MATHEMATICS

Class-X

Topic-12

PROBABILITY

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CH-12
PROBABILITY

(A) INTRODUCTION TO PROBABILITY AND THEORETICAL PROBABILITY

(a) Terms Related to Probability

Experiment : The word **experiment** means an operation, which can produce well defined outcomes. There are two types of experiment :

(i) Deterministic experiment **(ii) Probabilistic or Random experiment**

(i) Deterministic Experiment : Those experiment which when repeated under identical conditions, produce the same results or outcome are known as **deterministic experiment**. For example, Physics or Chemistry experiments performed under identical conditions.

(ii) Probabilistic or Random Experiment :– In an experiment, when repeated under identical conditions do not produce the same outcomes every time. For example, in tossing a coin, one is not sure that if a head or tail will be obtained. So it is a **random experiment**.

Sample space : The set of all possible out comes of a random experiment is called a **sample space** associated with it and is generally denoted by **S**. For example, When a dice is tossed then S = { 1, 2, 3, 4, 5, 6 }.

Event : A subset of sample space associated with a random experiment is called an **event**. For example, In tossing a dice getting an even number is an event.

Favourable Event : Let S be a sample space associated with a random experiment and **A** be event associated with the random experiment. The elementary events belonging to **A** are known as **favourable events** to the event A.
For example : In throwing a pair of dice, A is defined by "Getting 8 as the sum". Then following elementary events are as out comes : (2, 6) ,(3, 5), (4, 4) (5, 3), (6, 2). So, there are 5 elementary events fovourable to event A.

(b) Probability

If there are **n** elementary events associated with a random experiment and **m** of them are favourable to an event **A**, then the probability of happening or occurrence of event **A** is denoted by **P(A)**

Thus, $P(A) = \frac{\text{Total number of favourable outcomes}}{\text{Total number of possible outcomes}} = \frac{m}{n}$

And $0 \le P(A) \le 1$
If, $P(A) = 0$, then A is called **impossible event**
If, $P(A) = 1$, then A is called sure event
$P(A) + P(\bar{A}) = 1$

Where P(A) = probability of occurrence of A ; $P(\bar{A})$ = probability of non - occurrence of A.

Solved Examples

Example 1

Write the sample space when a coin is tossed.

Sol. When a coin is tossed, there are two possible outcomes: a head {H} or a tail {T}. The sample space of this experiment is S = {H, T}

Example 2

A bag contains 5 white balls, 4 red balls and 3 green balls. A ball is drawn at random. Find the probability that it is (i) a red ball (ii) a green ball (iii) a coloured ball (iv) a ball which is not green.

Sol. Total number of balls in the bag 5 + 4 + 3 = 12.

We denote the event of getting a red ball as R, that of getting a green ball G, that of getting a coloured ball as C and that of getting a ball not green as $\overline{G}$ or not G.

(i) $P(R) = \frac{[\text{Number of outcomes which favour R}]}{12} = \frac{4}{12}$

$= \frac{1}{3}$ [$\because$ 4 outcomes favour the event R]

(ii) $P(G) = \frac{3}{12} = \frac{1}{4}$.

(iii) There are 4 + 3 = 7 coloured balls, i.e. either red or green.
So, 7 outcomes favour the event C

$\therefore \quad P(C) = \frac{7}{12}$

(iv) There are 5 + 4 = 9 balls which are not green i.e. white or red, so there are 9 outcomes that favour the event not G.

Therefore, P (not G) = $\frac{9}{12} = \frac{3}{4}$.

Example 3

Two dice are thrown simultaneously. List the sample space for this experiment.

Sol. When two dice are thrown, there are $6 \times 6 = 6^2 = 36$ possible outcomes and
S = { (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) }

Example 4

A dice is thrown once. Find the probability of getting
(i) a prime number **(ii)** a prime number lying between 2 and 6
(iii) an odd number.

Sol. Sample space S = {1, 2, 3, 4, 5, 6}
Total number of events = 6

(i) a prime number = {2,3, 5}

$\therefore$ P (a prime number) = $\frac{3}{6} = \frac{1}{2}$.

(ii) a prime lying between 2 and 6 = {3, 5}

$\therefore$ P (a number lying between 2 and 6) = $\frac{2}{6} = \frac{1}{3}$.

(iii) an odd number = {1,3, 5}

$\therefore$ P (an odd number) = $\frac{3}{6} = \frac{1}{2}$.

Example 5

A dice is thrown once. Find the probability of getting (i) an even number (ii) a prime number (iii) a number greater than 4.

Sol. We know that sample space S on throwing a dice is S = {1, 2, 3, 4, 5, 6}
$\therefore$ Total number of cases (possible outcomes)
n(S) = 6

(i) Event E : getting an even number = {2,4, 6}
Number of favourable cases = n(E) = 3

Required probability = P(E) = $\frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$.

