NCERT solutions for class 10 maths chapter 15 Probability Excercise: 15.1

Q1 (i) Complete the following statements: Probability of an event E + Probability of the event 'not E' = _____.

Answer:

Probability of an event E + Probability of the event 'not E' = 1

$$E \cup E' = S$$
$$P(E \cup E') = P(S) = 1$$

Q1 (ii) The probability of an event that cannot happen is _____. Such an event is called _____.

Answer:

The probability of an event that cannot happen is 0. Such an event is called an impossible event.

When there is no outcome favorable, i.e., the number of outcomes is zero.

Q1 (iii) The probability of an event that is certain to happen is_____ . Such an event is called _____.

Answer:

The probability of an event that is certain to happen is 1. Such an event is called **a sure/certain event**

When the number of favorable outcomes is the same as the number of all possible outcomes it is a sure event.

Q1 (iv) The sum of the probabilities of all the elementary events of an experiment is _____.

Answer:

The sum of the probabilities of all the elementary events of an experiment is **1** .

Q1 (v) The probability of an event is greater than or equal to and less than or equal to _____ .

Answer:

The probability of an event is greater than or equal to **0** and less than or equal to **1** .

Q2 (i) Which of the following experiments have equally likely outcomes? Explain. A driver attempts to start a car. The car starts or does not start.

Answer:

It is not an equally likely event since it relies on various factors that are not alike for both the outcomes.

Q2 (ii) Which of the following experiments have equally likely outcomes? Explain.

A player attempts to shoot a basketball. She/he shoots or misses the shot.

Answer:

It is not an equally likely event, because it depends on the ability and amount of practice of the player. If he is a professional player, he will more likely have a successful shot. Whereas an amateur player will more likely miss the shot.

Q2 (iii) Which of the following experiments have equally likely outcomes? Explain.

A trial is made to answer a true-false question. The answer is right or wrong.

Answer:

It is an equally likely event. The only options are true or false and only one of them is correct.

Q2 (iv) Which of the following experiments have equally likely outcomes? Explain.

A baby is born. It is a boy or a girl.

Answer:

It is an equally likely event. The only possibilities of gender are boy and girl. Hence if not boy then girl and vice versa.

Q3 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:

The tossing of the coin is considered to be a fair way of deciding because the only possible outcomes are head and tails. Hence they are equally likely events.

Q4 Which of the following cannot be the probability of an event?

(A) 2/3

(B) –1.5

(C) 15%

(D) 0.7

Answer:

We know, probability of an event is either greater than or equal to 0 and always less than or equal to 1. Hence the probability of an event can never be negative.

Therefore, (B) -1.5 cannot be the probability of an event.

Also, (A) : $\frac{2}{3} = 0.67$

(C): $15\% = \frac{15}{100} = 0.15$

(D): 0.7

Hence (A), (C), (D) all lie between 0 and 1.

Q5 If P(E) = 0.05, what is the probability of 'not E'?

Answer:

Given, $P(E) = 0.05$

We know,

$$P(not\ E) = 1 - P(E)$$

$$\therefore P(not\ E) = 1 - 0.05 = 0.95$$

Hence, the probability of 'not E' is 0.95

Q6 (i) A bag contains lemon-flavored candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out- (i) an orange-flavored candy?

Answer:

According to the question, the bag contains only lemon-flavored candies. It does not contain any orange flavor candy. Hence, every time only lemon flavor candy will come out. Therefore, $P(an\ orange\ flavoured\ candy) = 0$ i.e. event of taking out an orange-flavored candy is an impossible event.

Q6 (ii) A bag contains lemon-flavored candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out (ii) a lemon-flavored candy?

Answer:

According to the question, the bag contains only lemon-flavored candies. So the event that Malini takes out a lemon-flavored candy is a sure event.
Therefore, $P(a\ lemon\ flavoured\ candy) = 1$

Q7 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:

Given,

Probability of two students not having the same birthday $P(\overline{E}) = 0.992$

$\therefore$ Probability of two students having the same birthday = $P(E) = 1 - P(\overline{E})$

$= 1 - 0.992 = 0.008$

Hence, the probability that the 2 students have the same birthday is 0.008

Q8 (i) 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 ?

