CHAPTER 15

Probability

1. OBJECTIVE QUESTIONS

1. The probability of getting a number greater than 2 in throwing a die is
(a) 2/3 (b) 1/3
(c) 4/3 (d) 1/4

Ans : (a) 2/3

Required probability $= \frac{4}{6} = \frac{2}{3}$

2. Out of one digit prime numbers, one number is selected at random. The probability of selecting an even number is
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{4}{9}$ (d) $\frac{2}{5}$

Ans : (b) $\frac{1}{4}$

One digit prime numbers are 2, 3, 5, 7. Out of these numbers, only the number 2 is even.

3. A bag contains 3 red and 2 blue marbles. If a marble is drawn at random, then the probability of drawing a blue marble is:
(a) $\frac{1}{5}$ (b) $\frac{2}{5}$
(c) $\frac{3}{5}$ (d) $\frac{4}{5}$

Ans : (b) $\frac{2}{5}$

There 5 marbles in the bag. Out of these 5 marbles one can be choose in 5 ways.

Hence, Total number of possible outcomes = 5
Since, the bag contains 2 blue marbles. Therefore, one blue marble can be drawn in 2 ways.
Hence, Favourable number of elementary events = 2

Hence, P (getting a blue marble) $= \frac{2}{5}$

4. A single letter is selected at random from the word "PROBABILITY". The probability that the selected letter is a vowel is
(a) $\frac{2}{11}$ (b) $\frac{3}{11}$
(c) $\frac{4}{11}$ (d) 0

Ans : (c) $\frac{4}{11}$

Required probability $= \frac{1+2+1}{11} = \frac{4}{11}$

5. A three digit number is to be formed using the digits 3, 4, 7, 8 and 2 without repetition. The probability that it is an odd number is
(a) $\frac{2}{5}$ (b) $\frac{1}{5}$
(c) $\frac{4}{5}$ (d) $\frac{3}{5}$

Ans : (a) $\frac{2}{5}$

6. Two coins are tossed simultaneously. The probability of getting at most one head is
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{3}{4}$ (d) 1

Ans : (c) $\frac{3}{4}$

$$\text{Total outcomes} = HH, HT, TH, TT$$
$$\text{Favourable outcomes} = HT, TH, TT$$
$$P(\text{at most one head}) = \frac{3}{4}$$

7. A fair die is thrown once. The probability of getting a composite number less than 5 is
(a) $\frac{1}{3}$ (b) $\frac{1}{6}$
(c) $\frac{2}{3}$ (d) 0

Ans : (b) $\frac{1}{6}$

The outcomes are 1, 2, 3, 4, 5, 6. Out of these, 4 is the only composite number which is less than 5.

8. If a letter is chosen at random from the letter of English alphabet, then the probability that it is a letter of the word 'DELHI' is
(a) $\frac{1}{5}$ (b) $\frac{1}{26}$
(c) $\frac{5}{26}$ (d) $\frac{21}{26}$

Ans : (c) $\frac{5}{26}$

The English alphabet has 26 letters in all. The word 'DELHI' has 5 letter, so the number of favourable outcomes = 5.

9. The probability that a two digit number selected at random will be a multiple of '3' and not a multiple of '5' is

(a) $\frac{2}{15}$ (b) $\frac{4}{15}$

(c) $\frac{1}{15}$ (d) $\frac{4}{90}$

Ans : (b) $\frac{4}{15}$

24 out of the 90 two digit numbers are divisible by '3' and not by '5'.

The required probability is therefore, $\frac{24}{90} = \frac{4}{15}$

10. If in a lottery, there are 5 prizes and 20 blanks, then the probability of getting a prize is

(a) $\frac{2}{5}$ (b) $\frac{4}{5}$

(c) $\frac{1}{5}$ (d) 1

Ans : (c) $\frac{1}{5}$

$$\text{Required probability } = \frac{5}{25} = \frac{1}{5}$$

11. If a number x is chosen at random from the numbers $-2, -1, 0, 1, 2$. Then, the probability that $x^2 < 2$ is:

(a) $\frac{2}{5}$ (b) $\frac{4}{5}$

(c) $\frac{1}{5}$ (d) $\frac{3}{5}$

Ans : (d) $\frac{3}{5}$

Clearly, number x can take anyone of the five given values.