(ii) Event E : getting a prime number E = {2,3, 5}
Number of favourable cases = n(E) = 3

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}.$

(iii) Event E : getting a number greater than E = {5, 6}
Number of favourable cases = n(E) = 2

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}.$

Example 6

(i) A lot of 20 bulbs contains 4 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective.

(ii) Suppose the bulb drawn in (i) is not defective and is not replaced. Now one bulb is drawn at random from the rest. What is the probability that this bulb is not defective.

Sol. **(i)** Number of defective bulbs = 4
Number of good bulbs (Not defective) = 16
Total number of bulbs = 4 + 16 = 20

Probability of getting a defective bulb = $\frac{4}{20} = \frac{1}{5}.$

(ii) When a defective bulb drawn is not being replaced, we are left with 19 bulbs. Now probability of not getting a defective bulb $= \frac{15}{19}.$

Example 7

One card is drawn from a well shuffled deck of 52 cards. Calculate the probability that the card will be :

(i) a diamond **(ii)** an ace
(iii) a black card **(iv)** not a heart

Sol. Total no. of cards = 52
Total number of events = 52

(i) Let E be an event of getting a diamond card n(E) = 13

$P(E) = \frac{13}{52} = \frac{1}{4}$

(i) Let E be an event of getting an ace n(E) = 4

$P(E) = \frac{4}{52} = \frac{1}{13}$

(iii) Let E be an event of getting a black card

$P(E) = \frac{26}{52} = \frac{1}{2}$

(iv) Let E be an event of getting not a heart n(E) = 52 – 13 = 39

$P(E) = \frac{39}{52} = \frac{3}{4}.$

Example 8

A box contains 5 red balls, 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is

(i) white **(ii)** neither red nor white

Sol. Total number of balls in the bag = 5 + 4 + 7 = 16
$\therefore$ Total number of elementary events = 16

(i) There are 7 white balls in the bag.
$\therefore$ Favourable number of elementary events = 7

Hence, P (Getting a white ball) $= \frac{\text{Total no. of favourable elementary events}}{\text{Total no. of elementary events}} = \frac{7}{16}$

(ii) There are 4 balls that are neither red nor white
$\therefore$ Favourable number of elementary events = 4

Hence, P (Getting neither red nor white ball) = $\frac{4}{16} = \frac{1}{4}$.

Example 9

All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting

(i) black face card **(ii)** a queen **(iii)** a black card.

Sol. After removing three face cards of spades (king, queen, jack) from a deck of 52 playing cards, there are 49 cards left in the pack. Out of these 49 cards one card can be chosen in 49 ways.

$\therefore$ Total number of elementary events = 49

(i) There are 6 black face cards out of which 3 face cards of spades are already removed. So, out of remaining 3 black face cards one black face card can be chosen in 3 ways.

$\therefore$ Favourable number of elementary events = 3

Hence, P (Getting a black face card) = $\frac{3}{49}$

(ii) There are 3 queens in the remaining 49 cards. So, out of these three queens, one queen can be chosen in 3 ways

$\therefore$ Favourable number of elementary events = 3

Hence, P (Getting a queen) = $\frac{3}{49}$

(iii) There are 23 black cards in the remaining 49 cards, So, out of these 23 black card, one black card can be chosen in 23 ways

$\therefore$ Favourable number of elementary events = 23

Hence, P (Getting a black card) = $\frac{23}{49}$.

Example 10

A die is thrown. Find the probability of

(i) prime number **(ii)** multiple of 2 or 3 **(iii)** a number greater than 3

Sol. In a single throw of die any one of six numbers 1,2,3,4,5,6 can be obtained. Therefore, the total number of elementary events associated with the random experiment of throwing a die is 6.

(i) Let A denote the event " Getting a prime no." Clearly, event A occurs if any one of 2,3,5 comes as out come.

$\therefore$ Favourable number of elementary events = 3

Hence, P (Getting a prime no.) = $\frac{3}{6} = \frac{1}{2}$.

(ii) An multiple of 2 or 3 is obtained if we obtain one of the numbers 2,3,4,6, as out comes

$\therefore$ Favourable number of elementary events = 4

Hence, P (Getting multiple of 2 or 3) = $\frac{4}{6} = \frac{2}{3}$.

(iii) The event "Getting a number greater than 3" will occur, if we obtain one of number 4,5,6 as an outcome.

$\therefore$ Favourable number of out comes = 3. Hence, required probability = $\frac{3}{6} = \frac{1}{2}$.

Example 11

Two unbiased coins are tossed simultaneously. Find the probability of getting

(i) two heads **(ii)** at least one head **(iii)** at most one head

Sol. If two unbiased coins are tossed simultaneously, we obtain any one of the following as an out come
HH, HT, TH, TT

$\therefore$ Total number of elementary events = 4

(i) Two heads are obtained if elementary event HH occurs.

