

CBSE Test Paper 04
Chapter 15 Probability

1. A ticket is drawn from a bag containing 100 tickets numbered from 1 to 100. The probability of getting a ticket with a number divisible by 10 is **(1)**
 - a. $\frac{3}{10}$
 - b. $\frac{1}{10}$
 - c. $\frac{4}{10}$
 - d. $\frac{1}{5}$
2. 3 rotten eggs are mixed with 12 good ones. One egg is chosen at random. The probability of choosing a rotten egg is **(1)**
 - a. $\frac{1}{15}$
 - b. $\frac{4}{5}$
 - c. $\frac{1}{5}$
 - d. $\frac{2}{5}$
3. A letter of English alphabets is chosen at random. The probability that the letter chosen is a vowel is **(1)**
 - a. $\frac{2}{26}$
 - b. $\frac{4}{26}$
 - c. $\frac{1}{26}$
 - d. $\frac{5}{26}$
4. If S is the sample space of a random experiment, then $P(S) =$ **(1)**
 - a. $\frac{1}{4}$
 - b. $\frac{1}{8}$
 - c. 1
 - d. 0
5. A bag contains 6 red, 8 white, 4 green and 7 black balls. One ball is drawn at random. The probability that the ball drawn is neither green nor white is **(1)**
 - a. $\frac{8}{25}$
 - b. $\frac{12}{25}$
 - c. $\frac{13}{25}$

d. $\frac{4}{25}$

6. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally likely outcomes. Find the probability that the arrow will point at any factor of 8? **(1)**
7. An unbiased die is thrown. What is the probability of getting a number between 3 and 6? **(1)**
8. A bag contains 18 balls out of which x balls are red. If one ball is drawn at random from the bag, what is the probability that it is not red? **(1)**
9. A die is thrown. Find the probability of getting a number lying between 2 and 6. **(1)**
10. 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. **(1)**
11. It is known that a box of 600 electric bulbs contains 12 defective bulbs. One bulb is taken out at random from this box. What is the probability that it is a non-defective bulb? **(2)**
12. From a group of 3 boys and 2 girls we select two children. What is the set representing the event: **(2)**
 - i. one girl is selected
 - ii. at least one girl is selected?
13. A card is drawn from a well shuffled pack of 52 cards. Find the probability that the card is neither a red card nor a queen. **(2)**
14. A bag contains 4 white balls, 5 red balls, 2 black balls and 4 green balls. A ball is drawn at random from the bag. Find the probability that it is **(3)**
 - i. black,
 - ii. not green,
 - iii. red or white,
 - iv. neither red nor green.
15. A bag contains 5 red and some blue balls, **(3)**
 - i. if probability of drawing a blue ball from the bag is twice that of a red ball, find the number of blue balls in the bag.

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- ii. if probability of drawing a blue ball from the bag is four times that of a red ball, find the number of blue balls in the bag.
16. In a game, the entry fee is Rs 5. The game consists of tossing a coin 3 times. If one or two heads show, Shweta gets her entry fee back. If she throws 3 heads, she receives double the entry fees. Otherwise, she will lose. For tossing a coin three times, find the probability that she **(3)**
- i. loses the entry fee.
 - ii. gets double entry fee.
 - iii. just gets her entry fee.
17. Cards marked with numbers 1,3,5,..., 101 are placed in a bag and mixed thoroughly. A card is drawn at random from the bag. Find the probability that the number on the drawn cards is **(3)**
- i. less than 19,
 - ii. a prime number less than 20.
18. 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 **(4)**
- i. a black queen
 - ii. a red card
 - iii. a ten
 - iv. a picture card (jacks, queens and kings are picture cards).
19. All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is drawn at random from the remaining pack. Find the probability of getting **(4)**
- i. a black face card
 - ii. a queen
 - iii. a black card
 - iv. a spade
20. The houses in a row are numbered consecutively from 1 to 49. Show that there exists a value of X such that sum of numbers of houses proceeding the house numbered X is equal to sum of the numbers of houses following X. **(4)**

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Solution

1. b. $\frac{1}{10}$

Explanation: Number of possible outcomes = {10, 20, 30, 40, 50, 60, 70, 80, 90, 100} = 10

Number of Total outcomes = 100

$$\therefore \text{Required Probability} = \frac{10}{100} = \frac{1}{10}$$

2. c. $\frac{1}{5}$

Explanation: Number of possible outcomes = 3

Number of Total outcomes = 15

$$\therefore \text{Required Probability} = \frac{3}{15} = \frac{1}{5}$$

3. d. $\frac{5}{26}$

Explanation: We know that "A, E, I, O, U" are vowels

Number of vowels = 5

Number of possible outcomes = 5

Number of total outcomes = 26

$$\therefore \text{Required Probability} = \frac{5}{26}$$

4. c. 1

Explanation: If S is the sample space of a random experiment, then $P(S) = 1$

5. c. $\frac{13}{25}$

Explanation: Total number of balls = 25

Number of Green and White balls = $4 + 8 = 12$

Number of balls neither green nor white = $25 - 12 = 13$

Number of possible outcomes = 13

Number of total outcomes = 25

$$\therefore \text{Required Probability} = \frac{13}{25}$$

6. Total number of points = 8

Total number of possible outcomes = 8

$$= (1 \times 8), (2 \times 4), (8 \times 1), (4 \times 2)$$

No. of favourable outcomes = 4

Probability of event happen $P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

$$\therefore P(\text{Factor of 8}) = \frac{4}{8} = \frac{1}{2}$$

7. The event "Getting a number between 3 and 6" occurs if we obtain either 4 or 5 as an outcome.

Favourable number of outcomes = 2

$$\text{Hence, required probability} = \frac{2}{6} = \frac{1}{3}$$

8. The total number of balls = 18.

Number of red balls = x.

