

Probability

EXAM DRILL

SOLUTIONS

1. (b) : Let E be the event that 'it will rain today'.

Given, $P(E) = 0.07$

$$\therefore P(\text{not } E) = 1 - P(E) \quad [\because P(E) + P(\bar{E}) = 1]$$

$$= 1 - 0.07 = 0.93$$

2. (c) : Numbers on a die are 1, 2, 3, 4, 5 and 6.

\therefore Total number of possible outcomes = 6

Smallest odd prime number = 3

\therefore Number of favourable outcome = 1

$\therefore P(\text{getting smallest odd prime}) = 1/6$

3. (c) : Total number of fruits in the basket = 10

\therefore Total number of possible outcomes = 10

Number of fruits not rotten = $10 - 3 = 7$

\therefore Number of favourable outcomes = 7

\therefore Required probability = $7/10$

4. (a) : Let E be the event of hitting the boundary.

$$\therefore P(E) = \frac{8}{40} = \frac{1}{5}$$

$$\Rightarrow P(\text{not } E) = 1 - P(E) = 1 - \frac{1}{5} = \frac{5-1}{5} = \frac{4}{5}$$

5. (b) : The total number of letters in the given word is 10.

\therefore Total number of possible outcomes = 10

The number of consonants in the given word = 7

\therefore Number of favourable outcomes = 7

\therefore Required probability = $7/10$

6. (b) : Number of letters in the word FOUNDATION is 10.

\therefore Total number of possible outcomes = 10.

Repeated letters are O and N.

\therefore Number of favourable outcomes = 2

$$\therefore \text{Required probability} = \frac{2}{10} = \frac{1}{5}$$

7. (a) : Possible outcomes are 1, 2, 3, 4, 5 and 6.

\therefore Total number of possible outcomes = 6

The factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.

Here, we see that 5 is not a factor of 36.

\therefore Number of favourable outcome = 1

\therefore Required probability = $1/6$

8. In a deck of 52 cards, there are 13 cards of heart and 1 of them is ace of heart.

Hence, the number of outcomes favourable to E is 51.

9. Numbers on a die are 1, 2, 3, 4, 5 and 6.

\therefore Total number of outcomes = 6

Odd number less than 3 is 1 only.

\therefore Number of favourable outcome = 1

\therefore Required probability = $1/6$.

10. Possible outcomes are {HH, HT, TH, TT}, i.e., 4 in number.

$$P(\text{two heads}) = \frac{1}{4}, P(\text{one head}) = \frac{2}{4}$$

$$\therefore \text{Ratio of the probability of two heads to one head}$$

$$= \frac{1}{4} : \frac{2}{4} = 1 : 2 \therefore k = 2$$

11. In a deck of 52 cards, there are 12 face cards i.e., 6 red and 6 black cards.

So, probability of getting a red face card = $6/52 = 3/26$

12. Total number of cards from 2 to 51 in a box are $51 - 1 = 50$.

\therefore Total number of possible outcomes = 50

Out of 50 possible outcomes, 25 outcomes i.e., 2, 4, 6, 8, 10, ..., 50 are even numbers.

\therefore Number of favourable outcomes = 25

$$\therefore P(\text{number on the drawn card is an even number})$$

$$= \frac{25}{50} = \frac{1}{2}$$

13. Let E be the event sure to occur.

$\therefore P(E) = 1$

$\therefore P(\text{non-occurrence of } E) = P(\bar{E}) = 1 - P(E) = 1 - 1 = 0$

14. Given, $P(A \text{ winning a game}) = 0.7$

$$\therefore P(A \text{ losing the game}) = 1 - P(A \text{ winning a game})$$

$$= 1 - 0.7 = 0.3$$

15. Total number of possible outcomes = 9

Numbers favourable to $|x| < 2$ are -1, 0 and 1 i.e., 3 in number.

$$\therefore \text{Required probability} = \frac{3}{9} = \frac{1}{3}$$

16. Total number of puppets in claw crane

$$= 58 + 42 + 36 + 64 = 200$$

$$(i) (b) : P(\text{picking a tiger}) = \frac{36}{200} = \frac{9}{50}$$

$$(ii) (a) : P(\text{picking a monkey}) = \frac{64}{200} = \frac{8}{25}$$

$$(iii) (c) : P(\text{picking a teddy bear}) = \frac{58}{200} = \frac{29}{100}$$

$$(iv) (d) : P(\text{not picking a monkey})$$

$$= 1 - P(\text{picking a monkey})$$

$$= 1 - \frac{8}{25} = \frac{17}{25}$$

$$(v) \text{ (d) : } P(\text{picking a pokemon}) = \frac{42}{200} = \frac{21}{100}$$