$\therefore$ Favourable number of events = 1. Hence, P (Two heads) = $\frac{1}{4}$.

(ii) At least one head is obtained if any one of the following elementary events happen :
HH, HT, TH
$\therefore$ Favourable number of events = 3

Hence, P (At least one head) = $\frac{3}{4}$

(iii) If one of the elementary events HT, TH, TT occurs, then at most one head is obtained
$\therefore$ Favourable number of events = 3

Hence, P (At most one head) = $\frac{3}{4}$.

Example 12

A box contains 20 balls bearing numbers, 1,2,3,4,.....20. A ball is drawn at random from the box. What is the probability that the number on the ball is :
(i) an odd number **(ii)** divisible by 2 or 3 **(iii)** prime number

Sol. Here, total numbers are 20.
$\therefore$ Total number of elementary events = 20

(i) The number selected will be odd number, if it is elected from 1,3,5,7,9,11,13,15,17,19
$\therefore$ Favourable number of elementary events = 10

Hence, P (An odd number) = $\frac{10}{20} = \frac{1}{2}$

(ii) Number divisible by 2 or 3 are 2, 3, 4, 6, 8, 9, 10, 12, 14,15, 16, 18, 20
$\therefore$ Favourable number of elementary events = 13

P (Number divisible by 2 or 3) = $\frac{13}{20}$.

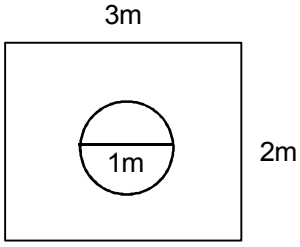
(iii) There are 8 prime number from 1 to 20, ie, 2,3,5,7,11,13,17,19
$\therefore$ Favourable number of elementary events = 8

P (Prime number) = $\frac{8}{20} = \frac{2}{5}$.

Example 13

A die is dropped at random on the rectangular region as shown in figure. What is the probability that it will land inside the circle with diameter 1m ?

Sol. Area of rectangular region = 3m × 2m = $6m^2$



Area of circle = πr^2

$= \pi \times \left(\frac{1}{2}\right)^2 = \frac{\pi}{4} m^2$

$\therefore$ Probability that die will land inside the circle

$= \frac{\pi/4}{6} = \frac{\pi}{24}$.

Check Your Level

1. If a coin is tossed 3 times what is the probability of getting a Tail each time?

2. A pair of dice is rolled once. What is the probability of getting a total of 8?

3. What is the probability of friends Apoorva and Sonia not celebrating their birthdays on the same day of the year (non leap year)?

4. A bag contains 5 blue, 4 green and 8 white balls. A ball is taken out at random. What is the probability that the color of the ball is (i) blue? (ii) white?

5. A box of dolls has 25 dolls out of which 4 are accidentally broken in transit. If you pick one doll at random from the box, what is the chance that you get a good doll?

Answers

1. $\frac{1}{8}$ **2.** $\frac{5}{36}$ **3.** 364/365.

4. **(i)** $\frac{5}{17}$ **(ii)** $\frac{8}{17}$ **5.** $\frac{21}{25}$

Exercise Board Level

TYPE (I) : VERY SHORT ANSWER TYPE QUESTIONS : [01 MARK EACH]

1. If an event cannot occur, then find its probability.

2. If the probability of an event is p, then find the probability of its complementary event.

3. The probability of an event A cannot be less than k and greater than m. Find value of k and m.

4. A card is selected from a deck of 52 cards. Then find the probability of its being a red face card.

5. When a die is thrown, then find the probability of getting an odd number less than 3.

6. A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. Then find the number of outcomes favourable to E.

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

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

9. Someone is asked to take a number from 1 to 100. Then find the probability that it is a prime.

10. 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 rest from house E. A single student is selected at random to be the class monitor. Then find the probability that the selected student is not from A, B and C

11. A coin is tossed three times. Find the probability of getting at least two heads.

12. A letter of English alphabets is chosen at random. Determine the probability that the letter is a consonant.

TYPE (II) : SHORT ANSWER TYPE QUESTIONS : [02 MARKS EACH]

13. Two dice are thrown at the same time. Find the probability of getting
(i) same number on both dice.
(ii) different numbers on both dice.

14. Two dice are thrown at the same time. Determine the probability that the difference of the numbers on the two dice is 2.

15. All the jacks, queens and kings are removed from a deck of 52 playing cards. The remaining cards are well shuffled and then one card is drawn at random. Giving ace a value 1 similar value for other cards, find the probability that the card has a value
(i) 7 **(ii)** greater than 7 **(iii)** less than 7

16. An integer is chosen between 0 and 100. What is the probability that it is
(i) divisible by 7 ? **(ii)** not divisible by 7 ?

