OBJECTIVE Type Questions

[**1** mark]

Multiple Choice Questions

1. If an event cannot occur, then its probability is:

(a) 1

(b) $\frac{3}{4}$

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

(d) 0

[NCERT Exemplar]

Ans. *(d) 0*

Explanation: The event which cannot occur is called an impossible event, whose probability is zero.

2. Which of the following cannot be the probability of an event?

(a) 0.01

(b) 3%

(c) $\frac{16}{17}$

(d) $\frac{17}{16}$

[CBSE Term-1 Std. 2021]

Ans. *(d)* $\frac{17}{16}$

Explanation:

Here, $0.01 = \frac{1}{100}$, $3\% = \frac{3}{100}$ and $\frac{16}{17} = 0.94$

The probability of an event always lies from 0 to 1.

As $\quad \frac{17}{16} > 1$

$\therefore \frac{17}{16}$ cannot be the probability of an event.

3. If a card is drawn from a deck of cards, what is the probability of a card drawn to be a red or a black card and what can we say about that event?

(a) 1 and it is a sure event.

(b) 0 and it is a sure event.

(c) 1 and it is an impossible event.

(d) 0 and it is an impossible event.

[CBSE Question Bank 2022]

Ans. *(a) 1 and it is a sure event*

Explanation: Total number of cards = 52

Number oif red cards = 26

$\therefore \quad$ P (getting a red card) $\quad = \frac{26}{52} = \frac{1}{2}$

Now, number of black cards = 26

$\therefore$ P (getting a black card) = $\dfrac{26}{52}$ = $\dfrac{1}{2}$

So, the required probability = $\dfrac{1}{2}$ + $\dfrac{1}{2}$ = 1

Thus, it is a sure event.

4. For an E, P(E) + P($\bar{E}$) = x, then the value of x^3 – 3 is:

(a) –2   (b) 2

(c) 1   (d) –1

[CBSE Term-1 Std. 2021]

Ans. (a) –2

Explanation: We know, sum of probability of complementary events is one.

So, for any event E,

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

$\therefore$ x = 1

Now, x^3 – 3 = $(1)^3$ – 3

             = 1 – 3

             = –2

5. 🖉 The probability expressed as a percentage of a particular occurrence can never be:

(a) less than 100

(b) less than 0

(c) greater than 1

(d) anything but a whole number

[NCERT Exemplar]

6. Two dice are rolled simultaneously. What is the probability that 6 will come up at least once?

(a) $\dfrac{1}{6}$ (b) $\dfrac{7}{36}$

(c) $\dfrac{11}{36}$ (d) $\dfrac{13}{36}$

[CBSE SQP Std. 2022]

Ans. (c) $\dfrac{11}{36}$

[CBSE Marking Scheme SQP Std. 2022]

Explanation: Outcomes when 6 will come up at least once are:

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

Probability that 6 will come up at least once

         = $\dfrac{11}{36}$

7. A number from numbers 1 to 100 was chosen at random. What is the probability that this number is a prime number that lies between 75 and 85?

(a) $\dfrac{1}{10}$ (b) $\dfrac{1}{50}$

(c) $\dfrac{1}{25}$ (d) $\dfrac{7}{100}$

Ans. (b) $\dfrac{1}{50}$

Explanation: Prime numbers between 75 and 85 are 79 and 83.

So, required probability is $\dfrac{2}{100}$ or, $\dfrac{1}{50}$.

8. A card is selected from a deck of 52 cards. The probability of its being a red face card is:

(a) $\dfrac{3}{26}$ (b) $\dfrac{3}{13}$

(c) $\dfrac{2}{13}$ (d) $\dfrac{1}{2}$

[CBSE 2012, 10, NCERT Exemplar]

Ans. (a) $\dfrac{3}{26}$

Explanation: In a deck of 52 cards:

Total number of cards = 52

Number of face cards = 12

Number of black face cards = 6

            (3 of spades and 3 of clubs)

Number of red face cards = 6

           (3 of hearts and 3 of diamonds)

$\therefore$ P(red face card) = $\dfrac{6}{52}$ = $\dfrac{3}{26}$.

9. 🖉 When a die is thrown, the probability of getting an odd number less than 3 is:

(a) $\dfrac{1}{6}$ (b) $\dfrac{1}{3}$

(c) $\dfrac{1}{2}$ (d) 0

[NCERT Exemplar]

10. 🖉 A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought?

(a) 40   (b) 240

(c) 480   (d) 750

[NCERT Exemplar]

11. A card is selected at random from a well shuffled deck of 52 cards. The probability of it being a red face card is:

(a) $\dfrac{3}{26}$ (b) $\dfrac{3}{13}$

(c) $\dfrac{2}{13}$ (d) $\dfrac{1}{2}$

[CBSE SQP Basic 2022]

Ans. (a) $\dfrac{3}{26}$

[CBSE Marking Scheme SQP Basic 2022]

Explanation: There are 52 cards in a deck out of which half are red cards.

In a deck of cards, there are 6 red-faced cards.

$$\text{Probability} = \dfrac{\text{No. of favourable events}}{\text{Total no. of events}}$$

So, the probability of drawing a red-faced card is 6 out of 52 cards.

Thus, the probability of drawing a red face card

$$\text{from a deck of cards} \;=\; \dfrac{6}{52}$$

$$= \dfrac{3}{26}$$

12. One ticket is drawn at random from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is:

(a) $\dfrac{1}{5}$ (b) $\dfrac{3}{5}$

(c) $\dfrac{4}{5}$ (d) $\dfrac{1}{3}$

[NCERT Exemplar]

Ans. (a) $\dfrac{1}{5}$

Explanation: Total no. of outcomes = 40
Multiples of 5 from 1 to 40 are {5, 10, 15, 20, 25, 30, 35, 40}
∴ No. of favourable outcomes = 8.

∴ Required probability

$$= \dfrac{\text{No. of favourable outcomes}}{\text{Total no. of outcomes}}$$

$$= \dfrac{8}{40} = \dfrac{1}{5}$$

13. Someone is asked to take a number from 1 to 100. The probability that it is a prime is:

(a) $\dfrac{1}{5}$ (b) $\dfrac{6}{25}$

(c) $\dfrac{1}{4}$ (d) $\dfrac{13}{50}$

[CBSE 2014, NCERT Exemplar]

Ans. (c) $\dfrac{1}{4}$

Explanation: Total no. of outcomes = 100
Prime numbers from 1 to 100 are
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97}

∴ No. of favourable outcomes = 25
∴ Required probability

$$= \dfrac{\text{No. of favourable outcomes}}{\text{Total no. of outcomes}}$$

$$= \dfrac{25}{100} = \dfrac{1}{4}$$

14. A school has five houses A, B, C, D and E. A class has 23 students, 4 from house A, 8 from house B, 5 from house C, 2 from house D and the rest from house E. A single student is selected at random to be the class monitor. The probability that the selected student is not from houses A, B and C is:

(a) $\dfrac{4}{23}$ (b) $\dfrac{6}{23}$

(c) $\dfrac{8}{23}$ (d) $\dfrac{17}{23}$

[NCERT Exemplar]