So, total number of possible outcomes = 5

We observe that $x^2 < 2$ when x takes anyone of the following three values -1, 0 and 1.

So, favourable number of elementary events = 3

Hence, $P(x^2 < 2) = \frac{3}{5}$

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

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$

(c) $\frac{4}{5}$ (d) $\frac{1}{5}$

Ans : (a) $\frac{2}{5}$

Out of 20 tickets numbered from 1 to 20, one can be chosen in 20 ways. So, total number of possible outcomes associated with the given random experiment is 20. Out of 20 tickets numbered 1 to 20, tickets bearing numbers which are multiple of 3 or 7 bear numbers 3, 6, 7, 9, 12, 14, 15 and 18.

Hence, Favourable number of elementary events = 8

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

13. Which of the following relationship is the correct?

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

(c) $P(E) = 1 + P(\overline{E})$ (d) None of these

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

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

14. A dice is thrown twice. The probability of getting 4, 5 or 6 in the first throw and 1, 2, 3 or 4 in the second throw is

(a) 1/3 (b) 2/3

(c) 1/2 (d) 1/4

Ans : (a) 1/3

Let $P(A)$ and $P(B)$ be the probability of the events, then

$$P(A \text{ and } B) = P(A) \cdot P(B) = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$$

15. Two dice are thrown together. The probability that sum of the two numbers will be a multiple of 4, is:

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

(c) $\frac{1}{8}$ (d) $\frac{1}{4}$

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

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

Total number of outcomes = 36

Number of favourable outcomes = 9

Hence, P (sum of two numbers will be multiple of 4)

$$= \frac{9}{36} = \frac{1}{4}$$

16. Two unbaised coins are tossed simultaneously then the probability of getting no head is $\frac{A}{B}$, then $(A+B)^2$ is equal to:

(a) 1 (b) 4

(c) 5 (d) 25

Ans : (d) 25

If two unbiased coins are tossed simultaneously we obtained possible outcomes.

$$HH, HT, TH, TT$$

Hence, Total number of outcomes = 4

No head is obtained if the event TT occurs.

Hence, Number of favourite outcomes = 1

Hence, Required probability $= \frac{1}{4}$

But, given probability $= \frac{A}{B}$

So, $A = 1$

and $B = 4$

Therefore, $(A+B)^2 = (1+4)^2$
$= (5)^2 = 25$

17. A letter is chosen at random from the letters of the word 'ASSASSINATION', then the probability that the letter chosen is a vowel is in the form of $\frac{6}{2x+1}$, then x is equal to:

(a) 5 (b) 6

(c) 7 (d) 8

Ans : (b) 6

There are 13 letters in the word 'ASSASSINATION' out of which one letter can be chosen in 13 ways.

Hence, Total number of outcomes $= 13$
There are 6 vowels in the word 'ASSISSINATION'.
So, there are 6 ways of selecting a vowel.

Hence, Required probability $= \frac{6}{13}$

But given that, $\frac{6}{2x+1} = \frac{6}{13}$

$$2x+1 = 13$$
$$2x = 12$$
$$x = 6$$

18. Ramesh buys a fish from a shop for his aquarium. The shopkeeper takes out one fish at random a tank containing 5 male fish and 9 female fish. Then, the probability that the fish taken out is a male fish, is:

(a) $\frac{5}{13}$ (b) $\frac{5}{14}$

(c) $\frac{6}{13}$ (d) $\frac{7}{13}$

Ans : (b) $\frac{5}{14}$

There are $14 = (5+9)$ fish out of which one can be chosen in 14 ways.
Hence, Total number of possible outcomes $= 13$
There are 5 male fish out of which are male fish can be chosen in 5 ways.
Hence, Favourable number of elementary events $= 5$

Hence, required probability $= \frac{5}{14}$

19. A number x is selected from the numbers 1, 2, 3 and then a second number y is randomly selected from the numbers 1, 4, 9 then the probability that the product xy of the two numbers will be less than 9 is:

(a) $\frac{3}{7}$ (b) $\frac{4}{9}$

(c) $\frac{5}{9}$ (d) $\frac{7}{9}$

Ans : (c) $\frac{5}{9}$

Number x can be selected in three ways and corresponding to each such way there are three ways of selecting number y.
Therefore two numbers can be selected in 9 ways as listed below:
(1, 1), (1, 4), (1, 9), (2, 1), (2, 4), (2, 9), (3, 1), (3, 4), (3, 9)
So, total numbers of possible outcomes $= 9$
The product xy will be less than 9, if x and y are chosen in one of the following ways:
(1, 1), (1, 4), (2, 1), (2, 4), (3, 1)
Hence, Favourable number of elementary events $= 5$

Hence, required probability $= \frac{5}{9}$

20. A bag contains 8 red balls and some blue balls. If the probability of drawing a blue ball is three times of a red ball, then the number of blue balls in the bag:

(a) 12 (b) 18
(c) 24 (d) 36

Ans : (c) 24

Let there be x blue balls in the bag.
Hence, Total number of balls in the bag $= (8+x)$

and Now,

$$P_1 = \text{Probability of drawing a blue bell}$$
$$= \frac{x}{8+x}$$

and $$P_2 = \text{Probability of drawing a red bell}$$
$$= \frac{8}{8+x}$$

It is given that, $P_1 = 3P_2$

$$\frac{x}{8+x} = 3 \times \frac{8}{(x+x)}$$
$$\frac{x}{8+x} = \frac{24}{8+x}$$
$$x = 24$$

Hence, there are 24 blue balls in the bag.

21. There are 1000 sealed envelopes in a box. 10 of them contain a cash prize of < 100 each, 100 of them contain a cash prize of <50 each and 200 of them contain a cash prize of < 10 each and rest do not contain any cash prize. If they are well-shuffled and an envelope is picked up out, then the probability that is contains no cash prize is:

(a) 0.65 (b) 0.69
(c) 0.54 (d) 0.57

Ans : (b) 0.69

Total number of envelopes in the box $= 1000$
Number of envelopes containing cash prize

$$= 10 + 100 + 200$$
$$= 310$$

Number of envelopes containing no cash

$$= 1000 - 310$$
$$= 690$$

Hence, Required probability $= \frac{690}{1000} = 0.69$

22. If odds in against of an event be 3:8, then the probability of occurence of this event is:

(a) $\frac{3}{8}$ (b) $\frac{5}{8}$

(c) $\frac{3}{11}$ (d) $\frac{8}{11}$

Ans : (c) $\frac{3}{11}$

Let the event be E. If number of favourable outcomes to event E are M and total outcomes be n. Then, according to the question

$$\frac{m}{n-m} = \frac{3}{8}$$

$$8m = 3n - 3m$$

$$11m = 3n$$

$$\frac{m}{n} = \frac{3}{11}$$

Hence, $P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of total outcomes}}$

$$= \frac{m}{n} = \frac{3}{11} \qquad \left[\text{Since, } \frac{m}{n} = \frac{3}{11}\right]$$

23. The given figure shows a disc on which player spins an arrow twice. The fraction $\frac{x}{y}$ is formed, where 'a' is the number of sectors on which the arrow stops on the first spin and 'b' is the number of the sectors in which the arrow stops on the second spin. In each spin, each sector has equal chance of selection by the arrow, then the probability that the fraction $\frac{x}{y} \geq 1$.

(a) $\frac{7}{12}$ (b) $\frac{5}{12}$

(c) $\frac{11}{12}$ (d) $\frac{1}{2}$

Ans : (a) $\frac{7}{12}$

Two numbers can be selected in $6 \times 6 = 36$ ways as listed below:

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

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

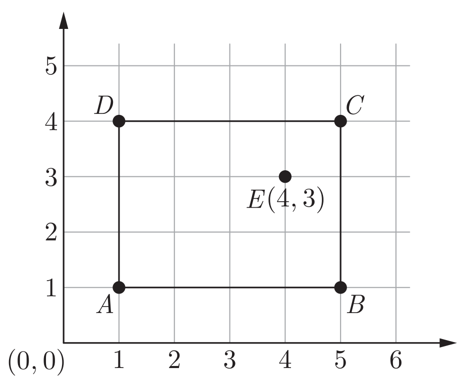
Hence, Favourable number of elementary events = 21

Hence, required probability

$$= \frac{\text{Favourable number of events}}{\text{Total number of events}}$$

$$= \frac{21}{36} = \frac{7}{12}$$

24. A graph is shown below. The intersection points of two lines are said to be the integer points.



The probability of E with respect to the integer points in the rectangle $ABCD$ is:

(a) 0 (b) 1

(c) 1/9 (d) 1/20

Ans : (d) 1/20

Total number of integer points in rectangle $ABCD$

= Number of integer points on rectangle

+ Number of integer points inside the rectangle

$= 14 + 6 = 20$

Hence, Required probability $= \frac{1}{20}$

25. 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. The probability of getting even sum is:

(a) $\frac{1}{9}$ (b) $\frac{1}{18}$

(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

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

Total number of outcomes $= 6 \times 6 = 36$

Possible sum of two numbers on the two dice are 2, 3, 4, 5, 6, 7, 8, 9.

