24. Probability

Exercise 24A

1. Question

A coin is tossed. What are all possible outcomes?

(i) Two coins are tossed simultaneously. What are all possible outcomes?

(ii) A die is thrown. What are all possible outcomes?

(iii) From a well-shuffled deck of 52 cards, one card is drawn at random. What is the number of all possible outcomes?

Answer

(i) A coin has two sides a head(H) and a tail(T).

∴ There are X^m possible outcomes.

[Where X is number of outcomes when a coin is tossed and m is number of coins.]

That is $2^1 = 2$ and they are H, T.

∴ All possible outcomes are H, T.

(ii) A coin has two sides a head(H) and a tail(T), and there are two such coins.

∴ There are X^m possible outcomes.

[Where X is number of outcomes when a coin is tossed and m is number of coins.]

That is $2^2 = 4$ and they are HH, HT, TH, TT

∴ All possible outcomes are HH, HT, TH, TT.

(iii) A die has 6 faces and they are 1, 2, 3, 4, 5, 6

∴ All possible outcomes are 1, 2, 3, 4, 5, 6.

(iv) A deck of cards have a total of 52 cards.

∴ Number of possible outcomes are 52.

2. Question

In a single throw of a coin, what is the probability of getting a tail?

Answer

A coin has two sides a head(H) and a tail(T).

∴ All possible outcomes are H, T.

Total number of outcomes = 2

Chances of getting a tail = 1

Probability P() $= \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a tail P(T) $\frac{\text{chances of getting a tail}}{\text{Total number of outcomes}} = \frac{1}{2}$

3. Question

In a single throw of two coins, find the probability of getting (i) both tails, (ii) at least 1 tail,(iii) at the most 1 tail.

Answer

(i) A coin has two sides a head(H) and a tail(T), and there are two such coins.

∴ There are X^m possible outcomes.

That is $2^2 = 4$ and they are HH, HT, TH, TT

∴ All possible outcomes are HH, HT, TH, TT.

Total number of outcomes = 4

Chances of getting 2 tails = 1, that is TT

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a tail P(both T) = $\frac{\text{Number of times two tails occured}}{\text{Total number of outcomes when a coin is tossed}} = \frac{1}{4}$

(ii) A coin has two sides a head(H) and a tail(T), and there are two such coins.

∴ There are X^m possible outcomes.

That is $2^2 = 4$ and they are HH, HT, TH, TT

∴ All possible outcomes are HH, HT, TH, TT.

Total number of outcomes = 4

Chances of getting atleast one tail = 3, that is HT, TH, TT.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a tail P(atleast 1 T) = $\frac{\text{Number of times atleast 1 tail occured}}{\text{Total number of outcomes when a coin is tossed}} = \frac{3}{4}$

(iii) A coin has two sides a head(H) and a tail(T), and there are two such coins.

∴ There are X^m possible outcomes.

That is $2^2 = 4$ and they are HH, HT, TH, TT

∴ All possible outcomes are HH, HT, TH, TT.

Total number of outcomes = 4

Chances of getting atmost 1 tail = 3, that is HT, TH, TT.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a tail P(atmost 1 T) = $\frac{\text{Number of times atmost 1 tail occured}}{\text{Total number of outcomes when a coin is tossed}} = \frac{3}{4}$

4. Question

A bag contains 4 white and 5 blue balls. They are mixed thoroughly and one ball is drawn at random. What is the probability of getting (i) a white ball? (ii) a blue ball?

Answer

(i) Total number of balls bag containing is: 4 white + 5 blue = 9 balls

Number of white balls = 4.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a white ball P(W) = $\frac{\text{Number of white balls}}{\text{Total number of balls}} = \frac{4}{9}$

(ii) Total number of balls bag containing is: 4 white + 5 blue = 9 balls

Number of blue balls = 5.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a blue ball P(B) = $\frac{\text{Number of blue balls}}{\text{Total number of balls}} = \frac{5}{9}$

5. Question

A bag contains 5 white, 6 red and 4 green balls. One ball is drawn at random. What is the probability that the ball drawn is (i) green?(ii) white? (iii)non-red?

