Probability

Q1. A bag contains 25 cards, numbered through 1 to 25. A card is drawn at random. What is the probability that the number on the card drawn is:
(a) multiple of 5
(b) a perfect square
(c) a prime number? [2023]

Solution: (a) 1/5 (b) 1/5 (c) 9/25

Step-by-step Explantion:

Let S be the sample space i.e bag contains cards numbered from 1 to 25.

$n(S) = 25$.

(a) A event of getting the number on this card multiple of 5 is

$n(A) = \{5, 10, 15, 20, 25\} = 5$

$P(A) = 5/25 = 1/5$

(b) Number of perfect squares between 1 to 25 = 5. The perfect squares are 1, 4, 9, 16, 25.

Hence P (a perfect square) $= 5/25 = 1/5$

(c) number of prime number between 1 to 25 = 9 (2, 3, 5, 7, 11, 13, 17, 19, 23)

Hence P (a prime number) $= 9/25$

Q2. A letter is chosen at random from all the letters of the English alphabets. The probability that the letter chosen is a vowel, is:
(a) 4/26
(b) 5/26
(c) 21/26
(d) 5/24 [2023]

Solution: (b) 5/26

Step-by-step Explantion: Total number of English Alphabets are 26, namely, A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z.

Let S be the sample space i.e. n (S) = 26

Vowels in English alphabets are 5- A, E, I, O, U.

Hence, P (a vowel) = 5/26 (Option b)

Q3. A letter of the word 'SECONDARY' is selected at random. What is the probability that the letter selected is not a vowel? [2022 Semester-2]

Solution: 2/3

Step-by-step Explantion: Number of letters in the word SECONDARY = 9.

Let S be the sample space. Hence, n (S) = 9.

letters which are not vowel are S, C, N, D, R, Y = 6

Hence, P (not a vowel) = 6/9 = 2/3

Q4. The bag contains 5 white, 2 red and 3 black balls. A ball is drawn at random. What is the probability that the ball drawn is a red ball? [2022 Semester-2]

Solution: 1/5

Step-by-step Explantion: Total number of balls in the bag = 5 + 2 + 3 =10

Let S be the sample space. Hence, n(S) = 10

Number of red balls = 2.

Hence, P (a red ball) = 2/10 = 1/5

Q5. The Probability of getting a number divisible by 3 in throwing a dice is:
(a) 1/6
(b) 1/3
(c) 1/2
(d) 2/3 [2022 Semester-2]

Solution: (b) 1/3

Step-by-step Explantion: The numbers in a dice are 1, 2, 3, 4, 5, 6 = 6.

Let S be the sample space. Hence, n(S)= 6.

Numbers divisible by 3 in a dice are = 3 and 6 = 2

Hence P(getting a number divisible by 3) = 2/6 = 1/3

Hence option (b) is correct.

Q6. Each of the letters of the word 'AUTHORIZES' is written on identical circular discs and put in a bag. They are well shuffled. If a disc is drawn at random from the bag, what is the probability that the letter is: [2020]
(i) a vowel
(ii) one of the first 9 letters of the English alphabet which appears

in the given word.
(iii) one of the last 9 letters of the English alphabet which appears in the given word.

Solution: (i) 1/2 (ii) 2/5 (iii) 1/2

Step-by-step Explantion:

Number of letters in the word **'AUTHORIZES'** is 10.

Let S be the sample space. Hence n(S) = 10.

(i) Vowels in the word AUTHORIZES = A, U, O, I, E = 5

Hence P (a vowel) = 5/10 = 1/2

(ii) One of the first 9 letters of the English alphabet which appears in the word AUTHORIZES are = A, H, I, E = 4

Hence P (one of the first 9 letters of the English alphabet which appears in the word) = 4/10 = 2/5

(iii) One of the last 9 letters of the English alphabet which appears in the word AUTHORIZES are = U, T, R, Z, S = 5

Hence, P(One of the last 9 letters of the English alphabet which appears in the word) = 5/10 = 1/2

Q7. There are 25 discs numbered 1 to 25. They are put in a closed box and shaken thoroughly. A disc is drawn at random from the box. Find the probability that the number on the disc is: [3]
(i) an odd number
(ii) divisible by 2 and 3 both
(iii) a number less than 16. [2019]

Solution: (i) 13/25 (ii) 4/25 (iii) 3/5

Step-by-step Explantion: There are 25 discs numbered 1 to 25. Let S be the sample space.