- i. Number of balls which are not red = $18 - x$

$$\text{Therefore, } P(\text{getting a ball which is not red}) = \frac{\text{Number of favorable outcomes}}{\text{Number of all possible outcomes}} = \frac{18-x}{18}$$

Thus, the probability of drawing a ball which is not red is $\frac{18-x}{18}$.

9. Favourable outcomes of getting a number lying between 2 and 6 = {3,4,5}

Therefore, number of favourable outcomes = 3

Hence, Probability of getting a number lying between 2 and 6 =

$$\frac{\text{number of favourable outcomes}}{\text{number of total outcomes}} = \frac{3}{6} = \frac{1}{2}$$

10. Total number of cases = 20

$$\Rightarrow n(s) = 20$$

A = favourable cases = {3, 6, 7, 9, 12, 14, 15, 18}

$$\therefore n(A) = 8$$

Probability of event happen $P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

$$\therefore \text{Required probability} = P(A) = \frac{n(A)}{n(S)} = \frac{8}{20} = \frac{2}{5}$$

11. Out of 600 electric bulbs one bulb can be chosen in 600 ways.

Total number of elementary events = 600

There are 588 (= 600 - 12) non-defective bulbs out of which one bulb can be chosen in 588 ways.

Favourable number of elementary events = 588

$$\text{Hence, } P(\text{Getting a non-defective bulb}) = \frac{588}{600} = \frac{49}{50} = 0.98$$

12. Let boys be B_1, B_2, B_3 (3 Boys)

Let girls be G_1, G_2 (2 girls)

Therefore, the set which represents, one girl is selected and at least one girl is selected are respectively as,

i. $\{B_1G_1, B_2G_1, B_3G_1, B_1G_2, B_2G_2, B_3G_2\}$

ii. $\{B_1G_1, B_2G_1, B_3G_1, B_1G_2, B_2G_2, B_3G_2, G_1G_2\}$

13. Total number of red cards = 26 (including 2 queens)

Total number of queen in pack of 52 cards is 4, out of which 2 are black queen cards and 2 are red queen cards.

$$\text{Total number of red cards and queen cards} = 26 + 2 = 28$$

$$\text{Number of favourable outcomes} = 52 - 28 = 24$$

$$\therefore P(\text{neither red nor queen}) = \frac{24}{52} = \frac{6}{13}$$

14. Total number of balls = 4 + 5 + 2 + 4 = 15.

i. Number of black balls = 2.

$$P(\text{getting a black ball}) = \frac{2}{15}$$

ii. Number of balls which are not green = 4 + 5 + 2 = 11

$$P(\text{getting a ball which is not green}) = \frac{11}{15}$$

iii. Number of balls which are red or white = 5 + 4 = 9.

$$P(\text{getting a ball which is red or white}) = \frac{9}{15} = \frac{3}{5}$$

iv. Number of balls which are neither red nor green = 4 + 2 = 6

$$P(\text{getting a ball which is neither red nor green}) = \frac{6}{15} = \frac{2}{5}$$

15. Let number of blue balls = x

$$\text{Total number of balls} = 5 + x$$

$$\text{Probability of red ball} = \frac{5}{5+x}$$

$$\text{Probability of blue ball} = \frac{x}{5+x}$$

By given condition,

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

$$x = 10$$

$$\text{No. of blue balls} = 10$$

ii. Here, $\frac{5}{5+x} = 4 \times \frac{x}{5+x}$

$$x = 20$$

$$\text{Hence, the number of blue balls} = 20$$

16. Possible outcomes when a coin is tossed 3 times:

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

\Rightarrow Total number of outcomes = 8

i. Shweta will lose the entry fee if she gets 'TTT'.

$$P(\text{Shweta losses the entry fee}) = \frac{1}{8}$$

ii. Shweta will get double the entry fee if she gets HHH,

$$P(\text{Shweta will get double the entry fee}) = \frac{1}{8}$$

iii. Shweta will get her entry fee, if she get HHH, HTH, THH, TTH, THT or TTT

$$P(\text{Shweta will get her entry fee}) = \frac{6}{8} = \frac{3}{4}$$

17. Given numbers 1, 3, 5, , 101 form an AP with $a = 1$ and $d = 2$. (first term is one and common difference is two)

Let $T_n = 101$. Then,

$$1 + (n - 1)2 = 101$$

$$\Rightarrow 1 + 2n - 2 = 101$$

$$\Rightarrow 2n = 102$$

$$\Rightarrow n = 51$$

Therefore, total number of outcomes = 51.

i. Suppose E_1 be the event of getting a number less than 19.