17. There are 1000 sealed envelopes in a box, 10 of them contain a cash prize of Rs 100 each, 100 of them contain a cash prize of Rs 50 each and 200 of them contain a cash prize of Rs 10 each and rest do not contain any cash prize. If they are well shuffled and an envelope is picked up out, what is the probability that it contains no cash prize?

18. A child's game has 8 triangles of which 3 are blue and rest are red, and 10 squares of which 6 are blue and rest are red. One piece is lost at random. Find the probability that it is a
(i) triangle **(ii)** square
(iii) square of blue colour **(iv)** triangle of red colour

19. A bag contains 24 balls of which x are red, 2x are white and 3x are blue. A ball is selected at random. What is the probability that it is
(i) not red? **(ii)** white?

TYPE (III): LONG ANSWER TYPE QUESTIONS **[03 MARK EACH]**

20. Two dice are thrown simultaneously. What is the probability that the sum of the numbers appearing on the dice is
(i) 7 **(ii)** a prime number **(iii)** 1

21. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is less than 9.

22. 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.

23. In a game, the entry fee is Rs 5. The game consists of a tossing a coin 3 times. If one or two heads show, Sweta 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
(i) loses the entry fee. **(ii)** gets double entry fee.
(iii) just gets her entry fee.

24. A lot consists of 48 mobile phones of which 42 are good, 3 have only minor defects and 3 have major defects. Varnika will buy a phone if it is good but the trader will only buy a mobile if it has no major defect. One phone is selected at random from the lot. What is the probability that it is
(i) acceptable to Varnika? **(ii)** acceptable to the trader?

25. 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
(i) the first player wins a prize?
(ii) the second player wins a prize, if the first has won?

Previous Year Problems

1. The probability of getting an even number, when a dice is throw once , is :
[1 MARK/CBSE 10TH BOARD: 2012]

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{6}$ (D) $\frac{5}{6}$

2. A box contains 90 discs , numbered from 1 to 90. If one disc is drawn at random from the box , the probability that it bears a prime-number less than 23,is :
[1 MARK/CBSE 10TH BOARD: 2012]

(A) $\frac{7}{90}$ (B) $\frac{10}{90}$ (C) $\frac{4}{45}$ (D) $\frac{9}{89}$

3. A dice is tossed once. Find the probability of getting an even number or a multiple of 3 .
[2 MARKS/CBSE 10TH BOARD: 2012]

4. A group consists of 12 persons , of which 3 are extremely patient , other 6 are extremely honest and rest are extremely kind . A person from the group is selected at random . Assuming that each person is equally likely to be selected , find the probability of selecting a person who is (i) extremely patient (ii) extremely kind or honest. Which of the above values you prefer more ?
[4 MARKS/CBSE 10TH BOARD: 2013]

5. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is.
[1 MARK /CBSE 10TH BOARD: 2013]

(A) $\frac{1}{5}$ (B) $\frac{3}{25}$ (C) $\frac{4}{25}$ (D) $\frac{2}{25}$

6. Two different coins are tossed simultaneously. The probability of getting at least one head is.
[1 MARK /CBSE 10TH BOARD: 2013]

(A) $\frac{1}{4}$ (B) $\frac{1}{8}$ (C) $\frac{3}{4}$ (D) $\frac{7}{8}$

7. A dice is rolled twice. Find the probability that **[4 MARKS/CBSE 10TH BOARD: 2013]**
(i) 5 will not come up either time.
(ii) 5 will come up exactly one time.

8. Two different dice are rolled simultaneously. Find the probability that the sum of numbers appearing on the two dice is 10. **[2 MARKS/ CBSE 10TH BOARD: 2014]**

9. A card is drawn at random from a well-shuffled deck of playing cards.
Find the probability that the card drawn is **[4 MARKS/CBSE 10TH BOARD: 2014]**
(i) a card of spade or an ace **(ii)** a black king
(iii) neither a jack nor a king **(iv)** either a king or a queen

10. Two different dice are tossed together. Find the probability that the product of the two number on the top of the dice is 6. **[1 MARK /CBSE 10TH BOARD: 2014]**

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

12. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting neither a red card nor a queen.
[1 MARK / CBSE 10TH BOARD: 2015]

13. A number x is selected at random from the numbers 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability that product of x and y is less than 16.
[4 MARKS / CBSE 10TH BOARD: 2015]

14. Three different coins are tossed together. Find the probability of getting
(i) exactly two heads (ii) at least two heads (iii) at least two tails.
[2 MARKS / CBSE 10TH BOARD: 2016]

15. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap ?
[1 MARK / CBSE 10TH BOARD: 2015]

16. Two different dice are thrown together. Find the probability that the numbers obtained have
[4 MARKS / CBSE 10TH BOARD: 2015]
(i) even sum, and
(ii) even product.

17. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag.
[3 MARKS/ CBSE 10TH BOARD: 2017]

Exercise-1

SUBJECTIVE QUESTIONS

Subjective Easy, only learning value problems

Section (A) : Introduction to probability and theoretical probability

A-1. A bag contains 12 balls out of which x are white.
(i) If one ball is drawn at random, what is the probability it will be a white ball?
(ii) If 6 more white balls are put in the box. The probability of drawing a white ball will be double than that in (i). Find x.

A-2. In a class, there are 18 girls and 16 boys. The class teacher wants to choose one pupil for class monitor. What she does, she writes the name of each pupil on a card and puts them into a basket and mixes thoroughly. A child is asked to pick one card from the basket. What is the probability that the name written on the card is :
(i) The name of a girl **(ii)** The name of a boy ?

A-3. A bag contains 4 red and 6 black balls. A ball is taken out of the bag at random. Find the probability of getting a black ball.

A-4. Two coins are tossed simultaneously. Find the probability of getting exactly one head.

A-5. A die is thrown once. What is the probability of getting a number greater than 4 ?

A-6. Find the probability that a leap year selected at random will contain 53 Tuesdays.

A-7. There are 30 cards of same size in a bag on which numbers 1 to 30 are written. One card is taken out of the bag at random. Find the probability that the number on the selected card is not divisible by 3.

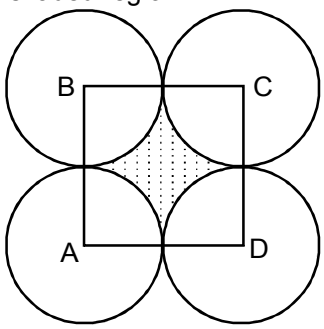
A-8. A bag contains cards which are numbered from 2 to 90. A card is drawn at random from the bag. Find the probability that it bears
(i) a two digit number **(ii)** a number which is a perfect square.

A-9. A bag contains 5 white balls, 6 red balls, 6 black balls and 8 green balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is
(i) White **(ii)** Red or black
(iii) Not green **(iv)** Neither white nor black

A-10. Two dice are thrown simultaneously. Find the probability of getting :
(i) An even number as the sum **(ii)** The sum as a prime number
(iii) A total of at least 10
(iv) A multiple of 2 on one dice and a multiple of 3 on the other.

A-11. A card is drawn at random from a well shuffled desk of playing cards. Find the probability that the card drawn is
(i) A card of spade or an ace **(ii)** A red king
(iii) Neither a king nor a queen **(iv)** Either a king or a queen

A-12. In figure points A, B, C and D are the centres of four circles that each have a radius of length one unit. If a point is selected at random from the interior of square ABCD. What is the probability that the point will be chosen from the shaded region?



A-13. Cards, marked with numbers 5 to 50, are placed in a box and mixed thoroughly. A card is drawn from the box at random. Find the probability that the number on the taken out card is
(i) a prime number less than 10.
(ii) a number which is a perfect square

A-14. Two dice are thrown simultaneously. What is the probability that
(i) 5 will not come up on either of them ?
(ii) 5 will come up on at least one ?
(iii) 5 will come up at both dice ?

OBJECTIVE QUESTIONS

Single Choice Objective, straight concept/formula oriented

Section (A) : Introduction to probability and theoretical probability

A-1. If three coins are tossed simultaneously, then the probability of getting at least two heads, is

(A) $\frac{1}{4}$ (B) $\frac{3}{8}$ (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

A-2. A bag contains three green marbles, four blue marbles, and two orange marbles. If a marble is picked at random, then the probability that it is not an orange marble is

(A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{4}{9}$ (D) $\frac{7}{9}$

A-3. A number is selected from numbers 1 to 27. The probability that it is prime is

(A) $\frac{2}{3}$ (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) $\frac{2}{9}$

A-4. If P(E) = 0.05, then P(not E) =

(A) – 0.05 (B) 0.5 (C) 0.9 (D) 0.95

A-5. A bulb is taken out at random from a box of 600 electric bulbs that contains 12 defective bulbs. Then the probability of a non-defective bulb is

(A) 0.02 (B) 0.98 (C) 0.50 (D) None

A-6. A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is

(A) 4 (B) 13 (C) 48 (D) 51

A-7. In a single throw of a pair of dice, the probability of getting the sum a perfect square is

(A) $\frac{1}{18}$ (B) $\frac{7}{36}$ (C) $\frac{1}{6}$ (D) $\frac{2}{9}$

A-8. Some one is asked to choose a number from 1 to 100. The probability of its being a prime number is

(A) $\frac{1}{5}$ (B) $\frac{6}{25}$ (C) $\frac{1}{4}$ (D) $\frac{13}{50}$

A-9. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6,000 tickets are sold, how many tickets has she bought ?

