[*CBSE* 2018 (30/1)]**
11. The probability of selecting a blue marble at random from a jar that contains only blue, black and green marbles is $\frac{1}{5}$. The probability of selecting a black marble at random from the same jar is $\frac{1}{4}$. If the jar contains 22 green marbles, find the total number of marbles in the jar. **[*Competency Based Question*]**
12. A die is thrown once. Find the probability of getting (*i*) a composite number, (*ii*) a prime number. **[*CBSE* 2019 (30/3/1)]**
13. Cards numbered 7 to 40 were put in a box. Poonam selects a card at random. What is the probability that Poonam selects a card which is a multiple of 5?
14. A bag contains 15 balls, out of which some are white and the others are black. If the probability of drawing a black ball at random from the bag is $\frac{2}{3}$, then find how many white balls are there in the bag. **[*CBSE* 2019 (30/4/2)]**
15. A card is drawn at random from a pack of 52 playing cards. Find the probability of drawing a card which is neither a spade nor a king. **[*CBSE* 2019 (30/4/2)]**
16. Three different coins are tossed simultaneously. Find the probability of getting exactly one head. **[*CBSE* 2019 (30/4/3)]**
17. A die is thrown once. Find the probability of getting (*i*) an even number (*ii*) an odd number. **[*CBSE* 2019 (30/4/3)]**
18. A pair of dice is thrown once. Find the probability of getting (*i*) even number on each die (*ii*) a total of 9. **[*CBSE* 2019 (*C*) (30/1/1)]**
19. A bag contains some balls of which x are white, $2x$ are black and $3x$ are red. A ball is selected at random. What is the probability that it is (*i*) not red? (*ii*) white? **[*CBSE* 2019 (*C*) (30/1/1)]**

20. A bag contains 6 white balls numbered 1 to 6 and 4 red balls numbered 7 to 10. Find the probability of getting a:

(*a*) red ball with even number on it.

(*b*) an odd number ball.

21. A card is drawn at random from a well-shuffled pack of 52 playing cards. Find the probability of getting a red face card.

22. Two coins are tossed simultaneously. What is the probability of getting at least one head?

23. What is the probability of getting atmost one tail when two coins are tossed simultaneously?

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

25. If probability of success is 63%, what is the probability of failure?

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

27. In a simultaneous throw of a pair of dice, find the probability of getting a doublet of even numbers.

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

29. Two different dice are rolled simultaneously. Find the probability that the sum of numbers appearing on the two dice is 10. **[*CBSE (F)* 2014]**

30. Two different dice are tossed together. Find the probability:

(*i*) that the number on each die is even.

(*ii*) that the sum of numbers appearing on the two dice is 5. **[*CBSE (AI)* 2014]**

■ Short Answer Questions–II: [3 marks each]

31. Two dice are thrown simultaneously. Find the probability of getting the sum **[*NCERT Exemplar*]**

(*i*) 9. (*ii*) 1. (*iii*) a prime number.

32. Two dice are thrown at the same time. Determine the probability that the difference of the numbers on the two dice is: **[*NCERT Exemplar*]**

(*i*) 0. (*ii*) 2.

33. Two different dice are thrown together. Find the probability that the product of the numbers appeared is less than 18. **[*CBSE (F)* 2017]**

34. A die has its six faces marked 0, 1, 1, 1, 6, 6. Two such dice are thrown together and the total score is recorded. **[*NCERT Exemplar*]**

(*i*) How many different scores are possible?

(*ii*) What is the probability of getting a total of 7?

35. A bag contains white, black and red balls only. A ball is drawn at random from the bag. The probability of getting a white ball is $\frac{3}{10}$ and that of a black ball is $\frac{2}{5}$. Find the probability of getting a red ball. If the bag contains 20 black balls, then find the total number of balls in the bag.

36. A die is thrown twice. What is the probability that:

(*i*) 3 will not come up either time?

(*ii*) 3 will come up at least once?

37. A bag contains 8 red, 7 orange and 9 green balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is:

(*i*) orange or green. (*ii*) not orange. (*iii*) neither green nor red.

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

39. All the jacks, queens and kings are removed from a deck of 52 playing cards and then well shuffled. Then one card is drawn at random. If an ace is given a value 1, find the probability that the card has a value:

(*i*) 5. (*ii*) less than 5. (*iii*) greater than 5.

40. A bag contains cards which are numbered from 2 to 90. A card is drawn at random from the bag. Find the probability that it bears:

(*i*) a single digit number.

(*ii*) a number which is a perfect square.