$$\begin{aligned} \therefore P(\text{not picking a pokemon}) &= 1 - P(\text{picking a pokemon}) \\ &= 1 - \frac{21}{100} = \frac{79}{100} \end{aligned}$$

$$17. \text{ Total time} = 3 \text{ mins} = 3 \times 60 \text{ secs} = 180 \text{ secs}$$

$$(i) \text{ (a) : Required probability} = \frac{30}{180} = \frac{1}{6}$$

$$(ii) \text{ (a) : Required probability} = \frac{45}{180} = \frac{1}{4}$$

$$(iii) \text{ (d) : } P(\text{music will stop within 2 mins}) = \frac{120}{180} = \frac{2}{3}$$

$$\therefore P(\text{music will stop after 2 mins}) = 1 - \frac{2}{3} = \frac{1}{3}$$

$$\begin{aligned} (iv) \text{ (b) : Required probability} &= 1 - P(\text{music will stop within first 60 secs}) \\ &= 1 - \frac{60}{180} = 1 - \frac{1}{3} = \frac{2}{3} \end{aligned}$$

$$(v) \text{ (b) : Required probability} = \frac{82}{180} = \frac{41}{90}$$

$$18. \text{ Total number of blocks in the kit} = 120$$

$$\text{Number of red blocks} = 40$$

$$\text{Number of blue blocks} = 25$$

$$\text{Number of green blocks} = 30$$

$$\begin{aligned} \therefore \text{Number of yellow blocks} &= 120 - (40 + 25 + 30) \\ &= 120 - 95 = 25 \end{aligned}$$

$$(i) \text{ (d) : } P(\text{block is red}) = \frac{40}{120} = \frac{1}{3}$$

$$\begin{aligned} (ii) \text{ (c) : } P(\text{block is not yellow}) &= 1 - P(\text{block is yellow}) \\ &= 1 - \frac{25}{120} = 1 - \frac{5}{24} = \frac{19}{24} \end{aligned}$$

$$(iii) \text{ (c) : } P(\text{block is green}) = \frac{30}{120} = \frac{1}{4}$$

$$(iv) \text{ (b) : } P(\text{block is yellow}) = \frac{5}{24}$$

$$\begin{aligned} (v) \text{ (b) : } P(\text{block is not blue}) &= 1 - P(\text{block is blue}) \\ &= 1 - \frac{25}{120} = 1 - \frac{5}{24} = \frac{19}{24} \end{aligned}$$

$$19. \text{ Total number of possible outcome, } n(S) = 200$$

(i) (c) : Let A be the event that number on selected card is divisible by 10.

$$\begin{aligned} \therefore A &= \{10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200\} \\ \Rightarrow n(A) &= 20 \end{aligned}$$

$$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{20}{200} = \frac{1}{10}$$

(ii) (c) : Let B be the event that the number on the selected card is a prime number more than 100 but less than 150.

$$\begin{aligned} \therefore B &= \{101, 103, 107, 109, 113, 127, 131, 137, 139, 149\} \\ \Rightarrow n(B) &= 10 \end{aligned}$$

$$\therefore P(B) = \frac{n(B)}{n(S)} = \frac{10}{200} = \frac{1}{20}$$

(iii) (c) : Let C be the event that the number on the selected card is a multiple number of 3.

$$\begin{aligned} \therefore C &= \{3, 6, 9, 12, \dots, 192, 195, 198\} \\ \Rightarrow n(C) &= 66 \end{aligned}$$

$$\therefore P(C) = \frac{n(C)}{n(S)} = \frac{66}{200} = \frac{33}{100}$$

(iv) (a) : Let D be the event that the number on the selected card is a perfect square.

$$\begin{aligned} \therefore D &= \{1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196\} \\ \Rightarrow n(D) &= 14 \end{aligned}$$

$$\therefore P(D) = \frac{n(D)}{n(S)} = \frac{14}{200} = \frac{7}{100}$$

(v) (a) : Let E be the event that the number on the selected card is a perfect cube.

$$\begin{aligned} \therefore E &= \{1, 8, 27, 64, 125\} \\ \Rightarrow n(E) &= 5 \end{aligned}$$

$$\therefore P(E) = \frac{5}{200} = \frac{1}{40}$$

$$20. \text{ Total number of possible outcomes} = 36$$

Favourable outcomes are (1, 5), (2, 4), (3, 3), (4, 2), (5, 1) and (6, 6).

$$\therefore \text{Number of favourable outcomes} = 6$$

$$\begin{aligned} \therefore P(\text{sum of two numbers will be multiple of 6}) &= \frac{6}{36} = \frac{1}{6} \end{aligned}$$

$$21. \text{ Given numbers are } 1, 2, 3, \dots, 30.$$

$$\therefore \text{Total number of possible outcomes} = 30$$

Prime numbers greater than 5 from 1 to 30 are 7, 11, 13, 17, 19, 23, 29.