Let, E = Event of getting even sum i.e. 2, 4, 6, 8

i.e. outcomes favourable to event are:

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

Hence, Number of outcomes favourable to E = 18

Hence, $P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of total outcomes}}$

$$= \frac{18}{36} = \frac{1}{2}$$

DIRECTION : (15 and 16) At a fate, cards numbers 1 to 1000. One number on one card are put in a box. Each player selects one card at random and that card is not replaced. If the selected card has a perfect square number greater than 500, the player wins a prize.

26. The probability that the first player wins is:

(a) 0.009 (b) 0.099

(c) 0.999 (d) 1

Ans : (a) 0.009

Given at a fate, cards bearing numbers 1 to 1000, one number on one card, are put in a box. Each player selects one card at random and that card is not replaced, so the total number of outcomes are 1000.

If the selected card has a perfect square number greater than 500, then player wins a prize.

Let,

E_1 = Event that the first player wins a prize

= player select a card which is a perfect square greater than 500.

$$= \{529, 576, 625, 676, 729, 784, 841, 900, 961\}$$

So, Number of Outcomes favourable to E_1 = 9

Hence, Required probability

$$= \frac{\text{Number of outcomes favourable to } E_1}{\text{Number of total outcomes}}$$

$$= \frac{9}{1000} = 0.009$$

27. The probability that the second player wins a prize, if the first has already wins, is:

(a) $\frac{1}{999}$ (b) $\frac{2}{999}$

(c) $\frac{4}{999}$ (d) $\frac{8}{999}$

Ans : (d) $\frac{8}{999}$

Now, if first has won, i.e. one card is already selected, greater than 500, has a perfect square. Since repetition is not allowed. So, one card is removed out of 1000 cards. So, number of remaining cards is 999.

Hence, Total number of remaining outcomes $= 999$

Let $E_2 =$ Event that the second player wins a prize, if the first has already won.

$=$ Remaining cards has a perfect square greater than 500.

Hence, Number of outcomes favourable to

$$E_2 = 9 - 1 = 8$$

$$\text{Hence, } P(E_2) = \frac{\text{Number of outcomes favourable to } E_2}{\text{Total number of remaining outcomes}}$$

$$= \frac{8}{999}$$

28. A box contains 54 marbles each of which is blue, green or white. The probability of selecting a blue marble at random from the box is 1/3 and the probability of selecting a green marble at random is 4/9. The number of white marbles in the box are:

(a) 10 (b) 12

(c) 14 (d) 16

Ans : (b) 12

Let the number of blue marbles be b, number of green marbles be g and number of white marbles be w.

Then, $$b + g + w = 54 \quad ...(1)$$

Hence, $$P(\text{selecting a blue marble}) = \frac{b}{54}$$

and $$P(\text{selecting a green marble}) = \frac{g}{54}$$

Given, the probability of selecting a blue marble

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

Hence, $$\frac{b}{54} = \frac{1}{3}$$

$$b = \frac{54}{3} = 18$$

Also, $$P(\text{selecting a green marble}) = \frac{4}{9}$$

Hence, $$\frac{g}{54} = \frac{4}{9}$$

$$g = \frac{4 \times 54}{9}$$

$$= 24$$

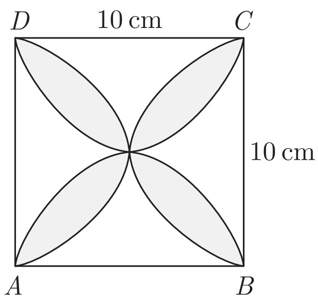
On substituting the values of b and g in Eq. (1), we get

$$18 + 24 + w = 54$$

$$w = 54 - 42$$

$$= 12$$

29. A helicopter was crashed some where in the region given below.



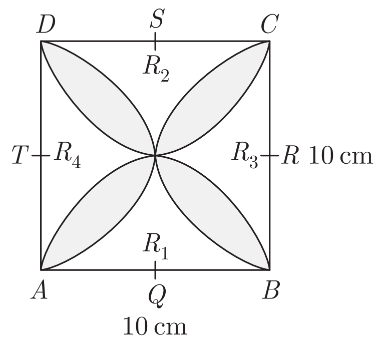
The probability that the helicopter was crashed in the shaded region is:

(a) 0.75 (b) 0.57

(c) 0.61 (d) 0.77

Ans : (b) 0.57

Let us mark the four unshaded regions as R_1, R_2, R_3 and R_4.



We have, Area of R_1 + Area of R_2

$=$ Area of $ABCD$

$-$ Area of two semi-circles having centres at R and T

$$= \left(10 \times 10 - 2 \times \frac{1}{2} \times 3.14 \times 5^2\right) \text{cm}^2$$

$$= 21.5 \text{ cm}^2$$

Similarly, we have,

Area of R_2 + Area of R_4

$$= 21.5 \text{ cm}^2$$

Hence, Area of shaded region

$=$ Area of square $ABCD$

$-(\text{Area of } R_1 + R_2 + R_3 + R_4)$

$$= 100 - 2 \times 21.5$$

$$= 57 \text{ cm}^2$$

Hence, Required probability

$$= \frac{\text{Area of shaded region}}{\text{Total area}} = \frac{57}{100} = 0.57$$

30. In a group of 3 people, the probability that atleast two will have the same birthday is (ignoring leap year):

(a) $\frac{364 \times 363}{365^2}$

(b) $\frac{364 \times 363 \times 362}{365^2}$

(c) $1 - \frac{364 \times 363}{365^2}$

(d) $1 - \frac{364 \times 363 \times 362}{365^2}$

Ans : (c) $1 - \frac{364 \times 363}{365^2}$

Let A be the event that atleast two people have the same birthday.

Then, $\overline{A} =$ No two or more people have the same birthday.

$=$ All the three persons have distinct birthdays.

Hence, $$P(\overline{A}) = \frac{365 \times 364 \times 363}{365^3}$$

$$= \frac{364 \times 363}{365^2}$$

Hence, required probability

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

$$= 1 - \frac{364 \times 363}{365^2}$$

31. Two number b and c are chosen at random with replacement from the numbers 1, 2, 3, 4, 5. The probability that $x^2 + bx + c = 0$ has non real roots is:

(a) $\frac{13}{25}$ (b) $\frac{12}{25}$

(c) $\frac{11}{25}$ (d) $\frac{9}{25}$

Ans : (a) $\frac{13}{25}$

Since, b and c both can be selected from 1 to 5. So, total number of ways of choosing b and c is:

$$5 \times 5 = 25$$

Now, for having non real roots of the equation

$$x^2 + bx + c = 0$$

$$\text{Discriminant} < 0$$

$$b^2 - 4c < 0$$

The following table shows the possible values of b and c for which $b^2 - 4c < 0$

