CBSE 2024 Maths Standard — Set 3

English Medium

Time Allowed: 3 Hours | Maximum Marks: 80

General Instructions:

1. This question paper contains 38 questions. All questions are compulsory.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 6 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 case-study based questions carrying 4 marks each.
7. Draw neat figures wherever required.

Section A

Multiple Choice Questions (1 mark each)

Q.1 [1 mark]

The pair of linear equations $x + 2y + 5 = 0$ and $-3x = 6y - 1$ has

(a) unique solution

(b) exactly two solutions

(c) infinitely many solutions

(d) no solution

Q.2 [1 mark]

The common difference of the A.P. $\frac{1}{2x}, \frac{1-4x}{2x}, \frac{1-8x}{2x}, \ldots$ is

(a) $-2x$

(b) -2

(c) 2

(d) $2x$

Q.3 [1 mark]

Two dice are thrown together. The probability that they show different numbers is

(a) $\frac{1}{6}$

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

(c) $\frac{1}{3}$

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

Q.4 [1 mark]

The probability of guessing the correct answer to a certain test question is $\frac{x}{6}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$, then the value of x is

(a) 2

(b) 3

(c) 4

(d) 6

Q.5 [1 mark]

If a = $2^2 \times 3^x$, b = $2^2 \times 3 \times 5$, c = $2^2 \times 3 \times 7$ and LCM(a, b, c) = 3780, then x is equal to

(a) 1

(b) 2

(c) 3

(d) 0

Q.6 [1 mark]

The zeroes of the quadratic polynomial $2x^2 - 3x - 9$ are

(a) 3, -3/2

(b) -3, -3/2

(c) -3, 3/2

(d) 3, 3/2

Q.7 [1 mark]

From a point on the ground, which is 30 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is found to be 60°. The height (in metres) of the tower is

(a) $10\sqrt{3}$

(b) $30\sqrt{3}$

(c) 60

(d) 30

Q.8 [1 mark]

If $\cos\theta = \sqrt{3}/2$ and $\sin\varphi = 1/2$, then $\tan(\theta + \varphi)$ is

(a) $\sqrt{3}$

(b) $1/\sqrt{3}$

(c) 1

(d) not defined

Q.9 [1 mark]

Maximum number of common tangents that can be drawn to two circles intersecting at two distinct points is

(a) 4

(b) 3

(c) 2

(d) 1

Q.10 [1 mark]

In the given figure, if PT is a tangent to a circle with centre O and $\angle TPO = 35°$, then the measure of $\angle x$ is

(a) 110°

(b) 115°

(c) 120°

(d) 125°

Q.11 [1 mark]

If the diagonals of a quadrilateral divide each other proportionally, then it is a

(a) parallelogram

(b) rectangle

(c) square

(d) trapezium

Q.12 [1 mark]

In $\triangle ABC$, DE || BC (as shown in the figure). If AD = 2 cm, BD = 3 cm, BC = 7.5 cm, then the length of DE (in cm) is

(a) 2.5

(b) 3

(c) 5
(d) 6

Q.13 [1 mark]

Given HCF(2520, 6600) = 40, LCM(2520, 6600) = 252 × k, then the value of k is

(a) 1650
(b) 1600
(c) 165
(d) 1625

Q.14 [1 mark]

A pair of irrational numbers whose product is a rational number is

(a) (√16, √4)
(b) (√5, √2)
(c) (√3, √27)
(d) (√36, √2)

Q.15 [1 mark]

If a digit is chosen at random from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9; then the probability that this digit is an odd prime number is

(a) 1/3
(b) 2/3
(c) 4/9
(d) 5/9

Q.16 [1 mark]

The mean of five observations is 15. If the mean of first three observations is 14 and that of the last three observations is 17, then the third observation is

(a) 20
(b) 19

(c) 18
(d) 17

Q.17 [1 mark]

Perimeter of a sector of a circle whose central angle is 90° and radius 7 cm is

(a) 35 cm
(b) 11 cm
(c) 22 cm
(d) 25 cm

Q.18 [1 mark]

In the given figure, O is the centre of the circle. MN is the chord and the tangent ML at point M makes an angle of 70° with MN. The measure of ∠MON is

(a) 120°
(b) 140°
(c) 70°
(d) 90°

Q.19 [1 mark]

Assertion (A): The point which divides the line segment joining the points A(1, 2) and B(-1, 1) internally in the ratio 1:2 is (-1/3, 5/3).

Reason (R): The coordinates of the point which divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ in the ratio $m_1:m_2$ are $((m_1x_2 + m_2x_1)/(m_1 + m_2), (m_1y_2 + m_2y_1)/(m_1 + m_2))$.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

Q.20 [1 mark]

Assertion (A): In a cricket match, a batsman hits a boundary 9 times out of 45 balls he plays. The probability that in a given ball, he does not hit the boundary is 4/5.