15. If a letter is chosen at random from the letters of English alphabets, then the probability that it is a letter of the word 'MATHEMATICS' is:

(a) $\dfrac{4}{13}$ (b) $\dfrac{9}{26}$

(c) $\dfrac{5}{13}$ (d) $\dfrac{11}{26}$

[CBSE SQP Term-1 2021]

Ans. (a) $\dfrac{4}{13}$

[CBSE Marking Scheme Term-1 2021]

Explanation: Total number of letters in English alphabets = 26
Unique letters in the word MATHEMATICS
$$= \{M, A, T, H, E, I, C, S\}$$
⇒ Number of unique letters = 8

∴   Required probability $= \dfrac{8}{26} = \dfrac{4}{13}$

16. 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) $\dfrac{1}{3}$ (b) $\dfrac{2}{3}$

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

[CBSE 2016, NCERT Exemplar]

Ans. (a) $\frac{1}{3}$

Explanation: Total number of outcomes on throwing a dice twice = 36

Here, favourable outcomes = {(4, 1), (4, 2), (4, 3), (4, 4), (5, 1), (5, 2), (5, 3), (5, 4), (6, 1), (6, 2), (6, 3), (6, 4)}

∴ Number of favourable outcomes = 12

∴   Required probability = $\frac{12}{36} = \frac{1}{3}$

17. Cards numbered 7 to 40 were put in a box. Anish selects a card at random. What is the probability that the selected card is a multiple of 7?

(a) $\frac{7}{34}$ (b) $\frac{5}{34}$

(c) $\frac{6}{35}$ (d) $\frac{7}{35}$

[British Council 2022]

Ans. (b) $\frac{5}{34}$

Explanation: Total possible outcomes = 34

Favourable outcomes (Card is a multiple of 4) = 5 (7, 14, 21, 28, 35)

P(card being a multiple of 7)

$= \frac{\text{Favourable outcomes}}{\text{Total possible outcomes}}$

$= \frac{5}{34}$

18. A bowl contains 3 red and 2 blue marbles. Roohi wants to pick a red marble.

Which of the following changes could she make so that the probability of picking a red marble is greater than it was before?

(i) Adding a red marble
(ii) Removing a blue marble
(iii) Adding 1 red and 1 blue marble
(a) Only (i)   (b) Only (i) and (ii)
(c) Only (i) and (iii)   (d) All of the above

[CBSE Question Bank 2023]

Ans. (b) Only (i) and (ii)

Explanation: Given, a bowl contains 3 red marbles and 2 blue marbles

Total number of outcomes = 5

P(picking a red marble) = $\frac{3}{5}$

(i) On adding a red marble,
Red marbles = 4
Blue marbles = 2

P(picking a red marble) = $\frac{4}{6}$

(ii) On removing a blue marble,
Red marbles = 3
Blue marbles = 1

P(picking a red marble) = $\frac{3}{4}$

(iii) On adding 1 red marble and 1 blue marble,
Red marbles = 4
Blue marbles = 3

P(picking a red marble) = $\frac{4}{7}$

Thus, on adding a red marble and removing a blue marble, the probability will be greater than it was before.

19. Ⓐ Which of the following cannot be the probability of an event?

(a) 1.5   (b) $\frac{3}{5}$

(c) 25%   (d) 0.3

20. Shivam went to a toy shop to buy some gifts for his nephew who would be turning three this year. He decided to buy him a bag containing balls of different colours as his nephew loves to play with balls.

The bag contains 3 red, 5 black and 7 white balls. A ball is drawn from the bag at random. The probability that the ball drawn is not black, is:

(a) $\frac{1}{3}$ (b) $\frac{9}{15}$

(c) $\frac{5}{10}$ (d) $\frac{2}{3}$ [CBSE 2020]

Ans. (d) $\frac{2}{3}$

Explanation: Out of the 15 (3 + 5 + 7) balls in the bag, 10 balls are not black.

So, the required probability is $\frac{10}{15}$, or $\frac{2}{3}$.

21. Ram Sewak is a wholesale dealer in eggs. He procures eggs directly from the poultry farms and sells them to the nearby stores

The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is:

(a) 7   (b) 14

(c) 21   (d) 58

[CBSE 2012, NCERT Exemplar]

Ans. (b) 14

Explanation: It is given that,

Total no. of eggs = 400

Probability of getting a bad egg = 0.035

∴ Probability of getting a bad egg

$$= \frac{\text{No. of bad eggs}}{\text{Total no. of eggs}} = 0.035$$

$$\Rightarrow \frac{\text{No. of bad eggs}}{400} = 0.035$$

⇒ No. of bad eggs = 0.035 × 400 = 14.

Hence, the number of bad eggs in the lot is 14.

22. Riya and Kajal are friends. The probability that both will have the same birthday in a non-leap is:

(a) $\frac{364}{365}$ (b) $\frac{31}{365}$

(c) $\frac{1}{365}$ (d) $\frac{1}{133225}$

[Delhi Gov. 2022]

Ans. (c) $\frac{1}{365}$

Explanation: Riya may have any one of the 365 days of the year as her birthday.

Similarly, Kajal may have any one of the 365 days as her birthday.

A total number of ways in which Riya and Kajal may have their birthday = 365 x 365

Then Riya and Kajal may have the same birthday on any one of 365 days.

Therefore the probability of Riya and Kajal may have same birthday are:

$$= \frac{365}{365 \times 365} = \frac{1}{365}$$

23. If P(A) denotes the probability of an event A then:

(a) P(A) < 0   (b) P(A) > 0

(c) 0 ≤ P(A) ≤ 1   (d) −1 ≤ P(A) ≤ 0

[Delhi Gov. 2022, CBSE 2010, NCERT Exemplar]

24. A card is drawn at random from a pack of well-shuffled 52 cards. What is the probability that the card drawn is not an ace?

(a) $\frac{1}{13}$ (b) $\frac{4}{13}$

(c) $\frac{9}{13}$ (d) $\frac{12}{13}$

[British Council 2022]

Ans. (d) $\frac{12}{13}$

Explanation: Total number of outcomes = 52

Number of ace cards = 4

Cards which are not ace = 52 − 4 = 48

$$P(\text{not an ace}) = \frac{48}{52} = \frac{12}{13}$$

25. A number is selected at random from first 50 natural numbers. The probability that it is a multiple of 3 and 4 both is:

(a) $\frac{7}{50}$ (b) $\frac{4}{25}$

(c) $\frac{1}{25}$ (d) $\frac{2}{25}$

[Delhi Gov. 2022]

Ans. (d) $\frac{2}{25}$

Explanation: A number is selected at random from the first 50 natural numbers.

This implies,

The total number of possible outcomes, n = 50

Multiples of 3 from 1 to 50 are 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45 and 48.

Multiples of 4 from 1 to 50 are 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44 and 48.

Multiples of both 3 and 4 from 1 to 50 are 12, 24, 36 and 48.

Total number of favourable outcomes = 4

Probability of an event

$$= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$$

$$= \frac{4}{50} = \frac{2}{25}$$

26. From a pack of 52 playing cards jacks, queens, kings and aces of red colour are removed. From the remaining, a card is drawn at random. Find the probability that the card drawn is a red card.