c	b	Total
1	1	1
2	1, 2	2
3	1, 2, 3	3
4	1, 2, 3	3
5	1, 2, 3, 4	4
		13

So, favourable number of elementary events

$$= 13$$

Hence, Required probability $= \frac{13}{25}$

2. FILL IN THE BLANK

1. A die is thrown once, the probability of getting a prime number is ....

Ans : 1/2

2. The probability of an event that is certain to happen is .... Such an event is called ....

Ans : 1, sure or certain event

3. The sum of the probabilities of all the elementary events of an experiment is ....

Ans : 1

4. On a single roll of a die, the probability of getting a number 8 is ....

Ans : zero

5. The probability of an event is greater than or equal to .... and less than or equal to ....

Ans : 0, 1

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

Ans : .95

7. Probability of an event $E +$ Probability of the event 'not E' $=$ ....

Ans : 1

8. The events which have equal chances to occur or no one is preferred over the other are called ....

Ans : equally likely events

9. The probability of an event that cannot happen is .... Such an event is called ....

Ans : 0, impossible event

10. On a single roll of a die, the probability of getting a number less than 7 is ....

Ans : one

11. If A is an event of a random experiment, then A^C or $\overline{A}$ or A is called the .... of the event.

Ans : complement

12. Someone is asked to make a number from 1 to 100. The probability that it is a prime is ....

Ans : $\frac{1}{4}$

13. A set of events which have no pair in common are called ....

Ans : mutually exclusive

14. When sum of probability of two events is 1, the events are called ....

Ans : complementary events

15. An outcome of a random experiment is called an .... event.

Ans : elementary

3. TRUE/FALSE

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

the probability that it bears a two-digit number is 0.9.
Ans : True

2. A bag contains slips numbered from 1 to 100. If Fatima chooses a slip at random from the bag, it will either be an odd number or an even number. Since, this situation has only two possible outcomes, so the probability of each is $\frac{1}{2}$.
Ans : True

3. A card is selected at random from a well shuffled deck of 52 playing cards. The probability of its being a face card is $\frac{3}{13}$.
Ans : True

4. An event associated to a random experiment is a compound event if it is obtained by combining two or more elementary events associated to the random experiment.
Ans : True

5. In a family, having three children, there may be no girl, one girl, two girls or three girls. So, the probability of each is $\frac{1}{4}$.
Ans : False

6. I toss three coins together. The possible outcomes are no head, 1 head, 2 heads and 3 heads. So, I say that probability of no head is $\frac{1}{4}$.
Ans : False

7. 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, the number of blue balls in the bag is 10.
Ans : True

8. The sum of probabilities of all the outcomes of an experiment is greater than one.
Ans : False

9. The sum of the probabilities of all the elementary events of an experiment is 1.
Ans : True

10. An event A associated to a random experiment is said to occur if any one of the elementary events associated to the event A is an outcomes.
Ans : True

11. In every situation that has only two possible outcomes, each outcome will have probability $\frac{1}{2}$.
Ans : False

12. If I toss a coin 3 times and get head each time, then I should expect a tail to have a higher chance in the 4th toss.
Ans : False

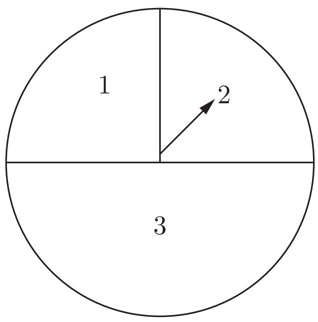
13. The probability expressed as percentage of a particular occurrence can never be less than zero.
Ans : True

14. For any event E, $P(E) + P(\overline{E}) = 1$, where $\overline{E}$ stands for 'not E'. E and $\overline{E}$ are called complementary events.
Ans : True

15. A single letter is selected at random from the word PROBABILITY, the probability it is a vowel is $\frac{4}{11}$.
Ans : True

16. The sum of probabilities of two students getting distinction in their final examinations is 1.2.
Ans : True

17. A game consists of spinning an arrow which comes to rest pointing at one of the regions (1, 2 or 3) (Fig. 15.1). The outcomes 1, 2 and 3 are equally likely to occur.



Ans : False

18. Probability of an event lies between zero and one.
Ans : False

19. If the probability of an event is 1, then it is an impossible event.
Ans : False

20. If you toss a coin 6 times and it comes down heads on each occasion, then the probability of getting a head is one.
Ans : False

21. The probability of an event can be greater than 1.
Ans : False

22. If A is any event is a sample space, then $P(\overline{A}) = 1 + P(A)$
Ans : False

23. A card is selected from a deck of 52 cards. The probability of its being a red face card is $\frac{3}{26}$.
Ans : True

4. MATCHING QUESTIONS

DIRECTION : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D, ...) in Column-I have to be matched with statements (p, q, r, s, ...) in Column-II.