Hence, n(S) = 25.

(i) odd numbers = 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25 = 13

Hence, P (odd number) = 13/25.

(ii) Numbers divisible by 2 and 3 both are = 6, 12, 18, 24 = 4

Hence, P(Number divisible by 2 and 3 both) = 4/25.

(iii) Numbers less than 16 are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 = 15

Hence, P(Number less than 16) = 15/25 = 3/5.

Q8. Cards bearing numbers 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card which is :
(i) a prime number.
(ii) a number divisible by 4.
(iii) a number that is a multiple of 6.
(iv) an odd number [4] [2018]

Solution: (i) 1/10 (ii) 1/2 (iii) 3/10 (iv) 0

Step-by-step Explantion: Total number of cards bearing numbers 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20 =10.

Let S be the sample space. Hence n(S) = 10.

(i) Prime numbers in the cards is only number 2. Hence total number of cards having prime number = 1

Hence, P (a prime number) = 1/10

(ii) numbers divisible by 4 in cards are 4, 8, 12, 16, 20 = 5.

Hence, P(number divisible by 4) = 5/10 = 1/2.

(iii) numbers multiple of 6 in the cards are 6, 12, 18 = 3

Hence, P(a number that is a multiple of 6) = 3/10.

(iv) odd numbers in the cards are 0.

Hence, P(an odd number) = 0/10 = 0.

Q9. Sixteen cards are labelled as a, b, c ... m, n, o, p. They are put in a box and shuffled. A boy is asked to draw a card from the box. What is the probability that the card drawn is : [3]
(i) a vowel
(ii) a consonant
(iii) none of the letters of the word median [3] [2017]

Solution: (i) 1/4 (ii) 3/4 (iii) 5/8

Step-by-step Explantion: Sixteen cards are labelled as a, b, c ... m, n, o, p.

Let S be the sample space. Hence n(S) = 16.

(i) Vowels in the cards are a, e, i, o = 4

Hence, P(a vowel) =4/16 = 1/4.

(ii) consonants in the cards are b, c, d, f, g, h, j, k, l, m, n, p = 12

Hence, P(a consonant) = 12/16 = 3/4.

(iii) none of the letters of the word 'median' in the cards are b, c, f, g, h, j, k, l, o, p = 10.

Hence, P(none of the letters of the word median) = 10/16 = 5/8.

Q10. A game of number has cards marked with 11, 12, 13, 40. A card is drawn at random. Find the Probability that the number on the card drawn is:
(i) A perfect square
(ii) Divisible by 7. [3] [2016]

Solution: (i) 0 (ii) 0

Step-by-step Explantion: A game of number has cards marked with 11, 12, 13, 40.

Let S be the sample space. Hence, n (S) = 4

(i) Perfect squares in the numbers 11, 12, 13 40 are = 0.

Hence P(a perfect square) = 0/4 = 0.

(ii) Numbers divisible by 7 in the numbers 11, 12, 13 40 are = 0.

Hence P(divisible by 7) = 0/4 = 0.

Q11. A bag contains 5 white balls, 6 red balls and 9 green balls. A ball is drawn at random from the bag. Find the probability that the ball drawn is:
(i) a green ball.
(ii) a white or a red ball
(iii) is neither a green ball nor a white ball. [2015]

Solution: (i) 9/20 (ii) 11/20 (iii) 3/10

Step-by-step Explantion: Let S be the sample space. Total number of balls in the bag = 5 + 6 + 9 = 20.

Hence, n(S) = 20

(i) Number of green balls = 9.

Hence, P(a green ball) = 9/20.

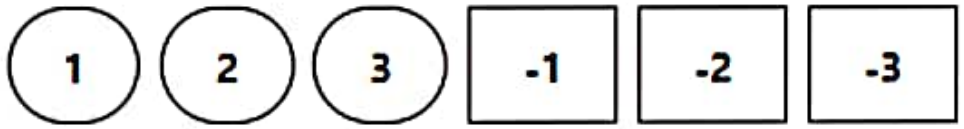
(ii) Number of white and red balls = 5 + 6 = 11.

Hence, P(a white or a red ball) = 11/20.