(a) $\frac{1}{4}$

(b) $\frac{1}{7}$

(c) 7

(d) $\frac{9}{22}$

[Delhi Gov. 2022]

Ans. (d) $\frac{9}{22}$

Explanation: Total no. of cards in a pack = 52
After removing red-colored – jack, queen, king, and aces,
Cards removed = 2 + 2 + 2 + 2 = 8
∴ Remaining number of cards = 52 – 8 = 44
   Number of red cards left = 26 – 8 = 18

∴   Required probability = $\frac{18}{44} = \frac{9}{22}$

Fill in the Blanks

27. The probability of an event that is sure to happen, is .... [CBSE 2020]

Ans. 1

Explanation: Probability of a sure event is always 1.

28. If the probability of an event E happening is 0.023, then $P(\overline{E})$ = ...

[CBSE 2020]

29. A number is chosen at random from the numbers –5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5. Then the probability that square of this number is less than or equal to 1 is ....

[CBSE 2019]

Ans. $\frac{3}{11}$

Explanation: Total no. of outcomes = 11
Squares of the given numbers are 25, 16, 9, 4, 1, 0, 1, 4, 9, 16, 25 respectively.
Squares that are less than or equal to 1 = {1, 0, 1}
⇒ No. of favourable outcomes = 3

∴ Required probability = $\frac{3}{11}$

30. Number of face cards in a pack of 52 cards is ....

Ans. 12

Explanation: There are 12 face cards in a packs of 52 cards.

31. When a digit is choosen at random from the digits 1 to 9, then the probability of this chosen digit to be a prime number is ....

32. The probability of getting a number which is neither prime nor composite in single throw of a dice is ....

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

Explanation: Of the six numbers, only one number, i.e. 1 is neither prime nor composite.

So, P(neither prime nor composite) = $\frac{1}{6}$

33. Total number of outcomes in a single throw of three coins is ....

Assertion Reason

Direction for questions 34 to 38: In question number 34 to 38, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option 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.

34. Assertion (A): The probability of getting a prime number, when a die thrown once is $\frac{2}{3}$.
   Reason (R): Prime numbers on a die are 2, 3, 5.

35. Assertion (A): The probability of winning a game is 0.345, than the probability of losing it, is 0.655.
   Reason (R): P(E) + P (not E) = 1

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

Explanation: We have,
   $P(E) = 0.345$
where   E = event of winning
   $P(not\ E) = 1 - P(E) = 1 - 0.345 = 0.655$
Hence, both assertion and reason are true and reason is the correct explanation of assertion.

36. Assertion (A): If a die is thrown, the probability of getting a number less than 3 and greater than 2 is zero.

Reason (R): Probability of an impossible event is one.

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

Explanation: This is an impossible event, so, if a die is thrown, the probability of getting a number less than 3 and greater than 2, is zero.

Hence, assertion is true but reason is false.

37. ✎Assertion (A): If a box contains 6 white, 2 red and 3 black marbles, then the probability of drawing a white marble from the box is $\frac{6}{11}$.

Reason (R): $P(\bar{E}) = 1 - P(\bar{E})$, where $\bar{E}$ is any event.

38. Assertion (A): 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 (R): For any event E, we have $0 \le P(E) \le 1$

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

Explanation:
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 = $\frac{7}{15}$

Hence, assertion is false but reason is true.

CASE BASED Questions (CBQs)

[**4** & **5** marks]

Read the following passages and answer the questions that follow:

39. On a weekend, Rani was playing cards with her family. The deck has 52 cards. If her brother drew one card.

[CBSE Question Bank 2021]

(A) The probability of getting a king of red colour is:

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{4}$

(B) ✎ The probability of getting a face card is:

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{2}{13}$ (d) $\frac{3}{13}$

(C) The probability of getting a jack of hearts is:

(a) $\frac{1}{26}$ (b) $\frac{1}{52}$

(c) $\frac{3}{52}$ (d) $\frac{3}{26}$

(D) ✎ The probability of getting a red face card is:

(a) $\frac{3}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{4}$

(E) The probability of getting a spade is:

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{4}$

[CBSE Question Bank 2021]

Ans. (A) (a) $\frac{1}{26}$

Explanation: Total number of cards = 52
Number of kings of red colour = 2

∴ P(getting a king of red colour) = $\frac{2}{52} = \frac{1}{26}$

(C) (b) $\frac{1}{52}$

Explanation: Number of cards of jack of hearts = 1

∴ P(getting a jack of hearts) = $\frac{1}{52}$

(E) (d) $\frac{1}{4}$

Explanation: Number of spades in a deck = 13

∴ P(getting a spade) = $\frac{13}{52} = \frac{1}{4}$

40. An unbiased game of chance as shown below consists of spinning the wheel on which different areas have been marked with different colours such as Red, Yellow, Blue and Orange denoted by the alphabets R, Y, B and O on the wheel respectively. Numbers have been marked on different parts and each of these is equally likely. The prize depends on the number at which the arrow points once the wheel comes to a rest.
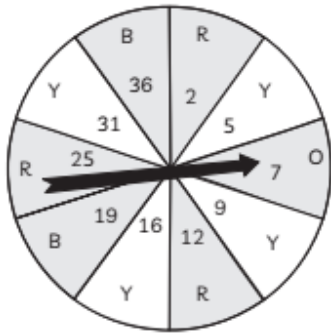
(A) The probability that the arrow will point at a prime number is:

(a) 0

(b) $\frac{3}{10}$

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

(d) $\frac{2}{5}$

(B) ✍ If the arrow points at a perfect square, the person gets a double chance to spin the wheel. The probability of a double chance of spinning wheel is:

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

(b) $\frac{3}{10}$

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

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

(C) The probability that the arrow will point towards yellow colour 'Y' is:

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

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

(c) $\frac{3}{10}$

(d) $\frac{2}{5}$

(D) ✍ The probability of arrow pointing towards a number divisible by 3 is:

(a) 0

(b) $\frac{3}{10}$

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

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

(E) The probability of arrow pointing towards an odd number or a prime number is:

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

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

(c) $\frac{7}{10}$

(d) $\frac{6}{5}$

Ans. (A) (c) $\frac{1}{2}$

Explanation: The probability of an event is

$$P(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Total Number of possible outcomes}}.$$

The total numbers of possible outcomes in this case are 10.

Out of the number, marked in the wheel, the prime numbers are 2, 5, 7, 19 and 31.

∴ Number of favourable outcomes = 5

∴ Probability that the arrow will point at a prime number

$$= \frac{5}{10} = \frac{1}{2}$$

(C) (d) $\frac{2}{5}$

Explanation: There are total four areas in yellow colour marked 'Y'.

∴ Probability that the arrow will point towards yellow colour 'Y'

$$= \frac{4}{10} = \frac{2}{5}$$

(E) (c) $\frac{7}{10}$

Explanation: Out of the given numbers, the odd numbers are 5, 7, 9, 19, 25 and 31 and prime numbers are 2, 5, 7, 19 and 31.