Out of these numbers, less than 19 are 1, 3, 5, , 17.

Given number 1, 3, 5, , 17 form an AP with $a = 1$ and $d = 2$. (first term is one and common difference is two)

Suppose $T_n = 17$. Then,

$$1 + (n - 1)2 = 17$$

$$\Rightarrow 1 + 2n - 2 = 17$$

$$\Rightarrow 2n = 18$$

$$\Rightarrow n = 9$$

Thus, number of favorable outcomes = 9.

Therefore, $P(\text{getting a number less than 19}) = P(E_1) =$

$$\frac{\text{Number of outcomes favorable to } E_1}{\text{Number of all possible outcomes}} = \frac{9}{51} = \frac{3}{17}$$

Therefore, the probability that the number on the drawn card is less than 19 is $\frac{3}{17}$.

ii. Suppose E_2 be the event of getting a prime number less than 20.

Out of these numbers, prime numbers less than 20 are 3, 5, 7, 11, 13, 17 and 19.

Therefore, the number of favorable outcomes = 7.

Therefore, $P(\text{getting a prime number less than 20}) = P(E_2) =$

$$\frac{\text{Number of outcomes favorable to } E_2}{\text{Number of all possible outcomes}} = \frac{7}{51}$$

Thus, the probability that the number on the drawn card is a prime number less than 20 is $\frac{7}{51}$.

18. There will be 52 cards in a deck.

There are four different suits: Diamonds, Clubs, Hearts, and Spades.

There will be thirteen cards in each suit, they are :

Ace, 2,3,4,5,6,7,8,9,10, Jack, Queen, King.

From a pack of 52 cards jacks, queens, kings and aces of red colour are removed.

Number of cards removed = $2 + 2 + 2 + 2 = 8$.

Total number of remaining cards = $52 - 8 = 44$.

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

i. Number of black queens = 2.

$$\therefore P(\text{getting a black queen}) = \frac{2}{44} = \frac{1}{22}$$

ii. Remaining number of red cards = $26 - 8 = 18$.

$$\therefore P(\text{getting a red card}) = \frac{18}{44} = \frac{9}{22}$$

iii. Number of tens = 4.

$$\therefore P(\text{getting ten}) = \frac{4}{44} = \frac{1}{11}$$

iv. We know that jacks, queens and kings are picture cards.

Out of 12 picture cards, it is given that 6 have been removed.

So, the remaining number of picture cards = $12 - 6 = 6$.

$$\therefore P(\text{getting a picture card}) = \frac{6}{44} = \frac{3}{22}$$

19. Here, all face cards of spades are removed from a deck of 52 playing cards.

So, remaining cards in deck = $52 - 3 = 49$

\therefore Total number of outcomes $n = 49$

i. We know that there are 6 black face cards in a deck of cards. After removing face cards of spades only 3 face cards of club are left.

so number of favorable outcomes $m = 3$

$$\therefore \text{Required Probability} = P(E) = \frac{m}{n} = \frac{3}{49}$$

ii. There are 4 queens in a deck. After removing a queen of spade, we are left with 3 queens.

Then, number of favorable outcomes $m = 3$

$$\therefore \text{Required Probability} = P(E) = \frac{m}{n} = \frac{3}{49}$$

iii. There are 26 black cards in a regular deck of cards.

After removing 3 face cards of spades, there are only 23 black cards.

Then, number of favorable outcomes $m = 23$

$$\therefore \text{Required Probability} = P(E) = \frac{m}{n} = \frac{23}{49}$$

iv. There are 13 cards of spade in a deck. After removing 3 face cards of spade only 10 spades cards are left.

So number of favorable outcomes $m = 10$

$$\therefore \text{Required Probability} = P(E) = \frac{m}{n} = \frac{10}{49}$$

20. The houses are numbered consecutively from 1 to 49.

1, 2, 3, (x - 1), x, (x + 1), 49

Sum of number of houses preceding x numbered house = Sum of number following x

Sum of number of houses preceding x numbered house =

$$S_1 = \frac{x-1}{2} \times (1 + x - 1) = \frac{x(x-1)}{2} \dots\dots (1)$$

Sum of number following x =

$$\begin{aligned} S_2 &= (1 + 2 + 3 + \dots\dots\dots 49) - \frac{x}{2} \times (x + 1) \\ &= \frac{49 \times 50}{2} - \frac{x^2 + x}{2} = \frac{2450 - x^2 - x}{2} \dots\dots (2) \end{aligned}$$

As $S_1 = S_2$

$$\frac{2450 - x^2 - x}{2} = \frac{x(x-1)}{2}$$

$$2450 - x^2 - x = x^2 - x$$

$$2x^2 = 2450$$

$$x^2 = 1225$$

$$x = 35$$

Hence sum of numbers of houses proceeding the house numbered 35 is equal to sum of the numbers of houses following 35