(A) 40 (B) 240 (C) 480 (D) 750

A-10. A number x is chosen at random from the numbers – 3, – 2, – 1, 0, 1, 2, 3. The probability that $|x| < 2$ is

(A) $\frac{5}{7}$ (B) $\frac{3}{7}$ (C) $\frac{2}{7}$ (D) $\frac{1}{7}$

A-11. If a card is drawn from a pack of cards. The probability of getting black ace is

(A) $\frac{1}{52}$ (B) $\frac{1}{26}$ (C) $\frac{1}{13}$ (D) $\frac{1}{4}$

A-12. A digit is chosen at random from the digits 1 to 9. The probability that the digit is even is

(A) $\frac{4}{9}$ (B) $\frac{5}{9}$ (C) $\frac{1}{9}$ (D) $\frac{1}{2}$

A-13. A letter of English alphabet is chosen at random. The probability that it is a letter of the word 'RANDOM' is

(A) $\frac{11}{26}$ (B) $\frac{3}{13}$ (C) $\frac{9}{26}$ (D) $\frac{4}{13}$

Exercise-2

OBJECTIVE QUESTIONS

1. A bag contains 40 balls out of which some are red, some are blue and remaining are black. If the probability of drawing a red ball is $\frac{11}{20}$ and that of blue ball is $\frac{1}{5}$, then the number of black balls is

(A) 5 (B) 25 (C) 10 (D) 30

2. Three unbiased coins are tossed, What is probability of getting exactly two heads ?

(A) $\frac{1}{3}$ (B) $\frac{3}{4}$ (C) $\frac{2}{3}$ (D) $\frac{3}{8}$

3. Three unbiased coins are tossed. What is the probability of getting at most 2 heads ?

(A) $\frac{1}{4}$ (B) $\frac{3}{8}$ (C) $\frac{7}{8}$ (D) $\frac{1}{2}$

4. What is the probability that a number selected from the numbers 1 2, 3, 4, 5,...,16 is a prime number ?

(A) $\frac{1}{16}$ (B) $\frac{5}{8}$ (C) $\frac{3}{8}$ (D) $\frac{7}{16}$

5. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn bears a number which is a multiple of 3 ?

(A) $\frac{3}{20}$ (B) $\frac{3}{10}$ (C) $\frac{2}{5}$ (D) $\frac{1}{2}$

6. One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card

(A) $\frac{3}{13}$ (B) $\frac{1}{4}$ (C) $\frac{9}{52}$ (D) $\frac{1}{13}$

7. One card is drawn at random form a pack of 52 cards. What is the probability that the card drawn is a king

(A) $\frac{1}{13}$ (B) $\frac{1}{52}$ (C) $\frac{3}{13}$ (D) $\frac{1}{4}$

8. What is the probability that an ordinary year has 53 Sundays ?

(A) $\frac{53}{365}$ (B) $\frac{1}{7}$ (C) $\frac{2}{7}$ (D) $\frac{48}{53}$

9. In a simultaneous throw of two dice, what is the probability of getting a total of 7 ?

(A) $\frac{1}{6}$ (B) $\frac{7}{12}$ (C) $\frac{7}{36}$ (D) $\frac{1}{4}$

10. In a simultaneous throw of two dice, what is the probability of getting a doublet ?

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) $\frac{2}{3}$

11. In a simultaneous throw of two dice, what is the probability of getting a total of 10 or 11 ?

(A) $\frac{7}{12}$ (B) $\frac{5}{36}$ (C) $\frac{1}{6}$ (D) $\frac{1}{4}$

12. Tickets numbered from 1 to 20 are mixed up and a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 7 ?

(A) $\frac{1}{15}$ (B) $\frac{1}{2}$ (C) $\frac{2}{5}$ (D) $\frac{7}{20}$

13. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white ?

(A) $\frac{4}{7}$ (B) $\frac{3}{4}$ (C) $\frac{4}{3}$ (D) $\frac{1}{8}$

14. What is the probability of getting a king or a queen in a single draw from a pack of 52 cards ?

(A) $\frac{1}{26}$ (B) $\frac{1}{13}$ (C) $\frac{2}{13}$ (D) none

15. In a lottery there are 10 prizes and 25 blanks. What is the probability of getting prize

(A) $\frac{1}{10}$ (B) $\frac{2}{5}$ (C) $\frac{2}{7}$ (D) $\frac{5}{7}$

16. An urn contains 9 red, 7 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn is not red ?

(A) $\frac{1}{11}$ (B) $\frac{9}{11}$ (C) $\frac{2}{11}$ (D) $\frac{11}{20}$

17. A card is drawn from a pack of 52 cards. A card is drawn at random. What is the probability that it is neither a heart nor a king ?