(iii) Neither green ball or white balls mean red balls. Number of red balls = 6.

Hence, P(neither a green ball nor a white ball) = 6/20 = 3/10.

Q12. A die has 6 faces marked by the given numbers shown below:



The die is thrown once. What is the probability of getting
(i) a positive integer.
(ii) an integer greater than -3.
(iii) the smallest integer. [2014]

Solution: (i) 1/2 (ii) 5/6 (iii) 1/6

Step-by-step Explantion: Numbers in a die are 6 (1, 2, 3, -1, -2, -3).

Let S be the sample space. Therefore, n(S) = 6.

(i) Number of positive integers in the die is 3 (1, 2, 3).

Hence, P(a positive integer) = 3/6 = 1/2.

(ii) Number of integers in a die which are greater than -3 is 5 (1, 2, 3, -1, -2).

Hence, P(an integer greater than -3) = 5/6.

(iii) the smallest integer is -3.

Hence P(smallest integer) = 1/6.

Q13. A box contains some black balls and 30 white balls. If the probability of drawing a black ball is two-fifths of a white ball, find the number of black balls in the box. [3] [2013]

Solution: 12

Step-by-step Explantion: Let the number of Black balls be x. Therefore, total number of balls = x + 30.

Let S be the sample space. Hence, n(S) = x + 30.

Number of white balls = 30.

Hence, P(a white ball) = 30/ (x+30)

Number of black balls = x.

Hence, P(a black ball) = x/(x+30)

Given,

$$\frac{x}{x+30} = \frac{2}{5} \times \frac{30}{x+30}$$

$$\Rightarrow x = \frac{2 \times 30}{5}$$

$$\Rightarrow x = 12$$

Hence, number of black balls is 12.

Q14. Two coins are tossed once. Find the probability of getting:
(i) 2 heads
(ii) At least 1 tail. [2012]

Solution: (i) 1/4 (ii) 3/4

Step-by-step Explantion:

Two coins are tossed. The sample set S will be {HH, HT, TH, TT}.
Hence, n(S) = 4

(i) Let A be the event of getting two heads. Then event A will contain the outcome {HH} = 1

Hence, P(A) = 1/4.

(ii) Let B be the event of getting at least 1 tail. Then, B will contain the outcomes {HT, TH, TT} = 3

P(B) = 3/4.

Q15. From a pack of 52 playing cards all cards whose numbers are multiples of 3 are removed. A card is now drawn at random. What is the probability that the card drawn is:
(i) a face card (King, Jack or Queen)
(ii) an even-numbered red card? [3] [2011]

Solution: (i) 3/10 (ii) 1/4

Step-by-step Explantion: From a pack of 52 playing cards all cards whose numbers are multiples of 3 are removed.

So, 3, 6, 9 are removed from each set. Hence total cards removed = 3×4 = 12.

Total number of cards left = 52 – 12 = 40.

Let S be the sample space. Hence, n(S) = 40.

(i) Total face cards = 4 kings, 4 queens and 4 Jacks = 12

Hence, P(a face card) = 12/40 =3/10.

(ii) even-numbered red cards (i.e from Hearts and diamonds) = 2(2, 4, 6, 8, 10)= 2(5) = 2×5 =10.

Hence, P(an even-numbered red card) = 10/40 = 1/4.

Q16. Cards marked with numbers 1, 2, 3, 4 ... 20 are well shuffled and a card is drawn at random. What is the probability that the number of the cards is
(i) a prime number
(ii) divisible by 3
(iii) a perfect square? [3] [2010]

Solution: (i) 2/5 (ii) 3/10 (iii) 1/5

Step-by-step Explantion: Cards are marked with numbers 1, 2, 3, 4 ... 20. Therefore, total number of cards = 20.

Let S be the sample space. Hence, n(S) = 20.

(i) Prime numbers are 2, 3, 5, 7, 11, 13, 17, 19 = 8.

Hence, P(a prime number) = 8/20 = 2/5.

(ii) numbers divisible by 3 are 3, 6, 9, 12, 15, 18 = 6.

Hence, P(divisible by 3) = 6/20 = 3/10.

(iii) Perfect squares are 1, 4, 9, 16 = 4.

Hence, P(a perfect square) = 4/20 = 1/5.