1. Match the proposed probability under Column-I with the appropriate written description under Column-II :

	Column-I (Probability)		Column-II (Written Description)
(A)	0.95	(p)	An incorrect assignement
(B)	0.02	(q)	No chance of happening
(C)	-0.3	(r)	As much chance of happening as not
(D)	0.5	(s)	Very likely to happen
(E)	0	(t)	Very little chance of happening

Ans : (A) – s, (B) – t, (C) – p, (D) – r, (E) – q

2. Two unbiased coins are tossed simultaneously. Match Column-I with the probabilities given in Column-II :

	Column-I		Column-II
(A)	The probability of getting one head is	(p)	$\frac{3}{4}$
(B)	The probability of getting at least one head is	(q)	$\frac{1}{4}$
(C)	The probability of getting two heads is	(r)	$\frac{1}{2}$

Ans : (A) – r, (B) – p, (C) – q

$$\text{Sample space} = \{HH, HT, TH, TT\}$$

$$A : P\ (\text{one head}) = \frac{2}{4} = \frac{1}{2}$$

(favourable event = HT, TH)

$$B : P\ (\text{at least one head}) = \frac{3}{4}$$

(favourable event = HH, HT, TH)

$$C : P\ (\text{two heads}) = \frac{1}{4}$$

(favourable event = HH)

DIRECTION : Following question has four statements (A, B, C, D) given in Column-I and statements (p, q, r, s, t) in Column-II. Any given statement in Column-I can have correct matching with one or more statement(s) given in Column-II. Match them and choose the correct option.

3.

	Column-I		Column-II
(A)	Probability of getting number 5 in throwing a dice.	(p)	0
(B)	Probability of obtaining three heads in a single throw of a coin.	(q)	$\frac{6}{36}$
(C)	Probability of getting the sum of the numbers as 7, when two dice are thrown	(r)	1
(D)	Probability of occurrence of two sure independent events.	(s)	$\left(\frac{1}{2}\right)^0$
		(t)	$\frac{1}{6}$

(a) (A) – p, (B) – (q, r), (C) – s, (D) – t
(b) (A) – (q, t), (B) – p, (C) – (q, t), (D) – (r, s)
(c) (A) – (q, t), (B) – (r, s), (C) – p, (D) – r
(d) (A) – p, (B) – (q, t), (C) – (q, s), (D) – r

Ans : (b) (A) – (q, t), (B) – p, (C) – (q, t), (D) – (r, s)

4. Match option of Column I with the appropriate option of Column II.

Column I		Column II	
(A)	The probability of a sure event is	(p)	0
(B)	The probability of impossible event is	(q)	1
(C)	Number of face cards in the pack of cards is	(r)	$\frac{2}{7}$
(D)	Probability of occuring 53 Sundays in a leap year is	(s)	12
(E)	The probability of getting a sum of atleast 11 in a throw of a pair of dice is	(t)	$\frac{11}{13}$
(F)	A card is drawn from a well-shuffled deck of 52 cards. The probability that the card drawn is neither a king nor a queen is	(u)	$\frac{1}{12}$

Ans : (A) – q, (B) – p, (C) – s, (D) – r, (E) – u, (F) – t.

5. ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

1. **Assertion :** If a box contains 5 white, 2 red and 4 black marbles, then the probability of not drawing a white marble from the box is $\frac{5}{11}$.
Reason : $P(\overline{E}) = 1 - P(E)$, where E is any evnet.
Ans : (d) Assertion (A) is false but reason (R) is true.
Assertion is not correct, but reason is correct.
$$P(\text{white marble}) = \frac{5}{5+2+4} = \frac{5}{11}$$
$$P(\text{not white marble}) = 1 - \frac{5}{11} = \frac{11-5}{11} = \frac{6}{11}$$

2. Let A and B be two independent events.
Assertion : If $P(A) = 0.3$ and $P(A \cup \overline{B}) = 0.8$, then $P(B)$ is $\frac{2}{7}$.
Reason : $P(\overline{E}) = 1 - P(E)$, where E is any event.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
$$\frac{2}{7}$$

3. **Assertion :** If $P(A) = 0.25$, $P(B) = 0.50$ and $P(A \cap B) = 0.14$, then the probability that neither A nor B occurs is 0.39.
Reason : $\overline{A \cup B} = \overline{A} \cup \overline{B}$.
Ans : (c) Assertion (A) is true but reason (R) is false.

4. **Assertion :** When two coins are tossed simultaneously then the probability of getting no tail is $\frac{1}{4}$.
Reason : The probability of getting a head (i.e., no tail) in one toss of a coin is $\frac{1}{2}$.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Probability of getting no tail when two coins tossed simultaneously i.e., both are head.
$$\text{Probability of both head} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

5. **Assertion :** An event is very unlikely to happen. Its probability is 0.0001
Reason : If $P(A)$ denote the probability of an event A, then $0 \leq P(A) \leq 1$.
Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
Assertion and Reason is correct but Reason is not correct explanation for Assertion.