41. A carton of 24 bulbs contain 6 defective bulbs. One bulb is drawn at random. What is the probability that the bulb is not defective? If the bulb selected is defective and it is not replaced and a second bulb is selected at random from the rest, what is the probability that the second bulb is defective? **[*NCERT Exemplar*]**

42. 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: **[*NCERT Exemplar*]**

(*i*) triangle. (*ii*) square.

(*iii*) square of blue colour. (*iv*) triangle of red colour.

43. Box *a* contains 25 slips of which 19 are marked ₹1 and other are marked ₹5 each. Box *b* contains 50 slips of which 45 are marked ₹1 each and others are marked ₹13 each. Slips of both the boxes are poured into a third box and reshuffled. A slip is drawn at random. What is the probability that it is marked other than ₹1? **[*NCERT Exemplar*]**

44. A lot of 60 bulbs contain 12 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective? Suppose the bulb drawn in first attempt is 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? **[*Competency Based Question*]**

■ Long Answer Questions: [5 marks each]

45. The King, Queen and Jack of clubs are removed from a pack of 52 cards and then the remaining cards are well shuffled. A card is selected from the remaining cards. Find the probability of getting a card **[*CBSE* 2018 (*C*) 30/1]**

(*i*) of spade (*ii*) of black king

(*iii*) of club (*iv*) of jacks

46. The probability of selecting a green marble at random from a jar that contains only green, white and yellow marbles is $\frac{1}{4}$. The probability of selecting a white marble at random from the same jar is $\frac{1}{3}$. If this jar contains 10 yellow marbles, what is the total number of marbles in the jar?

47. Red queens and black jacks are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is: **[*CBSE (AI)* 2014]**

(*i*) a king. (*ii*) of red colour.

(*iii*) a face card. (*iv*) a queen.

48. Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on the drawn card is:

(*i*) not divisible by 3.

(*ii*) a prime number greater than 7.

(*iii*) not a perfect square number. **[*CBSE (F)* 2014]**

Answers

1. (*i*) (*d*) (*ii*) (*b*) (*iii*) (*c*) (*iv*) (*c*) (*v*) (*b*)

2. $\frac{1}{2}$ **3.** $\frac{1}{5}$ **4.** 14 **5.** $\frac{3}{7}$ **6.** $\frac{4}{7}$ **7.** $\frac{1}{4}$ **8.** $\frac{4}{13}$

9. $\frac{5}{8}$ **10.** (*i*) $\frac{1}{6}$ (*ii*) $\frac{1}{12}$ **11.** 40 marbles **12.** (*i*) $\frac{1}{3}$ (*ii*) $\frac{1}{2}$

13. $\frac{7}{34}$ **14.** Number of white balls = 5 **15.** $\frac{9}{13}$ **16.** $\frac{3}{8}$

17. (*i*) $\frac{1}{2}$ (*ii*) $\frac{1}{2}$ **18.** (*i*) $\frac{1}{4}$ (*ii*) $\frac{1}{9}$ **19.** (*i*) $\frac{1}{2}$ (*ii*) $\frac{1}{6}$

20. (*a*) $\frac{1}{5}$ (*b*) $\frac{1}{2}$ **21.** $\frac{3}{26}$ **22.** $\frac{3}{4}$ **23.** $\frac{3}{4}$ **24.** $\frac{21}{26}$ **25.** 37%

26. $\frac{2}{3}$ **27.** $\frac{1}{12}$ **28.** $\frac{2}{25}$ **29.** $\frac{1}{12}$ **30.** (*i*) $\frac{1}{4}$ (*ii*) $\frac{1}{9}$

31. (*i*) $\frac{1}{9}$ (*ii*) 0 (*iii*) $\frac{5}{12}$ **32.** (*i*) $\frac{1}{6}$ (*ii*) $\frac{2}{9}$ **33.** $\frac{13}{18}$

34. (*i*) 6 (*ii*) $\frac{1}{3}$ **35.** $\frac{3}{10}$, 50 balls **36.** (*i*) $\frac{25}{36}$ (*ii*) $\frac{11}{36}$

37. (*i*) $\frac{2}{3}$ (*ii*) $\frac{17}{24}$ (*iii*) $\frac{7}{24}$ **38.** $\frac{7}{13}$ **39.** (*i*) $\frac{1}{10}$ (*ii*) $\frac{2}{5}$ (*iii*) $\frac{1}{2}$

40. (*i*) $\frac{8}{89}$ (*ii*) $\frac{8}{89}$ **41.** P (not defective) = $\frac{3}{4}$, P (2nd bulb defective) = $\frac{5}{23}$

42. (*i*) $\frac{4}{9}$ (*ii*) $\frac{5}{9}$ (*iii*) $\frac{1}{3}$ (*iv*) $\frac{5}{18}$ **43.** $\frac{11}{75}$ **44.** $\frac{1}{5}, \frac{48}{59}$