Answer

(i).

Total number of balls bag containing is: 5 white + 6 red + 4 green = 15 balls

Number of green balls = 4.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a Green ball P(G) = $\frac{\text{Number of Green balls}}{\text{Total number of balls}} = \frac{4}{15}$

(ii).

Total number of balls bag containing is: 5 white + 6 red + 4 green = 15 balls

Number of white balls = 5.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a white ball P(W) = $\frac{\text{Number of White balls}}{\text{Total number of balls}} = \frac{5}{15} = \frac{1}{3}$

(iii).

Total number of balls bag containing is: 5 white + 6 red + 4 green = 15 balls

Number of outcomes (No Red) = 5 + 4 = 9, that is5 white balls + 4 Green balls.

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a Green ball P(G) = $\frac{\text{Number of blue balls+WHite balls}}{\text{Total number of balls}} = \frac{9}{15} = \frac{3}{5}$

6. Question

In a lottery, there are 10 prizes and 20 blanks. A ticket is chosen at random. What is the probability of getting a prize?

Answer

Total number of lottery Tickets = 30

Number of lottery tickets having a prize = 10

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a prized lottery ticket P(p) = $\frac{\text{Number of prized lottery tickets}}{\text{Total number of lottery tickets}} = \frac{10}{30} = \frac{1}{3}$

7. Question

It is known that a box of 100 electric bulbs contains 8 defective bulbs. One bulb is taken out at random from the box. What is the probability that the bulb drawn is (i) defective? (ii) non-defective?

Answer

(i) Total number of electric bulbs = 100

Number of defective bulbs = 8

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a defective bulbs P(d bulbs) = $\frac{\text{Number of defective balls}}{\text{Total number of electric bubls}} = \frac{8}{100} = \frac{2}{25}$

(ii) Total number of electric bulbs = 100

Number of Non-defective bulbs = 100-8 = 92 (Number of electric bulbs – Number of defective bulbs)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a Non- defective bulbs P(bulbs) = $\frac{\text{Number of non−defective balls}}{\text{Total number of electric bubls}} = \frac{92}{100} = \frac{23}{25}$

8. Question

A die is thrown at random. Find the probability of getting (i) 2 (ii) a number less than 3 (iii) a composite number (iv) a number not less than 4.

Answer

(i) Total number of outcomes = 6 (they are 1,2,3,4,5,6)

Chances of getting 2 on the die = 1

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting 2 on die P(2) = $\frac{\text{possible chances of getting 2}}{\text{Total number of outcomes}} = \frac{1}{6}$

(ii) Total number of outcomes = 6 (they are 1,2,3,4,5,6)

Chances of getting a number less than 3 on the die = 2 (They are 1,2)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a number less than 3 on die P(less than 3)

= $\frac{\text{possible chances of getting a number less than 3}}{\text{Total number of outcomes}} = \frac{2}{6} = \frac{1}{3}$

(iii) Total number of outcomes = 6 (they are 1,2,3,4,5,6)

Composite number: A number which is not a prime number or a number which is divisible by numbers other than 1 and the number itself.

Chances of getting a composite number on the die = 2 (They are 4,6)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a composite number on die the P(composite number)

= $\frac{\text{possible chances of getting a number less than 3}}{\text{Total number of outcomes}} = \frac{2}{6} = \frac{1}{3}$

(iv) Total number of outcomes = 6 (they are 1,2,3,4,5,6)

Chances of getting a number not less than 4 on the die = 4 (They are 4,5,6)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a number not less than 4 on die P(not less than 4)

$= \frac{\text{possible chances of getting a number less than 3}}{\text{Total number of outcomes}} = \frac{3}{6} = \frac{1}{2}$

9. Question

In a survey of 200 ladies, it was found that 82 like coffee while 118 dislike it. From these ladies, one is chosen at random. What is the probability that the chosen lady dislikes coffee?