Answer:

Total number of balls in the bag = 8
No. of red balls = 3
No. of black balls = 5

(i) Let E be the event of getting a red ball

n(E) = No. of red balls = 3

n(S) = No. of total balls = 8

∴ Probability of the ball drawn to be red =

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

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

Q8 (ii) 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 not red?

Answer:

Total number of balls in the bag = 8

No. of red balls = 3

No. of black balls = 5

(ii) We know,

$$P(not\ E) = P(\overline{E}) = 1 - P(E)$$

where $E\ and\ \overline{E}$ are complementary events.

∴ Probability of not getting the red ball

$$= 1 - Probability\ of\ getting\ a\ red\ ball$$

$$= 1 - \frac{3}{8}$$

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

Q9 (i) 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 ?

Answer:

Given,

Total number of balls in the bag = 5 + 8 + 4 = 17

(i) Let R be the event that the ball taken out is red

The number of possible outcomes = 17

The number of outcomes favorable to the event R = 5

$$\therefore P(R) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{5}{17}$$

Q9 (ii) 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 (ii) white?

Answer:

Given,

Total number of balls in the bag = 5 + 8 + 4 = 17

(ii) Let W be the event that the ball taken out is white

The number of possible outcomes = 17

The number of outcomes favorable to the event W = 8

$$\therefore P(W) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{8}{17}$$

Q9 (iii) 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 not (iii) green?

Answer:

Given,

Total number of balls in the bag = 5 + 8 + 4 = 17

(iii) Let G be the event that the ball taken out is green

The number of possible outcomes = 17

The number of outcomes favorable to the event G = 4

$$\therefore P(G) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{4}{17}$$

$$\therefore P(not\ G) = P(\overline{G}) = 1 - P(G)$$
$$= 1 - \frac{4}{17}$$
$$= \frac{13}{17}$$

The required probability of not getting a green ball is $\frac{13}{17}$

Q10 (i) A piggy bank contains hundred 50p 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 will be a 50 p coin?

Answer:

Total number of coins in the piggy bank = 100+50+20+10 = 180

Let E be the event of getting a 50p coin.

Number of possible outcomes = 180

Number of outcomes favorable to event E = 100

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{100}{180}$$

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

Therefore, the probability of getting a 50p coin is $\frac{5}{9}$

Q10 (ii) A piggy bank contains hundred 50p 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 will not be a Rs 5 coin?

Answer:

Total number of coins in the piggy bank = 100+50+20+10 = 180

Let F be the event of getting an Rs. 5 coin.

Number of possible outcomes = 180

Number of outcomes favorable to event E = 10

$$\therefore P(F) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{10}{180}$$

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

$$\therefore P(not\ getting\ a\ Rs.\ 5\ coin) = P(\overline{F})$$

$$= 1 - P(F) = 1 - \frac{1}{18} = \frac{17}{18}$$

Therefore, the probability of not getting an Rs. 5 coin is $\frac{17}{18}$

Q11 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 Fig. 15.4). What is the probability that the fish taken out is a male fish?

Fig. 15.4

Answer:

Total number of fishes in the tank = 5 (male) + 8 (female) = 13

Let E be the event that the fish taken out is a male fish.

Number of possible outcomes = 13

Number of outcomes favorable to E = 5

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{5}{13}$$

Therefore, the probability that the fish are taken out is a male fish is $\frac{5}{13}$

Q12 (i) 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. 15. 5), and these are equally likely outcomes. What is the probability that it will point at 8?

Fig. 15.5

Answer:

Total posible outcomes = {1,2,3,4,5,6,7,8}

Number of possible outcomes = 8

Let E be the event of getting 8.

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{1}{8}$$

Therefore, the probability that it will point at 8 is $\frac{1}{8}$

Q12 (ii) 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. 15. 5), and these are equally likely outcomes. What is the probability that it will point at an odd number?

Fig. 15.5

Answer:

Total posible outcomes = {1,2,3,4,5,6,7,8}

Number of possible outcomes = 8

Let E be the event of pointing at an odd number.