Therefore, there are 7 numbers which are either odd or prime, which are 2, 5, 7, 9, 19, 25 and 31.

∴ Probability of arrow pointing towards an odd number or a prime number

$$= \frac{7}{10}$$

41. A school offers several sports to its students such as cricket, football, basketball, tennis, badminton and swimming. Based on past records, the sports teacher prepared a pie chart as shown below showing preference of students towards a particular sport.
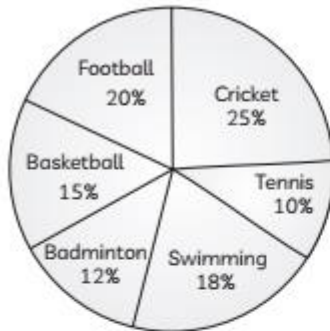
(A) Find the probability of favourite sport being either swimming or badminton.

(B) ⓐ Find the probability of favourite sport being neither football nor cricket.

(C) Find the probability of favourite sport being basketball, tennis or cricket.

Ans. (A) 18% students prefer swimming and 12% prefer badminton. Therefore, percentage of students showing preference for swimming or badminton = 30%.

Hence, probability of favourite sport being either swimming or badminton = $\frac{30}{100} = \frac{3}{10}$.

(C) 15% students prefer basketball, 10% students prefer tennis while 25% students prefer cricket.

Therefore, percentage of students showing preference for basketball, tennis or cricket = 15% + 10% + 25% = 50%

Hence, probability of favourite sport being basketball, tennis or cricket = $\frac{50}{100} = \frac{1}{2}$

42. In a two dice game, a player throws two dice simultaneously. A player scores the sum of the two dice thrown and gradually reaches a higher score as they continue to roll

(A) Find the probability that the difference of the numbers on the two dice is 3.

(B) Find the probability that the product of the numbers on the two dice is more than 18.

(C) ⓐ Find the probability that the number 4 will not appear on either of the dice.

Ans. (A) When two dice are thrown simultaneously, all possible outcomes are:

(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).

∴ Total number of possible outcomes = 36

If (a, b) are the outcomes of the two dice, then for the difference of numbers on the two dice to be 3, either $a - b = 3$ or $b - a = 3$.

Therefore, the favourable outcomes are:
(1, 4), (2, 5), (3, 6), (4, 1), (5, 2), (6, 3)

∴ Number of favourable outcomes = 6

∴ Probability that the difference of the numbers on the two dice is 3

$$= \frac{6}{36} = \frac{1}{6}$$

(B) Total number of possible outcomes = 36.

Favourable outcomes are (5, 4), (6, 4), (4, 5), (5, 5), (6, 5), (4, 6), (5, 6), (6, 6).

∴ Number of favourable outcomes = 8

∴ Probability of product of the numbers on the two dice is more than 18

$$= \frac{8}{36} = \frac{2}{9}$$

VERY SHORT ANSWER Type Questions (VSA)

[**1** mark]

43. A die is thrown once. What is the probability of getting a prime number? [CBSE SQP 2020]

44. A pair of dice is thrown once. What is the probability of getting a doublet? [CBSE SQP 2020]

45. A die is thrown once. What is the probability of getting an even prime number? [CBSE 2020]

Ans. Total number of possible outcomes = 6

Number of favourable outcomes = 1, as 2 is the only even prime number from 1 to 6.

So, the required probability is $\frac{1}{6}$.

46. A letter of the English alphabet is chosen at random. What is the probability that the chosen letter is a consonant? [CBSE 2020, Diksha]

Ans. Out of the 26 letters of english alphabets, 21 letters are consonants.

So, required probability = $\frac{21}{26}$.

47. A die is thrown once. What is the probability of getting a number less than 3? [CBSE 2020]

Ans. All possible outcomes are 1, 2, 3, 4, 5, 6. Favourable outcomes are 1 and 2.

So, required probability = $\frac{2}{6}$, i.e., $\frac{1}{3}$

48. If the probability of winning a game is 0.07, what is the probability of losing it? [CBSE 2020]

49. A bag contains 3 red and 5 black balls. A ball is drawn at random from the bag. What is the probability that the drawn ball is not red? [CBSE 2017]

Ans. Total number of balls in the bag = 3 + 5 = 8

Number of balls that are not red in colour = Number of black balls = 5

∴ Total number of favourable cases = 5

∴ P(getting a ball which is not red) = $\frac{5}{8}$

Hence, the required probability is $\frac{5}{8}$.

50. Two different dice are tossed together. Find the probability that the product of the two numbers on the top of the dice is 6. [CBSE 2015]

Ans. When two dice are tossed together,

Total number of outcomes = 36

Outcomes having product of two numbers on the top of the dice as 6

= {(1, 6), (2, 3), (3, 2), (6, 1)}

⇒ Number of favourable outcomes = 4

∴ Required probability = $\frac{4}{36} = \frac{1}{9}$

51. A bag contains 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag. Find the probability of getting neither a green ball nor a red ball.

Ans. A ball which is neither a green ball nor a red ball is necessarily a white ball.

So, required probability = $\frac{7}{5 + 8 + 7} = \frac{7}{20}$

52. Two dice are thrown simultaneously. What is the probability that the product of the numbers appearing on the top is 1? [CBSE 2020]

53. A letter is chosen from the letters of the word MAINTENANCE. What is the probability that it is N?

Ans. In the given word, there are 11 letters, out of which 3 are N.

So, the required probability is $\frac{3}{11}$.

54. Find the probability of getting a black queen when a card is drawn at random from a well-shuffled pack of 52 cards. [CBSE SQP 2020]

Ans. Total number of cards = 52

Also, number of black queens = 2

∴ P(getting a black queen) = $\frac{2}{52} = \frac{1}{26}$

55. A die is thrown twice. What is the probability that the same number will come up either time? [CBSE 2010]

56. A die is thrown once. What is the probability of getting a number greater than 4? [CBSE 2015]

57. We all know that dice are small, throwable objects with marked sides that can rest in multiple positions and are used for generating random numbers, commonly as part of tabletop games, including dice games, board games, role-playing games, and games of chance. A traditional die is a cube with each of its six faces marked with a different number of dots (pips) from one to six. But do you know that dice may also have polyhedral or irregular shapes and may have faces marked with numerals or symbols instead of pips?

Two such dice are thrown simultaneously. What is the probability that the sum of the two numbers appearing on the top is 13?

[CBSE 2020]

Ans. When two dice are thrown simultaneously,
No. of possible outcomes = 36.
No. of favourable outcomes is 0. (because the sum of number is on the two dice cannot be more than 12)

So, required probability is $\frac{0}{36}$, i.e., 0

58. An aquarium is a vivarium of any size having at least one transparent side in which aquatic plants or animals are kept and displayed. Fishkeepers use aquaria to keep fish, invertebrates, amphibians, aquatic reptiles, such as turtles and aquatic plants.

Sarita buys a fish from a shop for her aquarium. The shopkeeper takes out a fish at random from a tank containing 10 male fishes and 12 female fishes. What is the probability that the fish taken out is a female fish?