Reason (R): P(E) + P(not E) = 1.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

Section B

Very Short Answer Questions (2 marks each)

Q.21 [2 marks]

One card is drawn at random from a well shuffled deck of 52 cards. Find the probability that the card drawn (i) is queen of hearts; (ii) is not a jack.

Q.22(a) [2 marks]

If $2x + y = 13$ and $4x - y = 17$, find the value of $(x - y)$.

OR

Q.22(a) [2 marks]

Sum of two numbers is 105 and their difference is 45. Find the numbers.

Q.23(a) [2 marks]

Find a relation between x and y such that the point P(x, y) is equidistant from the points A(7, 1) and B(3, 5).

OR

Q.23(b) [2 marks]

Points A(-1, y) and B(5, 7) lie on a circle with centre O(2, -3y) such that AB is a diameter of the circle. Find the value of y. Also, find the radius of the circle.

Q.25 [2 marks]

Evaluate: (cos 45° + sin 60°) / (sec 30° + cosec 30°)

Q.26(a) [2 marks]

If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of first 20 terms.

OR

Q.26(b) [2 marks]

The ratio of the 10th term to the 30th term of an A.P. is 1:3, and the sum of first six terms is 42. Find the first term and the common difference of the A.P.

Section C

Short Answer Questions (3 marks each)

Q.28 [3 marks]

Solve the following system of linear equations graphically: x - y + 1 = 0 and x + y = 5.

Q.29(a) [3 marks]

Find the ratio in which the line segment joining the points (5, 3) and (-1, 6) is divided by the Y-axis.

OR

Q.29(b) [3 marks]

P(-2, 5) and Q(3, 2) are two points. Find the coordinates of the point R on line segment PQ such that PR = 2QR.

Q.32(a) [3 marks]

In a flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 km/h and the time of flight is increased by 30 minutes. Find the original duration of the flight.

OR

Q.32(b) [3 marks]

The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is 2 and 16/21, find the fraction.

Section D

Long Answer Questions (5 marks each)

Q.34 [5 marks]

From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

Q.35(a) [5 marks]

A solid iron pole consists of a solid cylinder of height 200 cm and base diameter 28 cm, which is surmounted by another cylinder of height 50 cm and radius 7 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass.

OR

Q.35(b) [5 marks]

A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 4 mm. Find its surface area. Also find its volume.

Q.36(i) [5 marks]

A stable owner has four horses. He ties each horse with a 7 m long rope to pegs at each corner of a square shaped grass field of 20 m length. Find the area of the square shaped grass field.

Q.0 [0 mark]

A stable owner has four horses tied with 7 m long ropes at each corner of a square shaped grass field of 20 m length. Find the area of the total field in which these horses can graze.

Q.0 [0 mark]

If the length of the rope of each horse is increased from 7 m to 10 m, find the area grazed by one horse. (Use π = 3.14)

Q.0 [0 mark]

In the stable owner scenario with four horses tied with 7 m ropes at corners of a 20 m square field, what is the area of the field that is left ungrazed?

Q.37(i) [4 marks]

A teacher made a frequency distribution table of students/adults undergoing vocational training from a training institute with the following data:
Age (in years): 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54
Number of participants: 62, 132, 96, 37, 13, 11, 10, 4
What is the lower limit of the modal class of the above data?

Q.0 [0 mark]

Using the vocational training frequency distribution (Age groups 15-19:62, 20-24:132, 25-29:96, 30-34:37, 35-39:13, 40-44:11, 45-49:10, 50-54:4), find the median class of the above data.

Q.0 [0 mark]

Using the vocational training frequency distribution (Age groups 15-19:62,

20-24:132, 25-29:96, 30-34:37, 35-39:13, 40-44:11, 45-49:10, 50-54:4), find the number of participants of age less than 50 years who undergo vocational training.

Q.0 [0 mark]

For the vocational training frequency distribution, give the empirical relationship between mean, median and mode.

Q.38(i) [4 marks]

Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to the second student. Second student also multiplied it by a prime number and passed it to third student. In this way by multiplying to a prime number, the last student got 173250. What is the least prime number used by students?

Q.0 [0 mark]

Ms. Mukta's prime number game starts with 2 and each of 5 students multiplies by a prime, ending at 173250. How many students are in the class?

Q.0 [0 mark]

In Ms. Mukta's prime number game where starting number is 2 and each student multiplies by a prime to get 173250, what is the highest prime number used by students?

Q.0 [0 mark]

In Ms. Mukta's prime number game where 173250 is the final product, which prime number has been used maximum times?