Total number of odd numbers = n({1,3,5,7}) = 4

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{4}{8}$$

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

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

Q12 (iii) 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. 15. 5), and these are equally likely outcomes. What is the probability that it will point at a number greater than 2?

Fig. 15.5

Answer:

Total posible outcomes = {1,2,3,4,5,6,7,8}

Number of possible outcomes = 8

Let E be the event of pointing at number greater than 2

Number of favouable outcomes= n({3,4,5,6,7}) = 5

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{5}{8}$$

Therefore, the probability of pointing at a number greater than 2 is $\frac{5}{8}$

Q12 (iv) 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. 15. 5), and these are equally likely outcomes. What is the probability that it will point at a number less than 9?

Fig. 15.5

Answer:

Total possible outcomes = {1,2,3,4,5,6,7,8}

Number of possible outcomes = 8

Let E be the event of pointing at a number less than 9

Since all the numbers on the wheel are less than 9, this is the sure event.

Number of favorable outcomes = 8

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{8}{8} = 1$$

Therefore, the probability of pointing at a number less than 9 is 1 .

Q13 (i) A die is thrown once. Find the probability of getting a prime number

Answer:

Possible outcomes when a die is thrown = {1,2,3,4,5,6}

Number of possible outcomes once = 6

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

Prime numbers on the die are = {2,3,5}

Number of favorable outcomes = 3

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{3}{6}$$

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

Therefore, the probability of getting a prime number is $\frac{1}{2}$

Q13 (ii) A die is thrown once. Find the probability of getting a number lying between 2 and 6

Answer:

Possible outcomes when a die is thrown once = {1,2,3,4,5,6}

Number of possible outcomes = 6

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

Numbers lying between 2 and 6 on the die are = {3,4,5}

Number of favorable outcomes = 3

$$\therefore P(F) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{3}{6}$$

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

Therefore, the probability of getting a number lying between 2 and 6 is $\frac{1}{2}$

Q13 (iii) A die is thrown once. Find the probability of getting an odd number.

Answer:

Possible outcomes when a die is thrown = {1,2,3,4,5,6}

Number of possible outcomes once = 6

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

Odd numbers on the die are = {1,3,5}

Number of favorable outcomes = 3

$$\therefore P(O) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{3}{6}$$

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

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

Q14 (i) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting a king of red color.

Answer:

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

Hence, total possible outcomes = 52

(1) Let E be the event of getting a king of red color.

There are only red color kings: Hearts and diamonds

Hence, number of favorable outcomes = 2

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{2}{52}$$

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

Therefore, the probability of getting a king of red color is $\frac{1}{26}$

Q14 (ii) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (ii) a face card

Answer:

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

Hence, total possible outcomes = 52

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

Face cards: (J, Q, K) of each four suits

Hence, number of favorable outcomes = 12

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{12}{52}$$

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

Therefore, the probability of getting a face card is $\frac{3}{13}$

Q14 (iii) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (iii) a red face card

Answer:

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

Hence, total possible outcomes = 52

(3) Let E be the event of getting a red face card.

Face cards: (J, Q, K) of hearts and diamonds

Hence, number of favourable outcomes = 3x2 = 6

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{6}{52}$$

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

Therefore, the probability of getting a red face card is $\frac{3}{26}$

14 (iv) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (iv)the jack of hearts

Answer:

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

Hence, total possible outcomes = 52

(4) Let E be the event of getting the jack of hearts

Hence, the number of favourable outcomes = 1

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{1}{52}$$

Therefore, the probability of getting the jack of hearts is $\frac{1}{52}$

14 (v) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (v)a spade

Answer:

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

Hence, total possible outcomes = 52

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

There are 13 cards in each suit. {2,3,4,5,6,7,8,9,10,J,Q,K,A}

Hence, number of favourable outcomes = 13

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{13}{52}$$

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

Therefore, the probability of getting a spade is $\frac{1}{4}$

14 (vi) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (vi) the queen of diamonds

Answer:

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

Hence, total possible outcomes = 52

(6) Let E be the event of getting the queen of diamonds

Hence, the number of favorable outcomes = 1

$$\therefore P(E) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{1}{52}$$

Therefore, the probability of getting the queen of diamonds is $\frac{1}{52}$

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

Answer:

Total number of cards = 5

Hence, the total possible outcomes = 5

(1) There is only one queen.