Ans. Total number of fishes in the tank = 10 + 12 = 22
∴ P(getting a female fish)

$$= \frac{\text{Total number of female fishes}}{\text{Total number of fishes}} = \frac{12}{22} = \frac{6}{11}$$

59. In cricket, the toss is the flipping of a coin to determine which captain will have the right to choose whether their team will bat or field at the start of the match.

When we toss a coin, there are two possible outcomes – heads or tails. Therefore, the probability of each outcome is $\frac{1}{2}$. Justify your answer.

[CBSE 2014, NCERT Exemplar]

Ans. Yes (True).
Total number of outcomes = 2

∴ Probability of head = Probability of tail = $\frac{1}{2}$

As heads and tails both are equally likely events.

60. Sneha and puja wants to visit Taj Mahal tomorrow since it is the monsoon season, they were worried whether they will be able to go or not.

The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow ?

[NCERT Exemplar]

Ans. P(it will not rain tomorrow)
= 1 – P(it will rain tomorrow)
= 1 – 0.85 = 0.15

SHORT ANSWER Type-I Questions (SA-I)

[**2** marks]

61. What is the probability that a randomly taken leap year has 53 Sundays?

[CBSE 2020]

Ans. In a leap year, there are 366 days which includes 52 weeks and two days.

In 52 weeks, there are 52 Sundays.

Now, 53rd Sunday can be in the remaining two days.

But the remaining two days can be {(Sun, Mon), (Mon, Tue), (Tue, Wed), (Wed, Thurs), (Thurs, Fri), (Fri, Sat), (Sat, Sun)}

So, total number of possibilities = 7

And, favourable number of possibilities = 2 *i.e.* {(Sun, Mon), (Sat, Sun)}

∴ P(53 Sundays) = $\frac{2}{7}$

62. A number is selected at random from natural numbers 1 to 20. Find the probability that the selected number is a prime number.

[CBSE 2017]

Ans. Total number of outcomes = 20

Let, E be the event that a number selected is a prime number.

Since, the prime number between 1 to 20 (or favourable cases) are 2, 3, 5, 7, 11, 13, 17, 19

∴ Number of favourable outcomes = 8

∴ P(E) = $\dfrac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

= $\dfrac{8}{20}$ = $\dfrac{2}{5}$

Hence, the required probability is $\dfrac{2}{5}$.

63. ⓐ A number is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What will be the probability that square of this number is less than or equal to 1? [CBSE 2017]

64. If two different coins are tossed together, then find the probability of getting two heads.

[CBSE 2017]

Ans. On tossing two coins, all possible outcomes are: {(H, H), (H, T); (T, H); (T, T)}

∴ Total number of possible outcomes = 4

Let E be the event of getting two heads.

Then, favourable outcomes = {(H, H)}

∴ Total number of favourable outcomes = 1

∴ P(E) = $\dfrac{1}{4}$

Hence, the required probability is $\dfrac{1}{4}$.

65. A letter of the English alphabets is chosen at random. Find the probability that the chosen letter is a letter of the word 'TRIGONOMETRY'.

[CBSE 2016]

Ans. Total number of letters in the english alphabets is 26.

∴ Total number of possible outcomes = 26

Number of alphabets in TRIGONOMETRY = 9

∴ Total number of favourable cases

= {T, R, I, G, O, N, M, E, Y} = 9

∴ P(choosing a letter from TRIGONOMETRY)

= $\dfrac{9}{26}$

Hence, the required probability is $\dfrac{9}{26}$

66. 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7.

[CBSE 2019, Diksha]

Ans. Total number of possible outcomes = 20

Let E be the event of getting a ticket number which is a multiple of 3 or 7

Then, the favourable outcomes = {3, 6, 7, 9, 12, 14, 15, 18}.

∴ Number of favourable outcomes = 8

∴ P(E) = $\dfrac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$

= $\dfrac{8}{20}$ = $\dfrac{2}{5}$

Hence, the required probability is $\dfrac{2}{5}$.

67. ⓐ Cards marked with numbers 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect square number.

[CBSE 2016, Diksha]

68. ⓐ In a family with three children, there may be no girl, one girl, two girls or three girls. So, the probability of each is $\dfrac{1}{4}$. Is this correct? Justify your answer.

[CBSE 2014, NCERT Exemplar]

69. A game consists of spinning an arrow which comes to rest pointing at one of the three regions (1, 2 or 3) (see figure). Are the outcomes 1, 2 and 3 equally likely to occur? Give reasons.
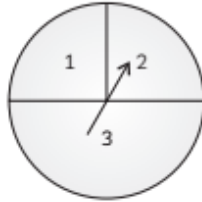
[NCERT Exemplar]

Ans. No.

The area of region 3 is double than that of regions 1 or 2, therefore its probability is double than the probabilities of 1 or 2.

Hence, probability of 1 = probability of 2 ≠ probability of 3.

Thus, the outcomes of 1, 2 and 3 are not equally likely to occur.

70. I toss three coins together. The possible outcomes are no heads, 1 head, 2 heads and 3 heads. So, I say that the probability of no heads is $\frac{1}{4}$. What is wrong with this conclusion? [NCERT Exemplar]

Ans. Possible outcomes when three coins are tossed together:

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

∴ Total number of outcomes = 8.

Favourable outcomes of getting no heads

= {TTT}

∴ No. of favourable outcomes = 1

∴ Probability of getting no heads = $\frac{1}{8}$

Hence, the probability of getting no head is $\frac{1}{8}$

and not $\frac{1}{4}$.

71. ⓐ 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, the probability of each is $\frac{1}{2}$. Justify. [NCERT Exemplar]

72. A Group Housing Society has 600 members, who have their houses in the campus and decided to hold a Tree Plantation Drive on the occation of New Year. Each household was given the choice of planting a saplings of its choice. The number of different types of saplings planted were:

(1) Neem – 125

(2) Peepal – 165

(3) Creepers – 50

(4) Fruit plants – 150

(5) Flowering plants – 110

On the opening ceremony, one of the plants is selected randomly for a prize. After reading the above passage, answer the following questions.

What is the probability that the selected plant is:

(A) a fruit plant or a flowering plant?

(B) either a Neem plant or a Peepal plant? [CBSE 2020]

Ans. (A) Of the 600 plants, there are 150 fruit plants and 110 flowering plants.

So, required probability

$$= \frac{(150 + 110)}{600} = \frac{260}{600} \ i.e. \ \frac{13}{30}$$

(B) Of the 600 plants, there are 290 (125 + 165) plants which are either neem plants or peepal plants.

So, required probability = $\frac{290}{600}$, i.e., $\frac{29}{60}$

73. If a number x is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What is the probability that $x^2 < 4$? [CBSE 2020]

Ans. All possible outcomes are –3, –2, –1, 0, 1, 2, 3

Favourable outcomes are – 1, 0, 1.