$$\therefore \text{Number of favourable outcomes} = 7$$

$$\therefore P(\text{selecting a prime number greater than 5}) = \frac{7}{30}$$

$$22. \text{ Total number of envelopes in the box} = 1000$$

$$\therefore \text{Total number of possible outcomes} = 1000$$

$$\begin{aligned} \text{Number of envelopes containing cash prize} &= 10 + 100 + 200 = 310 \end{aligned}$$

$$\begin{aligned} \text{So, number of envelopes containing no cash prize} &= 1000 - 310 = 690 \end{aligned}$$

$$\therefore \text{Number of favourable outcomes} = 690$$

$$\therefore \text{Required probability} = \frac{690}{1000} = 0.69$$

23. Let E be the event of guessing correct answer.

$$\therefore P(E) = \frac{x}{12}, P(\bar{E}) = \frac{2}{3} \quad [\text{Given}]$$

We know, $P(E) + P(\bar{E}) = 1$

$$\Rightarrow \frac{x}{12} + \frac{2}{3} = 1 \Rightarrow \frac{x}{12} = 1 - \frac{2}{3} = \frac{1}{3} \Rightarrow x = 4$$

24. Total number of cards = $100 - 2 = 98$

Let E be the event that the selected card bears a perfect square number.

$$\therefore E = \{4, 9, 16, 25, 36, 49, 64, 81, 100\}$$

\therefore Number of favourable outcomes = 9

$$\therefore P(E) = \frac{9}{98}$$

25. For perfect square number, sum of numbers on both the dice should be 1 or 4 or 9.

Total number of outcomes = 36

Favourable outcomes are $\{(1, 3), (2, 2), (3, 1), (3, 6), (4, 5), (5, 4), (6, 3)\}$

Number of favourable outcomes = 7

\therefore Required probability = $7/36$

26. When a cube is thrown once, all possible outcomes are 2, 3, 5, 7, A , B .

\therefore Total number of possible outcomes = 6

(i) Let E_1 be the event of getting an alphabet.

\therefore Favourable outcomes are A, B .

\therefore Number of favourable outcomes = 2

$$\therefore P(E_1) = \frac{2}{6} = \frac{1}{3}$$

(ii) Let E_2 be the event of getting a prime number.

\therefore Favourable outcomes are 2, 3, 5, 7.

\therefore Number of favourable outcomes = 4

$$\therefore P(E_2) = \frac{4}{6} = \frac{2}{3}$$

(iii) Let E_3 be the event of getting a consonant.

\therefore Favourable outcome is B .

\therefore Number of favourable outcome = 1

$$\therefore P(E_3) = 1/6$$

27. The number x is selected from the numbers 1, 2, 3 and the number y is selected from the numbers 1, 4, 9.

Possible outcomes of the experiment are

$(1, 1), (1, 4), (1, 9), (2, 1), (2, 4), (2, 9), (3, 1), (3, 4), (3, 9)$.

So, the total number of possible outcomes = $3 \times 3 = 9$

Let A be the event of getting $xy < 9$, then the outcomes favourable to A are $(1, 1), (1, 4), (2, 1), (2, 4), (3, 1)$.

\therefore Number of favourable outcomes = 5

$$\therefore P(A) = 5/9$$

28. Area of the square $ABCD = (BC)^2 = 10^2 = 100 \text{ cm}^2$

Side of square $PQRS = 5 \text{ cm}$

Now, area of the square $PQRS = (5)^2 = 25 \text{ cm}^2$

\therefore $P(\text{the point will be chosen from the shaded part})$

$$= \frac{\text{Area of the square PQRS}}{\text{Area of the square ABCD}} = \frac{25}{100} = 0.25$$

29. If two unbiased coins are tossed simultaneously, then the possible outcomes are $\{HH, HT, TH, TT\}$

\therefore Total number of possible outcomes = 4

No head is obtained if the event $\{TT\}$ occurs.

\therefore Number of favourable outcome = 1

$\therefore P(\text{getting no head}) = 1/4$

But, given $P(\text{getting no head}) = A/B$

So, $A = 1$ and $B = 4$

$$\therefore (A + B)^2 = (1 + 4)^2 = (5)^2 = 25$$

30. Given numbers are 2, 3, 3, 5, 5, 5, 7, 9, 20

Since the total numbers are 9, i.e., an odd number of observations.

Therefore, median is the value of $\left(\frac{9+1}{2}\right)^{\text{th}}$ observation, i.e., 5^{th} observation = 5

Total number of possible outcomes = 9

Let A denotes the event "the selected number is median".

Number of outcomes favourable to the event A are 3.