Hence, favorable outcome = 1

$$\therefore P(getting\ a\ queen) = \frac{1}{5}$$

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

Answer:

When the queen is kept aside, there are only 4 cards left

Hence, the total possible outcomes = 4

(2a) There is only one ace.

Hence, favorable outcome = 1

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

Therefore, the probability of getting an ace is 0.25

15 (iii) 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. If the queen is drawn and put aside, what is the probability that the second card picked up is (b) a queen?

Answer:

When the queen is kept aside, there are only 4 cards left

Hence, the total possible outcomes = 4

(2b) Since there is no queen left.

Hence, favorable outcome = 0

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

Therefore, the probability of getting a queen is 0. Thus, it is an impossible event.

Q16 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 is taken out is a good one.

Answer:

Total number of pens = 132(good) + 12(defective)

Hence, the total possible outcomes = 144

Number of good pens = number of favorable outcomes = 132

$$\therefore P(getting\ a\ good\ pen) = \frac{favourable\ outcome}{total\ outcome} = \frac{132}{144} = \frac{11}{12}$$

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?

Answer:

Total number of bulbs = 20

Hence, total possible outcomes = 20

Number of defective bulbs = 4

Hence, the number of favorable outcomes = 4

$$\therefore P(getting\ a\ defective\ bulb) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{4}{20}$$

$= \frac{1}{5}$

Q17 (ii) Suppose the bulb is 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:

Total number of bulbs = 20

Hence, total possible outcomes = 20

Number of defective bulbs = 4

Hence, the number of favorable outcomes = 4

$$\therefore P(getting\ a\ defective\ bulb) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{4}{20}$$

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

$$\therefore P(getting\ a\ non\ defective\ bulb) = 1 - \frac{1}{5} = \frac{4}{5}$$

Q18 (i) 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 a two-digit number

Answer:

Total number of discs = 90

Number of discs having a two-digit number between 1 and 90 = 81

$$\therefore P(getting\ a\ two-digit\ number) = \frac{favourable\ outcomes}{total\ \ outcomes} = \frac{81}{90}$$

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

Q18 (ii) 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 a perfect square number

Answer:

Total number of discs = 90

Perfect square numbers between 1 and 90 are {1, 4, 9, 16, 25, 36, 49, 64, 81}

Therefore, the total number of discs having perfect squares = 9.

$$\therefore P(getting\ a\ perfect\ square) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{9}{90}$$

$$= \frac{1}{10}$$

Q18 (iii) 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 a number divisible by 5.

Answer:

Total number of discs = 90

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

Therefore, total number of discs having numbers that are divisible by 5 = 18.

$$\therefore P(getting\ a\ number\ divisible\ by\ 5) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{18}{90}$$

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

Q19 (i) A child has a die whose six faces show the letters as given below:

A	B	C	D	E	A

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

Answer:

The six faces of the die contains : {A,B,C,D,E,A}

Total number of letters = 6

(i) Since there are two A's,

number of favorable outcomes = 2

$$\therefore P(getting\ A) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{2}{6}$$

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

Therefore, the probability of getting A is $\frac{1}{3}$

Q19 (ii) A child has a die whose six faces show the letters as given below:

A	B	C	D	E	A

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

Answer:

The six faces of the die contains : {A,B,C,D,E,A}

Total number of letters = 6

(i) Since there is only one D,

number of favorable outcomes = 1

$$\therefore P(getting\ A) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{1}{6}$$

Therefore, the probability of getting D is $\frac{1}{6}$

Q20 Suppose you drop a die at random on the rectangular region shown in Fig. 15.6. What is the probability that it will land inside the circle with diameter 1m?