(As $x^2 < 4$)

So, required probability = $\frac{3}{7}$

74. ⓐ A child has a die whose 6 faces show the letters given below:

A B C A A B

The die is thrown once. What is the probability of getting (A) A (B) B ? [CBSE 2019]

75. A card is drawn at random from a pack of 52 playing cards. Find the probability of drawing a card which is neither a spade nor a king. [CBSE 2019]

Ans. Total number of possible outcomes

= Total number of playing cards = 52

Total number of spade cards + 3 kings (as one king is already in spade) = 13 + 3 = 16

∴ Cards which are neither spade nor kings.

= 52 − 16 = 36

∴ P(getting a card which is neither spade nor king)

$$= \frac{36}{52} = \frac{9}{13}$$

Hence, the required probability is $\frac{9}{13}$.

76. ⓐ A die is thrown once. Find the probability of getting a number which (A) is a prime number (B) lies between 2 and 6. [CBSE 2019]

77. 20 cards from 11 to 30, are put in a box and mixed thoroughly. A card is then drawn from the box at random. Find the probability that the number on the drawn card is a prime number. [CBSE 2017]

Ans. Total number of outcomes = 20

Let, E be the event of getting a prime number on the drawn card.

Then, favourable outcomes = 11, 13, 17, 19, 23, 29

∴ Number of favourable outcomes = 6

∴ P(prime number) = $\frac{6}{20} = \frac{3}{10}$

78. ⓐ Find the probability that in the leap year there will be 53 Tuesdays. [CBSE 2017]

79. ⓐ Two different dice are thrown together. Find the probability that the product of the numbers appeared is less than 18. [CBSE 2017]

80. 15 cards numbered from 1 to 15 are put in a box and mixed thoroughly. Then, a card is drawn at random from the box. Find the probability that the number on the drawn card is divisible by 2 or 3. [CBSE 2016]

Ans. Total possible outcomes = Total number of tickets = 15

Let E be the event that the number on the drawn card is divisible by 2 or 3.

Then, numbers from 1 to 15 that are divisible by 2 or 3 = 2, 3, 4, 6, 8, 9, 10, 12, 14, 15

∴ Total number of favourable cases = 10

∴ $P(E) = \frac{10}{15} = \frac{2}{3}$

81. An integer is chosen between 70 and 100. Find the probability that it is:
(A) a prime number.
(B) divisible by 7. [CBSE SQP 2019]

Ans. Total number of integers = 29

(A) Prob. (prime number) = $\frac{6}{29}$

(B) Prob. (number divisible by 7) = $\frac{4}{29}$
[CBSE Marking Scheme SQP 2019]

Explanation: Total number of outcomes = Total number of integers between 70 and 100 = 29

(A) Prime numbers between 70 and 100
= {71, 73, 79, 83, 89, 97}
∴ Number of favourable outcomes = 6
∴ P(prime number) = $\frac{6}{29}$

(B) Numbers divisible by 7 between 70 and 100 = {77, 84, 91, 98}
∴ Number of favourable outcomes = 4
∴ P(divisible by 7) = $\frac{4}{29}$

82. Amrish wakes up in the morning and notices that his digital clock reads 07: 25 am. After noon, he looks at the clock again.

07 : 25
↑ ↑
A B
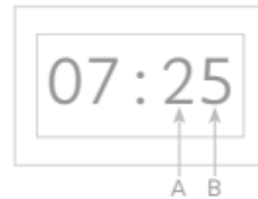
What is the probability that:
(A) the number in column A is 4?
(B) the number in column B is 8?

Ans. (A) The number in column A can be 0, 1, 2, 3, 4 or 5.

So, P(number in column A is 4) = $\frac{1}{6}$

(B) The number in column B can be 0, 1, 2, 3, ..., 9.

So, P(number in column B is 8) = $\frac{1}{10}$

83. ⓐ Cards marked with numbers 5 to 50 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that the number on the card taken out is (A) a prime number less than 10 (B) a number which is a perfect square. [CBSE 2019]

84. ⓐ Two dice are thrown at the same time. Find the probability of getting:
(A) the same number on both dice.
(B) different numbers on both dice. [NCERT]

85. A coin is tossed two times. Find the probability of getting at most one head. [CBSE 2011, NCERT Exemplar]

Ans. A coin is tossed two times.

∴ Possible outcomes are {(H, H), (H, T), (T, H), (T, T)}

∴ Total no. of outcomes = 4

Favourable outcomes of getting at most 1 head = {(T, T), (H, T), (T, H)}

∴ No. of favourable outcomes = 3

∴   P(at most one head) = $\frac{3}{4}$

Hence,   P(E) = $\frac{3}{4}$

86. Two dices were rolled once. Find the probability of getting such numbers on the two dice, whose product is 12.   [NCERT]

Ans. When two dices are rolled together, total possible outcomes are:

(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).

∴ Total number of outcomes = 36

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

= 4

∴ Number of favourable outcomes = 4

∴   Required probability = $\frac{4}{36} = \frac{1}{9}$.

87. In a family of 3 children, find the probability of having at least two boys.   [NCERT Exemplar]

Ans. Let B denotes a boy and G denotes a girl. Then, possibilities of girls and boys with three children

= {GGG, GGB, GBG, BGG, BBG, BGB, GBB, BBB}

∴ Total number of possible outcomes = 8

Now, outcomes with at least two boys *i.e.* two or three boys

= {BBG, GBB, BGB, BBB}

∴ Number of favourable outcomes = 4

∴ P(at least two boys) = $\frac{4}{8} = \frac{1}{2}$

88. Find the probability that a leap year selected at random will contain 53 Sundays and 53 Mondays.   [CBSE 2020]

Ans. A leap year has 52 complete weeks + 2 days. These two days may be

(Sun, Mon), (Mon, Tue), (Tue, Wed), (Wed, Thu), (Thu, Fri), (Fri, Sat) and (Sat, Sun).

Of the 7 possible outcomes, only 1 *i.e.*, (Sun, Mon) is the favourable outcome.

So, required probability is $\frac{1}{7}$.

89. ⓐ Two dice are thrown together once. Find the probability of getting a sum of more than 9.   [CBSE 2020]

SHORT ANSWER Type-II Questions (SA-II)

[**3** marks]

90. Two coins are tossed simultaneously. What is the probability of getting

(A) at least one head?

(B) at most one tail?

(C) a head and a tail?

[CBSE SQP Std. 2022]

Ans. (A) P (at least one head) = $\frac{3}{4}$

(B) P(at most one tail) = $\frac{3}{4}$

(C) P(a head and a tail) = $\frac{2}{4} = \frac{1}{2}$

[CBSE Marking Scheme SQP Std. 2022]

91. Apoorv throws two dice at once and computes the product of the numbers appearing on the dice. Peehu throws one die and squares the number that appears on it. Who has a better chance of getting the number 36? Why?   [NCERT]

Ans. For Apoorv:

He throws two dice at once.

∴ Total number of outcomes = 36

Favourable number of outcomes for getting a product 36 = {(6, 6)}

∴ Number of favourable outcomes = 1

∴ P(getting 36) = $\frac{1}{36}$

For Peehu:

She throws one dice.

∴ Total number of outcomes = 6

Favourable outcomes for getting a square 36 = {6}

∴ Number of favourable outcomes = 1

∴   P(getting 36) = $\dfrac{1}{6}$

∵ $\dfrac{1}{6} > \dfrac{1}{36}$

Hence, Peehu has a better chance.