(\because 5 repeats 3 times)

$$\text{Hence, } P(A) = \frac{3}{9} = \frac{1}{3}$$

31. Total possible outcomes in spinning of an arrow twice = $6 \times 6 = 36$

So, favourable outcomes (a, b) for which $\frac{a}{b} > 1$ are $\{(2, 1),$

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

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

\therefore Number of favourable outcomes = 15

\therefore Required probability = $15/36 = 5/12$

32. Total number of cards bearing numbers from 6 to 70 = $70 - 5 = 65$

(i) Let E_1 denotes the event that card bears a one digit number. Then, numbers favourable to event E_1 are 6, 7, 8, 9.

\therefore Number of favourable outcomes = 4

$$\therefore P(E_1) = 4/65$$

(ii) Let E_2 denotes the event that card bears a number divisible by 5. Then, numbers favourable to event E_2 are 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70.

\therefore Number of favourable outcomes = 13

$$\therefore P(E_2) = \frac{13}{65} = \frac{1}{5}$$

(iii) Let E_3 denotes the event that card bears an odd number less than 30. Then, numbers favourable to event E_3 are 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29.

\therefore Number of favourable outcomes = 12

$$\therefore P(E_3) = \frac{12}{65}$$

(iv) Let E_4 denotes the event that card bears a composite number between 50 and 70. Then, numbers favourable to event E_4 are 51, 52, 54, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 68, 69.

\therefore Number of favourable outcomes = 15

$$\therefore P(E_4) = \frac{15}{65} = \frac{3}{13}$$

OR

Hari throws two dice once.

When a pair of different dice is thrown, then the total number of possible outcomes = $6 \times 6 = 36$

Let A denotes the event that the product of two numbers is 36.

\therefore Favourable outcome is (6, 6) i.e., 1 in number.

$$\therefore P(A) = 1/36$$

Suresh throws one die.

So, the number of possible outcomes = 6

Let B denotes the event that the square of the number is 36.

\therefore Favourable outcome is 6 i.e., 1 in number.

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

Since, $P(B) > P(A)$

\therefore Suresh has better chance of getting the number 36.

33. (i) Total number of balls = 18

Given, number of red balls = x

$$\therefore P(\text{drawing a red ball}) = \frac{x}{18}$$

$$\therefore P(\text{not drawing a red ball}) = 1 - P(\text{drawing a red ball}) \\ = 1 - \frac{x}{18} = \frac{18-x}{18}$$

(ii) When 2 more red balls are added, then total number of balls = $18 + 2 = 20$ and number of red balls = $x + 2$

$$\therefore P(\text{drawing a red ball}) = \frac{x+2}{20}$$

$$\text{According to question, } \frac{x+2}{20} = \frac{9}{8} \left(\frac{x}{18} \right) \Rightarrow \frac{x+2}{20} = \frac{x}{16}$$

$$\Rightarrow 16(x+2) = 20x$$

$$\Rightarrow 4x + 8 = 5x \Rightarrow x = 8$$

OR

Let R , W and G be the event of getting red, white and green balls respectively.

Given, total number of balls = 30 and

number of red balls = 15

$$\therefore P(R) = \frac{15}{30} = \frac{1}{2}$$

Given, $P(W) = 2 \times P(G)$... (i)

We know, sum of probabilities of elementary events is 1.

$$\therefore P(R) + P(W) + P(G) = 1$$

$$\Rightarrow \frac{1}{2} + 2P(G) + P(G) = 1 \quad [\text{From (i)}]$$

$$\Rightarrow 3P(G) = 1 - \frac{1}{2} = \frac{1}{2} \Rightarrow P(G) = \frac{1}{6}$$

$$\text{From (i), } P(W) = 2 \times \frac{1}{6} = \frac{1}{3}$$

$$\Rightarrow \frac{\text{Number of white balls}}{30} = \frac{1}{3}$$

$$\Rightarrow \text{Number of white balls} = \frac{1}{3} \times 30 = 10$$

$$\text{Now, } P(G) = \frac{1}{6}$$

$$\Rightarrow \frac{\text{Number of green balls}}{30} = \frac{1}{6}$$

$$\Rightarrow \text{Number of green balls} = \frac{1}{6} \times 30 = 5$$

Hence, number of white and green balls are respectively 10 and 5.

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

(i) Favourable outcomes when sum is even are

{(1, 1), (1, 3), (1, 5), (2, 2), (2, 4), (2, 6), (3, 1), (3, 3), (3, 5), (4, 2), (4, 4), (4, 6), (5, 1), (5, 3), (5, 5), (6, 2), (6, 4), (6, 6)}
i.e., 18 in number.

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

(ii) Favourable outcomes when product is even are

{(1, 2), (1, 4), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 2), (3, 4), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 2), (5, 4), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}
i.e., 27 in number

$$\therefore P(\text{getting even product}) = \frac{27}{36} = \frac{3}{4}$$