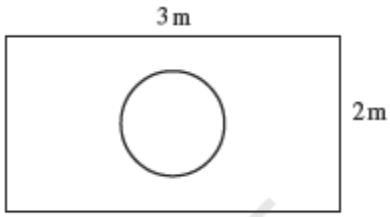

Fig. 15.6

Answer:

Here, the Total outcome in the area of the rectangle and favorable outcome is the area of the circle.

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

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

$$\therefore P(die\ will\ land\ inside\ the\ hole) = \frac{Area\ of\ circle}{Total\ area}$$

$$= \frac{\frac{\pi}{4}}{6} = \frac{\pi}{24}$$

Q21 (i) 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?

Answer:

Total number of pens = 144

Total number of defective pens = 20

∴ Number of good pens = 144-20 = 124

She will buy it if the pen is good.

Therefore, the probability that she buys = probability that the pen is good =

$$P(getting\ a\ good\ pen) = \frac{number\ of\ good\ pens}{total\ pens} = \frac{124}{144}$$

$$= \frac{31}{36}$$

Q21 (ii) 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 (ii) She will not buy it?

Answer:

Total number of pens = 144

Total number of defective pens = 20

She will buy it if the pen is good.

Therefore, the probability that she will not buy = probability that the pen is defective =

$$P(getting\ a\ defective\ pen) = \frac{no.\ of\ defective\ pens}{total\ pens} = \frac{20}{144}$$

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

Q22 (i) Refer to Example 13. (i) Complete the following table:

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

Answer:

The table becomes:

The sum of two dice	2	3	4	5	6	7	8	9	10	11	12
Probability	1/36	1/18	1/12	1/9	5/36	1/6	5/36	1/9	1/12	1/18	1/36

22.(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 of 1/11. Do you agree with this argument? Justify your answer.

Answer:

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 of 1/11. We do not agree with this argument because there are a different number of possible outcomes for each sum. we can see that each sum has a different probability.

Q23 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 when a coin is tossed 3 times: (Same as 3 coins tossed at once!)

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

Number of total possible outcomes = 8

For Hanif to win, there are only two favorable outcomes: {HHH, TTT}

Number of favorable outcomes = 2

$$\therefore P(Hanif\ will\ win) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{2}{8}$$

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

$$\therefore P(Hanif\ will\ lose) = 1 - \frac{1}{4}$$

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

Therefore, the probability that Hanif will lose is $\frac{3}{4}$

Q24 (i) A die is thrown twice. What is the probability that 5 will not come up either time?

Answer:

When a die is thrown twice, the possible outcomes =

$\{(x, y) : x, y \in \{1, 2, 3, 4, 5, 6\}\}$

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

The outcomes when 5 comes up either on them =

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

Number of such favorable outcomes = 11

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

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

Therefore, the probability that 5 will not come either time is $\frac{25}{36}$

24 (ii) A die is thrown twice. What is the probability that 5 will come up at least once?

Answer:

When a die is thrown twice, the possible outcomes =

$\{(x, y) : x, y \in \{1, 2, 3, 4, 5, 6\}\}$

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

The outcomes when 5 comes up at least once =

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

Number of such favorable outcomes = 11

$$\therefore P(5 \text{ comes up at least once}) = \frac{11}{36}$$

Therefore, the probability that 5 comes at least once is $\frac{11}{36}$

Q25 (i) 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 1/3

Answer:

The possible outcomes when two coins are tossed = {HH, HT, TH, TT}

Total number of possible outcomes = 4

$$\therefore P(getting\ two\ heads) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{1}{4}$$

Hence, the given statement is not correct. This is because one of each can occur in two different ways. Hence the mentioned events are not equally likely.

Q25 (ii) Which of the following arguments are correct and which are not correct? Give reasons for your answer. (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 1/2

Answer:

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

Total number of possible outcomes = 6

Number of odd number, {1,3,5} = 3

And, number of even numbers {2,4,6} = 3

Hence, both these events are equally likely

$$\therefore P(getting\ an\ odd) = \frac{favourable\ outcomes}{total\ outcomes} = \frac{3}{6} = \frac{1}{2}$$

NCERT solutions for class 10 maths chapter Probability Excercise: 15.2

1 (i) 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?

Answer:

Total possible ways Shyam and Ekta can visit the shop = $5 \times 5 = 25$

(1) A case that both will visit the same day.