(A) $\frac{4}{13}$ (B) $\frac{9}{13}$ (C) $\frac{2}{13}$ (D) $\frac{4}{13}$

18. In a single throw of two dice what is the probability of not getting the same number on both the dice ?

(A) $\frac{1}{6}$ (B) $\frac{2}{3}$ (C) $\frac{5}{6}$ (D) $\frac{1}{3}$

19. A card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a spade or a king ?

(A) $\frac{4}{13}$ (B) $\frac{3}{13}$ (C) $\frac{2}{13}$ (D) $\frac{1}{13}$

Exercise-3

NTSE PROBLEMS (PREVIOUS YEARS)

1. The author of the book "The Book on games of chance" based on probability theory is **[Raj. NTSE Stage-1 2013]**

(A) J. Cardon (B) R.S. Woodwards (C) P.S. Laplace (D) P.D. Pherma

2. A bag contains 20 balls out of which x are black. If 10 more black balls are put in the box, the probability of drawing a black ball is double of what it was before. The value of x is: **[Delhi NTSE Stage 1 2013]**

(A) 0 (B) 5 (C) 10 (D) 40

3. The probability of getting a number greater than 2 by throwing a fair dice is : **[M.P. NTSE Stage-1 2013]**

(A) 2/3 (B) 1/3 (C) 1 (D) 3/5

4. What is the probability of getting two heads in four tosses of a coin ?**[M.P. NTSE Stage-1 2013]**

(A) $\frac{1}{2}$ (B) $\frac{3}{8}$ (C) $\frac{1}{4}$ (D) $\frac{3}{16}$

5. A die is thrown twice. The probability that 5 will not come up either of the time is **[Raj. NTSE Stage-1 2014]**

(A) $\frac{35}{36}$ (B) $\frac{25}{36}$ (C) $\frac{1}{36}$ (D) $\frac{11}{36}$

6. A die is thrown twice. The probability of the sum being odd, is **[Raj. NTSE Stage-1 2014]**

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{6}$

7. Two fair die are thrown. The probability the sum of the numbers appearing is 6 is : **[Bihar NTSE Stage-1 2014]**

(A) $\frac{1}{6}$ (B) $\frac{5}{6}$ (C) $\frac{1}{36}$ (D) $\frac{5}{36}$

8. From a pack of playing cards all cards whose numbers are multiple of 3 are removed. A card is now drawn at random. Then the probability that the card drawn is an even number is red card : **[Chattisgarh NTSE Stage-1 2014]**

(A) $\frac{10}{52}$ (B) $\frac{1}{4}$ (C) $\frac{1}{5}$ (D) $\frac{3}{13}$

9. From the natural number 1 to 19, a number is chosen randomly; the probability that the number is a prime number is - **[M.P. NTSE Stage-1 2014]**

(A) $\frac{8}{19}$ (B) $\frac{7}{19}$ (C) $\frac{6}{19}$ (D) $\frac{5}{19}$

10. In a 400 m running race, there are 'n' competitors and they are numbered at random. Find the probability that Sujata, numbered 12, will get 6th rank in the race ?
[Maharashtra NTSE Stage-1 2014]

(A) $\frac{1}{6}$ (B) $\frac{1}{n-1}$ (C) $\frac{n-1}{n}$ (D) $\frac{1}{n}$

11. A number is selected at random from first 50 natural numbers. The probability that selected number is a multiple of 3 or 4 is : **[Delhi NTSE Stage 1 2014]**

(A) $\frac{12}{25}$ (B) $\frac{14}{25}$ (C) $\frac{14}{50}$ (D) $\frac{8}{25}$

12. The probability that a leap year selected will have 53 sundays is :
[Jharkhand NTSE Stage-1 2014]

(A) $\frac{1}{7}$ (B) $\frac{2}{7}$ (C) $\frac{3}{7}$ (D) 0

13. Two fair dice are thrown together. The probability that the number 5 does not appear on any of them is : **[Jharkhand NTSE Stage-1 2014]**

(A) $\frac{1}{36}$ (B) $\frac{5}{36}$ (C) $\frac{11}{36}$ (D) $\frac{25}{36}$

14. Two coins are tossed simultaneously. What is the probability of getting at least one head.
[Jharkhand NTSE Stage-1 2015]

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (4) 1

15. Two fair dice are rolled together. The probability that the difference of numbers appearing is 1 will be
[Bihar NTSE Stage-1 2015]

(A) $\frac{5}{6}$ (B) $\frac{7}{36}$ (C) $\frac{5}{18}$ (D) $\frac{7}{14}$

16. Two coins are tossed simultaneously, the probability of getting at least one head is :
[M.P. NTSE Stage-1 2016]

(A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) $\frac{3}{5}$

17. A card is drawn from a well shuffled pack of 52 cards. The probability that card is a red ace is
[Raj. NTSE Stage-1 2016]