Answer

Total number of ladies: 200

Number of ladies who like coffee: 82

Number of ladies who dislike coffee: 118

Probability P() $= \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

Let p(No Coffee) be probability of ladies who dislike coffee

P (No Coffee) $= \frac{\text{Number of ladies who like coffee}}{\text{Total number ladies}}$

P (No Coffee) $= \frac{118}{200} = \frac{59}{100}$

10. Question

A box contains 19 balls bearing numbers 1, 2, 3 ..., 19 respectively. A ball is drawn at random from the box. Find the probability that the number on the ball is (i) a prime number (ii) an even number (iii) a number divisible by 3.

Answer

(i) Total number of ball bearings = 19

Chances of drawing a prime numbered ball = 9 (They are 2,3,5,7,11,13,17,19)

Probability P() $= \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a prime numbered ball bearing P(prime ball)

$= \frac{\text{possible chances of drawing a prime numbered ball bearing}}{\text{Total number of ball bearings}} = \frac{8}{19}$

(ii) Total number of ball bearings = 19

Chances of drawing an even numbered ball = 9 (They are 2,4,6,8,10,12,14,16,18)

Probability P() $= \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing an even numbered ball bearing P(even ball)

$= \frac{\text{possible chances of drawing an even numbered ball bearing}}{\text{Total number of ball bearings}} = \frac{9}{19}$

(iii) Total number of ball bearings = 19

Chances of drawing a numbered ball which is divisible by 3 =6 (They are 3,6,9,12,15,18)

Probability P() $= \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a numbered ball bearing which is divisible by 3 P(ball divisible by 3)

$= \frac{\text{possible chances of drawing a numbered ball bearing which is divisible by 3}}{\text{Total number of ball bearings}} = \frac{6}{19}$

11. Question

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

is (i) a king (ii) a spade (iii) a red queen (iv) a black 8.

Answer

(i) Total number cards in a deck = 52

Number of kings in a deck of cards = 4

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a king from the deck of cards P(king)

$= \frac{\text{Number of kings in a deck of cards}}{\text{Total number of cards in a deck}} = \frac{4}{52} = \frac{1}{13}$

(ii) Total number cards in a deck = 52

Number of spades in a deck of cards = 13

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a spade from the deck of cards P(spade)

$= \frac{\text{Number of spades in a deck of cards}}{\text{Total number of cards in a deck}} = \frac{13}{52} = \frac{1}{4}$

(iii) Total number cards in a deck = 52

Chances of drawing a Red queen from the deck of cards = 2 (they are queen of hearts and queen of diamonds)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a Red queen from the deck of cards P(Red queen)

$= \frac{\text{chances of drawing a Red queen from the deck of cards}}{\text{Total number of cards in a deck}} = \frac{2}{52} = \frac{1}{26}$

(iv) Total number cards in a deck = 52

Chances of drawing a black 8 from the deck of cards = 2 (they are 8 of clubs and 8 of spades)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a black 8 from a deck of cards P(black 8)

$= \frac{\text{chances of drawing a black 8 from the deck of cards}}{\text{Total number of cards in a deck}} = \frac{2}{52} = \frac{1}{26}$

12. Question

One card is drawn at random from a well-shuffled deck of 52 cards. Find the probability that the card drawn is (i) a 4 (ii) a queen (iii) a black card.

Answer

(i) Total number cards in a deck = 52

Number of 4’s in a deck of cards = 4

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a 4 numbered card from the deck of cards P(4)

$= \frac{\text{Number of } 4's \text{ in a deck of cards}}{\text{Total number of cards in a deck}} = \frac{4}{52} = \frac{1}{13}$

(ii) Total number cards in a deck = 52

Number of Queens in a deck of cards = 4

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a queen from the deck of cards P(queen)

$= \frac{\text{Number of queen in a deck of cards}}{\text{Total number of cards in a deck}} = \frac{4}{52} = \frac{1}{13}$

(iii) Total number cards in a deck = 52

Number of black cards in a deck of cards = 26 (13 spades and 13 clubs)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a black card from the deck of cards P(black)

$= \frac{\text{Number of black cards in a deck of cards}}{\text{Total number of cards in a deck}} = \frac{26}{52} = \frac{1}{2}$

Exercise 24B

1. Question

In a spinning wheel, there are 3 white and 5 green sectors. It is spinned. What is the probability of getting a green sector?