45. (*i*) $\frac{3}{49}$ (*ii*) $\frac{1}{49}$ (*iii*) $\frac{10}{49}$ (*iv*) $\frac{3}{49}$ **46.** 24

47. (*i*) $\frac{1}{12}$ (*ii*) $\frac{1}{2}$ (*iii*) $\frac{1}{6}$ (*iv*) $\frac{1}{24}$ **48.** (*i*) $\frac{2}{3}$ (*ii*) $\frac{1}{5}$ (*iii*) $\frac{5}{6}$

Self-Assessment

Time allowed: 1 hour **Max. marks: 40**

SECTION A

1. Choose and write the correct option in the following questions. **(3 × 1 = 3)**

(*i*) 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*) $\frac{8}{15}$

(*ii*) When a die is thrown, the probability of getting an even number less than 4 is

(*a*) $\frac{1}{4}$ (*b*) 0 (*c*) $\frac{1}{2}$ (*d*) $\frac{1}{6}$

(*iii*) Which of the following can be the probability of an event?

(*a*) – 0.04 (*b*) 1.004 (*c*) $\frac{18}{23}$ (*d*) $\frac{8}{7}$

2. Solve the following questions. **(2 × 1 = 2)**

(*i*) In a game, a number is chosen at random from the set 1, 2, 3, ...28, 29, 30. What is the probability that the number chosen is a product of exactly two different prime numbers?

(*ii*) The probability of getting a bad egg from a lot of 500 eggs is 0.028. What is the number of bad eggs?

SECTION B

■ **Solve the following questions.** **(4 × 2 = 8)**

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

4. Two different dice are rolled simultaneously. Find the probability that the sum of numbers appearing on the two dice is 10.

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

(*i*) same number on both dice.

(*ii*) different numbers on both dice.

6. A coin is tossed 2 times. List the possible outcomes. Find the probability of getting:

(*i*) at least one head.

(*ii*) atmost one head.

■ **Solve the following questions.** **(4 × 3 = 12)**

7. The king, queen and jack of clubs are removed from a deck of 52 cards. The remaining cards are mixed together and then a card is drawn at random from it. Find the probability of getting

(*i*) a face card (*ii*) a card of heart

(*iii*) a card of clubs (*iv*) a queen of diamond

8. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag.

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

(*i*) divisible by 2 or 3. (*ii*) a prime number.

10. In a game, the entry fee is ₹5. The game consists of tossing a coin 3 times. If one or two heads show, Sweta gets her entry fee back. If she shows 3 heads, she receives double the entry fees. Otherwise, she will lose. After tossing a coin three times, find the probability that she:

(*i*) loses the entry fee.

(*ii*) gets double entry fee.

(*iii*) just gets her entry fee.

■ **Solve the following questions.** **(3 × 5 = 15)**

11. 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 number divisible by 5. **[*CBSE (F)* 2017]**

12. Cards, on which numbers 1, 2, 3, ..., 100 are written (one number on one card and no number is repeated) are put in a bag and are mixed thoroughly. A card is drawn at random from the bag. Find the probability that card taken out has

(*i*) an even number

(*ii*) a number which is a multiple of 13

(*iii*) a perfect square number

(*iv*) a prime number less than 20

13. A dice is rolled twice. Find the probability that:

(*i*) 5 will not come up either time.

(*ii*) 5 will come up exactly one time. **[*CBSE (F)* 2014]**

Answers

1. (*i*) (*b*) (*ii*) (*d*) (*iii*) (*c*)

2. (*i*) $\frac{7}{30}$ (*ii*) 14 **3.** $\frac{16}{25}$ **4.** $\frac{1}{12}$ **5.** (*i*) $\frac{1}{6}$ (*ii*) $\frac{5}{6}$

6. {*HH*, *HT*, *TH*, *TT*}; (*i*) $\frac{3}{4}$ (*ii*) $\frac{3}{4}$ **7.** (*i*) $\frac{9}{49}$ (*ii*) $\frac{13}{49}$ (*iii*) $\frac{10}{49}$ (*iv*) $\frac{1}{49}$

8. 45 **9.** (*i*) $\frac{13}{20}$ (*ii*) $\frac{2}{5}$ **10.** (*i*) $\frac{1}{8}$ (*ii*) $\frac{1}{8}$ (*iii*) $\frac{3}{4}$

11. (*i*) $\frac{9}{10}$ (*ii*) $\frac{1}{5}$ **12.** (*i*) $\frac{1}{2}$ (*ii*) $\frac{7}{100}$ (*iii*) $\frac{1}{10}$ (*iv*) $\frac{2}{25}$

13. (*i*) $\frac{25}{36}$ (*ii*) $\frac{5}{18}$