92. ⓐ The probability of selecting a blue marble at random from a jar that contains blue, black and green marbles is $\dfrac{1}{5}$. The probability of selecting a black marble at random from the same jar is $\dfrac{1}{4}$. If the jar contains 11 green marbles, find the total number of marbles in the jar.   [CBSE 2019]

93. Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is

(A) 8?

(B) 13?

(C) less than or equal to 12?

[CBSE SQP Basic 2022]

Ans. (A) P(8) = $\dfrac{5}{36}$

(B) P(13) = $\dfrac{0}{36}$ = 0

(C) P (less than or equal to 12) = 1

[CBSE Marking Scheme SQP Basic 2022]

94. A game in a booth at a Diwali fair involves using a spinner first. Then, if the spinner stops on an even number, the player is allowed to pick a marble from a bag. The spinner and the marbles in the bag are represented in the figure.

Prizes are given when a black marble is picked. Shweta plays the game once.

(A) What is the probability that she will be allowed to pick a marble from the bag?

(B) Suppose she is allowed to pick a marble from the bag, what is the probability of getting a prize, when it is given that the bag contains 20 balls out of which 6 are black?   [CBSE 2020]

Ans. (A) Shweta will be allowed to pick up a marble, only when the spinner stops on an even number.

P(getting an even number) = $\dfrac{5}{6}$

Hence, the probability that she will be allowed to pick a marble from the bag is $\dfrac{5}{6}$

(B) P (getting a black marble) = $\dfrac{6}{20}$, or $\dfrac{3}{10}$.

∴ Probability of getting a prize is $\dfrac{3}{10}$.

95. ⓐ All kings, jacks and diamonds have been removed from a pack of playing cards and the remaining cards are well-shuffled. A card is then drawn at random. Find the probability that the drawn card is a:

(A) face card.

(B) black card.   [CBSE 2017]

96. A bag contains 12 balls out of which some are white and some are red. If the probability of drawing a white ball at random from the bag is $\dfrac{2}{3}$, then find how many red balls are there in the bag.

[CBSE 2017]

Ans. Let the number of red balls in the bag be 'x'.

Since, total number of balls in the bag = 12

Then, number of white balls = 12 − x

P(drawing a white ball) = $\dfrac{\text{Number of white balls}}{\text{Total number of balls}}$

= $\dfrac{12 - x}{12}$

But, P(drawing a white ball) = $\dfrac{2}{3}$ [Given]

∴ $\dfrac{12 - x}{12} = \dfrac{2}{3}$

⇒   12 − x = 8

⇒   x = 4

Hence, the number of red balls in the bag is 4.

97. ⓐ A square dartboard has sections numbered from 1 to 12 as shown below. Players have to make a prediction and throw a dart. They win if their dart lands on the section that matches their prediction.

Arya says, "My dart will land on a composite number."

Bashir says "My dart will land on an even number."

Cathy says, "My dart will land on a factor of 12."
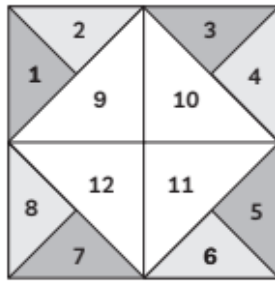
Calculate the probability of each of their predictions occurring and determine who has the highest chances of winning. Show your work.   [CBSE Question Bank 2023]

98. Two different dice are thrown together. Find the probability that the numbers obtained:

(A) have a sum less than 7

(B) have a product less than 16

(C) is a doublet of odd numbers.

[CBSE 2017]

Ans. The outcomes when two dice are thrown together, are:

(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),

∴ Total number of outcomes = 36

(B) Let E_2 be the event of getting the numbers whose product is less than 16.
Then, favourable outcomes are (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), (4, 1), (4, 2), (4, 3), (5, 1), (5, 2), (5, 3), (6, 1) and (6, 2).
∴ Number of favourable outcomes = 25

∴ $P(E_2) = \dfrac{25}{36}$

Hence, the required probability is $\dfrac{25}{36}$.

(C) Let E_3 be the event of getting the numbers which are doublets of odd numbers.

Then, favourable outcomes are (1, 1), (3, 3) and (5, 5)

∴ Number of favourable outcomes = 3

∴ $P(E_3) = \dfrac{3}{36} = \dfrac{1}{12}$

Hence, the required probability is $\dfrac{1}{12}$.

99. ✍ A lot consists of 144 ball pens of which 20 are defective. The customers will buy a ball pen if it is good, but will not buy a defective ball pen. The shopkeeper draws one pen at random from the lot and gives it to a customer. What is the probability that

(A) customer will buy the ball pen?

(B) customer will not buy the ball pen?

[CBSE 2017]

100. A coin is tossed 3 times. Write all the possible outcomes. Find the probability of getting at least 2 heads.   [CBSE 2016]

Ans. When three coins are tossed simultaneously, all possible outcomes are: HHH, HHT, HTH, THH, HTT, THT, TTH, TTT.

∴ Total number of possible outcomes = 8

Let E be the event of getting at least 2 heads.

Then, favourable outcomes are: HHH, HHT, HTH, THH.

∴ Number of favourable outcomes = 4

∴ $P(E) = \dfrac{4}{8} = \dfrac{1}{2}$

Hence, the required probability is $\dfrac{1}{2}$.

101. Black aces and black queens are removed from a pack of 52 cards. The remaining cards are reshuffled and then a card is drawn. Find the probability of getting:

(A) a black card   (B) an ace.   [CBSE 2016]

Ans. Number of cards removed = 2 + 2 = 4

Total number of remaining cards = 52 – 4

= 48

Now, there are 2 aces and 2 queens of red colour left.

(A) Number of black cards left = 26 – 4

= 22

∴ P(getting a black card) = $\dfrac{22}{48} = \dfrac{11}{24}$

Hence, the required probability is $\dfrac{11}{24}$.

(B) Number of aces = 4 – 2 = 2

∴ P(getting an ace) = $\dfrac{2}{48} = \dfrac{1}{24}$

Hence, the required probability is $\dfrac{1}{24}$.

102. In a single throw of a pair of different dice, what is the probability of getting (A) a prime number on each dice (B) a total of 9 or 11?

[CBSE 2016]

Ans. When two dice are thrown, the total possible outcomes are :

(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).

∴ Total number of possible outcomes = 36

(A) Let E_1 be the event of getting a prime number on both dice
Then, the favourable outcomes = (2, 2), (2, 3), (2, 5), (3, 2), (3, 3), (3, 5), (5, 2), (5, 3), (5, 5)

∴ Number of favourable outcomes = 9

∴ $P(E_1) = \dfrac{9}{36}$, or $\dfrac{1}{4}$

Hence, the required probability is $\dfrac{1}{4}$.

(B) Let E_2 be the event of getting a total of 9 or 11.
Then, favourable outcomes = (3, 6), (4, 5), (5, 4), (6, 3), (5, 6), (6, 5).