A. $\frac{5}{3}$

B. $\frac{5}{8}$

C. $\frac{1}{5}$

D. $\frac{3}{8}$

Answer

Total number sectors = 8

Number of green sectors = 5

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

Probability of getting a green sector P(green) = $\frac{\text{Number of green sectors}}{\text{Total number of sectors}} = \frac{5}{8}$

2. Question

8 cards are numbered as 1, 2, 3, 4, 5, 6, 7, 8 respectively. They are kept in a box and mixed thoroughly. Once card is chosen at random. What is the probability of getting a number less than 4?

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. $\frac{3}{8}$

D. $\frac{3}{5}$

Answer

Total number cards kept in the box = 8

Number of cards having a number less than 4 on it = 3

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of selecting a card with a number less than 4 P(No. less than 4)

= $\frac{\text{Number of cards having a number less than 4}}{\text{Total number of cards in a deck}} = \frac{3}{8}$

3. Question

Two coins are tossed simultaneously. What is the probability of getting one head and one tail?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\frac{3}{4}$

D. $\frac{2}{3}$

Answer

All possible outcomes are HH, HT, TH, TT.

Total number of outcomes = 4

Chances of getting one head and one tail = 3, that is TH and HT

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a tail P(both T) = $\frac{\text{Number of one head and one tail occured}}{\text{Total number of outcomes when a coin is tossed}} = \frac{2}{4} = \frac{1}{2}$

4. Question

A bag contains 3 white and 2 red balls. One ball is drawn at random. What is the probability that the ball drawn is red?

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{1}{5}$

D. $\frac{2}{5}$

Answer

Total number of balls bag containing is: 3 white + 2 red = 5 balls

Number of red balls = 2

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting a red ball P(R) = $\frac{\text{Number of Red balls}}{\text{Total number of balls}} = \frac{2}{5}$

5. Question

A die is thrown. What is the probability of getting 6?

A. 1

B. $\frac{1}{6}$

C. $\frac{6}{1}$

D. none of these

Answer

Total number of outcomes = 6 (they are 1,2,3,4,5,6)

Chances of getting 6 on the die = 1

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting 6 on die P(6) = $\frac{\text{possible chances of getting 6}}{\text{Total number of outcomes}} = \frac{1}{6}$

6. Question

A die is thrown. What is the probability of getting an even number?

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{5}{6}$

D. $\frac{1}{6}$

Answer

Total number of outcomes = 6 (they are 1,2,3,4,5,6)

Chances of getting a even number on the die = 3 they are (2,4,6)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of getting even number on the die P(even) = $\frac{\text{chances of getting even number}}{\text{Total number of outcomes}} = \frac{1}{2}$

7. Question

From a well-shuffled deck of 52 cards, one card is drawn at random. What is the probability that the drawn card is a queen?

A. $\frac{1}{4}$

B. $\frac{1}{52}$

C. $\frac{1}{13}$

D. $\frac{1}{26}$

Answer

Total number cards in a deck = 52

Number of Queens in a deck of cards = 4

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a queen from the deck of cards P(queen)

$= \frac{\text{Number of queen in a deck of cards}}{\text{Total number of cards in a deck}} = \frac{4}{52} = \frac{1}{13}$

8. Question

From a well-shuffled deck of 52 cards, one card is drawn at random. What is the probability that the drawn card is a black 6?

A. $\frac{3}{26}$

B. $\frac{1}{26}$

C. $\frac{1}{13}$

D. $\frac{1}{52}$

Answer

Total number cards in a deck = 52

Chances of drawing a black 6 from the deck of cards = 2 (they are 8 of clubs and 8 of spades)

Probability P() = $\frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$

∴ Probability of drawing a black 6 from a deck of cards P(black 6)

$= \frac{\text{chances of drawing a black 6 from the deck of cards}}{\text{Total number of cards in a deck}} = \frac{2}{52} = \frac{1}{26}$