6. **Assertion :** If the probability of an event is P then probability of its complementary event will be $1 - P$.
Reason : When E and $\overline{E}$ are complementary events, then $P(E) + P(\overline{E}) = 1$.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Both statements are correct and Reason is the correct for Assertion.

7. **Assertion :** If a die is thrown, the probability of getting a number less than 3 and greater than 2 is zero.
Reason : Probability of an impossible event is zero.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Both statements are correct. Event given in Assertion is an impossible event.

8. **Assertion :** In a simultaneously throw of a pair of dice. The probability of getting a double is $\frac{1}{6}$.
Reason : Probability of an event may be negative.
Ans : (c) Assertion (A) is true but reason (R) is false.
When two dice are tossed. Total possible outcomes $= 36$
$$n(S) = 36$$
and total favourable outcomes (doublet)
$$= \{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$$
$$n(E) = 6$$
$$\text{Probability} = \frac{6}{36} = \frac{1}{6} \text{ and,}$$
we know that $0 \leq P(E) \leq 1$.

9. **Assertion :** If A and B are two independent events and it is given that $P(A) = \frac{2}{5}$, $P(B) = \frac{3}{5}$, then $P(A \cap B) = \frac{6}{25}$.
Reason : $P(A \cap B) = P(A) \cdot P(B)$, where A and B are two independent events.
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
Both assertion and reason are correct. Also, reason is the correct explanation of the assertion.
$$P(A \cap B) = \left(\frac{2}{5}\right)\left(\frac{3}{5}\right) = \frac{6}{25}$$

10. **Assertion :** The probability of winning a game is 0.4, then the probability of losing it, is 0.6
Reason : $P(E) + P(\text{not } E) = 1$
Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
We have, $P(E) = 0.4$,
where $E =$ event of winning
$$P(\text{Not } E) = 1 - P(E) = 1 - 0.4 = 0.6$$

11. **Assertion :** in rolling a dice, the probability of getting

number 8 is zero.

Reason : Its an impossible event.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Assertion and Reason both are correct. Also Reason is the correct explanation of the Assertion.

12. **Assertion :** Card numbered as 1, 2, 3 .... 15 are put in a box and mixed thoroughly, one card is then drawn at random. The probability of drawing an even number is $\frac{1}{2}$.

Reason : For any event E, we have $0 \leq P(E) \leq 1$

Ans : (d) Assertion (A) is false but reason (R) is true.

Total possible outcomes $= 15$

$$n(S) = 15$$

Total favourable numbers are 2, 4, 6, 8, 10, 12, 14.

$$E = \{2, 4, 6, 8, 10, 12, 14\}$$

$$n(E) = 7$$

Probability of drawing an even number $= \frac{7}{15}$

13. **Assertion :** If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, then $P(E \text{ or } F)$ is $\frac{5}{8}$.

Reason : If A and B are independent, then $P(A \cap B) = P(A)$.

Ans : (c) Assertion (A) is true but reason (R) is false.

$$P(E \text{ or } F) = P(E \cup F)$$
$$= P(E) + P(F) - P(E \cap F)$$
$$= \frac{1}{4} + \frac{1}{2} - \frac{1}{8} = \frac{5}{8}$$

14. **Assertion :** The probability of getting a prime number. When a die is thrown once is $\frac{2}{3}$.

Reason : Prime numbers on a die are 2, 3, 5.

Ans : (d) Assertion (A) is false but reason (R) is true.

When a die is thrown once, total possible outcomes $= 6$

and prime numbers in it are $\{2, 3, 5\}$.

Total possible outcomes $= 3$

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

15. **Assertion :** The probabilities that A, B, C can solve a problem independently are $\frac{1}{3}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. The probability that only two of them are able to solve the problem is $\frac{7}{36}$.

Reason : If A and B are mutually exclusive events, then $P(A \cap B) \neq 0$.

Ans : (c) Assertion (A) is true but reason (R) is false.

1. A and B solve the problem and C does not solve the problem
2. B and C solve the problem and A does not solve the problem and
3. C and A solve the problem and B does not solve the problem.

The required probability

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

$$= \frac{3}{36} + \frac{2}{36} + \frac{2}{36} = \frac{7}{36}$$