Shyam can go on any day between Tuesday to Saturday in 5 ways.

For any day that Shyam goes, Ekta will go on the same day in 1 way.

Total ways that they both go in the same day = $5 \times 1 = 5$

$$\therefore P(both\ go\ on\ same\ day) = \frac{5}{25} = \frac{1}{5}$$

Q1 (ii) 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 (ii) consecutive days?

Answer:

Total possible ways Shyam and Ekta can visit the shop = $5 \times 5 = 25$

(2) The case that both will visit the shop on consecutive days.

Shyam can go on any day between Tuesday to Friday in 4 ways.

For any day that Shyam goes, Ekta will go on the next day in 1 way

Similarly, Ekta can go on any day between Tuesday to Friday in 4 ways.

And Shyam will go on the next day in 1 way.

(Note: None of the cases repeats since they are in a different order!)

Total ways that they both go in the same day = $4 \times 1 + 4 \times 1 = 8$

$$\therefore P(they\ go\ on\ consecutive\ days) = \frac{8}{25}$$

Q1 (iii) 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 (iii) different days?

Answer:

Total possible ways Shyam and Ekta can visit the shop = $5 \times 5 = 25$

(1) A case that both will visit the same day.

Shyam can go on any day between Tuesday to Saturday in 5 ways.

For any day that Shyam goes, Ekta will go on a different day in $(5 - 1) = 4$ ways.

Total ways that they both go in the same day = $5 \times 4 = 20$

$$\therefore P(both\ go\ on\ different\ days) = \frac{20}{25} = \frac{4}{5}$$

2 (i) A die is numbered in such a way that its faces show the numbers 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

Number in second throw						
+	1	2	2	3	3	6
1	2	3	3	4	4	7
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?

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

(1) Number of times when the sum is even = 18

$$\therefore P(sum\ is\ even) = \frac{18}{36} = \frac{1}{2}$$

Q2 (ii) A die is numbered in such a way that its faces show the numbers 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

Number in second throw	+	1	2	2	3	3	6
	1	2	3	3	4	4	7
	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 (ii) 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 possible outcomes when two dice are thrown = $6 \times 6 = 36$

Number of times when the sum is 6 = 4

$$\therefore P(sum\ is\ 6) = \frac{4}{36} = \frac{1}{9}$$

Q2 (iii) A die is numbered in such a way that its faces show the numbers 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

Number in second throw	+	1	2	2	3	3	6
	1	2	3	3	4	4	7
	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 (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 possible outcomes when two dice are thrown = $6 \times 6 = 36$

Number of times when the sum is at least 6, which means sum is greater than 5 = 15

$$\therefore P(sum\ is\ atleast\ 6) = \frac{15}{36} = \frac{5}{12}$$

Q3 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 there be the number of blue balls in the bag.

Number of red balls = 5

Thus, the total number of balls = total possible outcomes = $5 + x$

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

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

According to question,

$$P(getting\ a\ blue\ ball) = P(getting\ a\ red\ ball)$$

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

$$\Longrightarrow\ x = 2.5 = 10$$

Therefore, there are 10 blue balls in the bag.

Q4 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 what it was before. Find x.

Answer:

Total number of balls in the bag = 12

Number of black balls in the bag = x

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

According to the question,

6 more black balls are added to the bag.

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

And, the new number of black balls = $x + 6$

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

Also, $P' = 2 \times P$

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

$$\implies \frac{x+6}{18} = \frac{x}{6}$$
$$\implies x + 6 = 3x$$
$$\implies 2x = 6$$

$$\implies x = 3$$

The required value of x is 3

Q5 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 2/3 Find the number of blue balls in the jar.

Answer:

Let x be the number of blue marbles in the jar.

$\therefore$ Number of green marbles in the jar = $24 - x$

According to question,

$$P(getting\ a\ green\ marble) = \frac{24 - x}{24} = \frac{2}{3}$$

$$\implies 24 - x = 2 \times 8$$
$$\implies x = 24 - 16 = 8$$

$\therefore$ Number of blue marbles in the jar is 8