∴ Number of favourable outcomes = 6

∴ $P(E_2) = \dfrac{6}{36} = \dfrac{1}{6}$

Hence, the required probability is $\dfrac{1}{6}$

103. At a fete, 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. If the selected card has a perfect square greater than 500, the player wins a prize. What is the probability that:

(A) ✎the first player wins a prize?

(B) the second player wins a prize, if the first has won?   [NCERT]

Ans. Total number of outcomes = 1000

(B) Let E_2 be the event that the second player wins the prize. Now, the remaining number of cards which are a perfect square greater than 500 i.e., 8.

∴ No. of favourable outcomes = 8.

Total no. of outcomes, as one card was already selected by first player = 999.

∴ $P(E_2) = \dfrac{8}{999}$

104. ✎ One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting

(A) a king of red colour.

(B) a spade

(C) the queen of diamonds
                    [CBSE SQP 2020]

105. ✎ Two unbiased coins are tossed simultaneously. If the probability of getting no head is $\dfrac{A}{B}$, then find $(A + B)^2$.   [Diksha]

106. The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\dfrac{1}{4}$. The probability of selecting a blue ball at random from the same jar is $\dfrac{1}{3}$. If the jar contains 10 orange balls, find the total number of balls in the jar.   [CBSE SQP 2015]

Ans. $P(\text{red}) = \dfrac{1}{4}$, $P(\text{blue}) = \dfrac{1}{3}$

⇒ $P(\text{orange}) = 1 - \dfrac{1}{4} - \dfrac{1}{3} = \dfrac{5}{12}$

⇒ $\dfrac{5}{12}$ (Total no. of balls)   = 10

⇒ Total no. of balls = $\dfrac{10 \times 12}{5} = 24$

                    [CBSE Marking Scheme SQP 2015]

107. Two different dice are thrown at the same time. Find the probability that the number appearing on the two dice

(A) have a sum 8.

(B) are first even and second odd.[CBSE 2017]

Ans. When two dice are thrown, then total possible outcomes are:

(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).

∴ Total number of outcomes = 36

(A) Let E_1 be the event that the numbers appearing on the dice have a sum 8.
Then, favourable outcomes
        = (2, 6), (3, 5), (4, 4), (5, 3), (6, 2)
∴ Total number of favourable outcomes = 5

∴ $P(E_1) = \dfrac{5}{36}$

Hence, the required probability is $\dfrac{5}{36}$.

(B) Let E_2 be the event that the number appearing on first dice is even and the number appearing on the second dice is odd.
Then, favourable outcomes = (2, 1), (2, 3), (2, 5), (4, 1), (4, 3), (4, 5), (6, 1), (6, 3), (6, 5)
∴ Total number of favourable outcomes = 9

∴ $P(E_2) = \dfrac{9}{36} = \dfrac{1}{4}$

Hence, the required probability is $\dfrac{1}{4}$.

108. 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) a two-digit number.

(B) a number divisible by 5.

(C) perfect square number.

[CBSE SQP 2020, 17]

Ans. Total number of outcomes = 90

(A) Let E_1 be the event that the disc drawn be a two-digit number.

Favourable cases are 10, 11, 12, 13..., 90.

∴ Total number of favourable outcomes = 81

∴ $P(E_1) = \dfrac{81}{90} = \dfrac{9}{10}$

Hence, the required probability is $\dfrac{9}{10}$.

(C) Let E_3 be the event that the disc drawn be a perfect square number.

Then, favourable cases are,

1, 4, 9, 16, 25, 36, 49, 64, 81

∴ Total number of favourable outcomes = 9

∴ $P(E_3) = \dfrac{9}{90} = \dfrac{1}{10}$

Hence, the required probability is $\dfrac{1}{10}$.

109. Peter throws two different dice together and find the product of the two numbers obtained. Rina throws a die and squares the number obtained. Who has the better chance to get the number 25? [CBSE 2017]

110. A die is thrown twice. Find the probability that:

(A) 5 will not come either time.

(B) the sum of numbers on the two dice is not more than 5. [CBSE 2016]

111. A game of chance consists of spinning an arrow on a circular board, divided into 8 equal parts, which comes to rest pointing to one of the numbers 1, 2, 3, ..., 8 which are equally likely outcomes. What is the probability that the arrow will point at:

(A) an odd number?

(B) a number greater than 3?

(C) a number less than 9? [CBSE 2016]

Ans. Total numbers of outcomes = 8

(A) Odd numbers from 1 to 8 = 1, 3, 5, 7

∴ Number of odd numbers = 4

P(getting an odd number)

$= \dfrac{4}{8} = \dfrac{1}{2}$

Hence, the required probability is $\dfrac{1}{2}$.

(C) Numbers less than 9 = 1, 2, 3, 4, 5, 6, 7, 8

∴ Number of numbers less than 9 = 8

P(getting a number less than 9) = $\dfrac{8}{8} = 1$

Hence, the required probability is 1.

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

113. A bag contains 24 balls of which x are red, $2x$ are white and $3x$ are blue. A ball is drawn at random. What is the probability that it is:

(A) not a red ball?

(B) a white ball?

(C) either a blue or a white ball?

Ans. Total number of balls = $x + 2x + 3x = 6x$

(A) P (not a red ball) = P(a white or a blue ball)

$= \dfrac{2x + 3x}{6x} = \dfrac{5}{6}$

(B) P (a white ball) = $\dfrac{2x}{6x} = \dfrac{1}{3}$

(C) P (a blue or a white) = P (not a red ball)

$= \dfrac{5}{6}$ [by (A) above]

114. In the figure, a disc is shown on which a player spins an arrow twice. The function $\dfrac{a}{b}$ is formed, where 'a' is the number of sector on which arrow stops on the first spin and 'b' is the number of the sector in which the arrow stops on the second spin. On each spin, each sector has equal chance of selection by the arrow. Find the probability that the fraction $\dfrac{a}{b} > 1$.
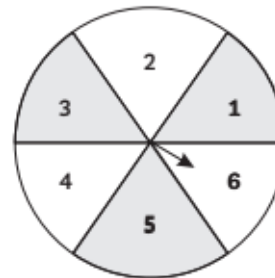
[CBSE 2016]

LONG ANSWER Type Questions (LA)

[**4** & **5** marks]

115. ✎ 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. Find the probability of getting each sum from 2 to 9 separately. [NCERT]

116. From a pack of 52 playing cards, Jacks and Kings of red colour and Queens and Aces of black colour are removed. The remaining cards are mixed and a card is drawn at random. Find the probability that the drawn card is:
   (A) a black queen.
   (B) a card of red colour.

(C) ✎ a Jack of black colour.
(D) ✎ a face card. [CBSE 2017]

Ans. Number of cards removed = (2 + 2 + 2 + 2) = 8

Total number of remaining cards = (52 − 8) = 44

Now, there are 2 jacks, 2 kings of black colour and 2 queens, 2 aces of red colour left.

(A) Number of black queens = 0

∴ P(getting a black queen) = $\dfrac{0}{44}$ = 0

(B) Number of red cards = 26 − 4 = 22

∴ P(getting a red card) = $\dfrac{22}{44}$ = $\dfrac{1}{2}$