(A) $\frac{1}{13}$ (B) $\frac{1}{26}$ (C) $\frac{3}{52}$ (D) $\frac{1}{2}$

18. From a pack of 52 playing cards, face club cards are removed. The remaining cards are well shuffled and a card is drawn at random. Find the probability that the card drawn is a Heart card.
[Maharashtra NTSE Stage-1 2017]

(A) $\frac{1}{4}$ (B) $\frac{13}{49}$ (C) $\frac{3}{52}$ (D) $\frac{49}{52}$

Answer Key

Exercise Board Level

TYPE (I)

1. 0 **2.** 1 – p **3.** k = 0, m = 1 **4.** $\frac{3}{26}$

5. $\frac{1}{6}$ **6.** 51 **7.** 14 **8.** $\frac{1}{5}$

9. $\frac{1}{4}$ **10.** $\frac{6}{23}$ **11.** $\frac{1}{2}$ **12.** $\frac{21}{26}$

TYPE (II)

13. **(i)** $\frac{1}{6}$ **(ii)** $\frac{5}{6}$ **14.** $\frac{2}{9}$

15. **(i)** $\frac{1}{10}$ **(ii)** $\frac{3}{10}$ **(iii)** $\frac{3}{5}$ **16.** **(i)** $\frac{14}{99}$ **(ii)** $\frac{85}{99}$

17. 0.69

18. **(i)** $\frac{4}{9}$ **(ii)** $\frac{5}{9}$ **(iii)** $\frac{1}{3}$ **(iv)** $\frac{5}{18}$ **19.** **(i)** $\frac{5}{6}$ **(ii)** $\frac{1}{3}$

TYPE (III)

20. **(i)** $\frac{1}{6}$ **(ii)** $\frac{5}{12}$ **(iii)** 0 **21.** $\frac{4}{9}$

22. $\frac{1}{18}, \frac{1}{9}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{9}, \frac{1}{18}$

23. **(i)** $\frac{1}{8}$ **(ii)** $\frac{1}{8}$ **(iii)** $\frac{3}{4}$

24. **(i)** $\frac{7}{8}$ **(ii)** $\frac{15}{16}$ **25.** **(i)** 0.009 **(ii)** $\frac{8}{999}$

Previous Year Problems

1. (A) **2.** (C) **3.** 2/3 **4.** **(i)** 1/4 **(ii)** 3/4

5. (C) **6.** (C) **7.** **(i)** 25/36 **(ii)** 5/18 **8.** 1/12

9. **(i)** 4/13 **(ii)** 1/26 **(iii)** 11/13 **(iv)** 2/13 **10.** 1/9

11. 24 **12.** 6/13 **13.** 1/2

14. **(i)** 3/8 **(ii)** 1/2 **(iii)** 1/2 **15.** 162

16. **(i)** 1/2 , **(ii)** 3/4 **17.** 45

Exercise-1

SUBJECTIVE QUESTIONS

Section (A)

A-1. (i) $\frac{x}{12}$ (ii) 3 **A-2.** (i) $\frac{9}{17}$ (ii) $\frac{8}{17}$

A-3. $\frac{3}{5}$ **A-4.** $\frac{1}{2}$. **A-5.** $\frac{1}{3}$. **A-6.** $\frac{2}{7}$

A-7. $\frac{2}{3}$ **A-8.** (i) $\frac{81}{89}$ (ii) $\frac{8}{89}$.

A-9. (i) $\frac{1}{5}$ (ii) $\frac{12}{25}$ (iii) $\frac{17}{25}$ (iv) $\frac{14}{25}$

A-10. (i) $\frac{1}{2}$ (ii) $\frac{15}{36}$ (iii) $\frac{1}{6}$ (iv) $\frac{11}{36}$

A-11. (i) $\frac{4}{13}$ (ii) $\frac{1}{26}$ (iii) $\frac{11}{13}$ (iv) $\frac{2}{13}$ **A-12.** $\left(1-\frac{\pi}{4}\right)$

A-13. (i) $\frac{1}{23}$ (ii) $\frac{5}{46}$ **A-14.** (i) $\frac{25}{36}$ (ii) $\frac{11}{36}$ (iii) $\frac{1}{36}$.

OBJECTIVE QUESTIONS

Section (A)

A-1. (C) **A-2.** (D) **A-3.** (C) **A-4.** (D) **A-5.** (B)

A-6. (D) **A-7.** (B) **A-8.** (C) **A-9.** (C) **A-10.** (B)

A-11. (B) **A-12.** (A) **A-13.** (B)

Exercise-2

Ques.																		
Ans.	C	D	C	C	B	A	A	B	A	A	B	C	A	C	C	D	B	C
Ques.																		
Ans.	A																	

Exercise-3

Ques.																		
Ans.								C	A	D	A	B	D	C	C	A	B	B