CBSE 2023 Maths Standard — Set 2

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]

Which of the following quadratic equations has sum of its roots as 4?

(a) 2x^2 - 4x + 8 = 0

(b) -x^2 + 4x + 4 = 0

(c) sqrt(2)*x^2 - 4/sqrt(2)*x + 1 = 0

(d) 4x^2 - 4x + 4 = 0

Q.2 [1 mark]

What is the length of the arc of the sector of a circle with radius 14 cm and of central angle 90 degrees?

(a) 22 cm

(b) 44 cm

(c) 88 cm

(d) 11 cm

Q.3 [1 mark]

If triangle ABC ~ triangle PQR with angle A = 32 degrees and angle R = 65 degrees, then the measure of angle B is:

(a) 32 degrees

(b) 65 degrees

(c) 83 degrees

(d) 97 degrees

Q.4 [1 mark]

If 'p' and 'q' are natural numbers and 'p' is the multiple of 'q', then what is the HCF of 'p' and 'q'?

(a) pq

(b) p

(c) q

(d) p + q

Q.5 [1 mark]

The coordinates of the vertex A of a rectangle ABCD whose three vertices are given as B(0, 0), C(3, 0) and D(0, 4) are:

(a) (4, 0)

(b) (0, 3)

(c) (3, 4)

(d) (4, 3)

Q.6 [1 mark]

If the pair of equations 3x - y + 8 = 0 and 6x - ry + 16 = 0 represent coincident lines, then the value of 'r' is:

(a) -1/2

(b) 1/2

(c) -2

(d) 2

Q.7 [1 mark]

A bag contains 100 cards numbered 1 to 100. A card is drawn at random from the bag. What is the probability that the number on the card is a perfect cube?

(a) 1/20

(b) 3/50

(c) 1/25

(d) 7/100

Q.8 [1 mark]

The pair of equations x = a and y = b graphically represents lines which are:

(a) parallel

(b) intersecting at (b, a)
(c) coincident
(d) intersecting at (a, b)

Q.9 [1 mark]

If one zero of the polynomial 6x^2 + 37x - (k - 2) is reciprocal of the other, then what is the value of k?

(a) -4
(b) -6
(c) 6
(d) 4

Q.10 [1 mark]

What is the total surface area of a solid hemisphere of diameter 'd'?

(a) 3*pi*d^2
(b) 2*pi*d^2
(c) (1/2)*pi*d^2
(d) (3/4)*pi*d^2

Q.11 [1 mark]

If three coins are tossed simultaneously, what is the probability of getting at most one tail?

(a) 3/8
(b) 4/8
(c) 5/8
(d) 7/8

Q.12 [1 mark]

In a triangle, DE is parallel to BC. If AD = 2 units, DB = 3 units, AE = 3 units and EC = x units, then the value of x is:

(a) 2

(b) 3
(c) 5
(d) 9/2

Q.13 [1 mark]

The hour-hand of a clock is 6 cm long. The angle swept by it between 7:20 a.m. and 7:55 a.m. is:

(a) (35/4) degrees
(b) (35/2) degrees
(c) 35 degrees
(d) 70 degrees

Q.14 [1 mark]

The zeroes of the polynomial p(x) = x^2 + 4x + 3 are given by:

(a) 1, 3
(b) -1, 3
(c) 1, -3
(d) -1, -3

Q.15 [1 mark]

In a figure, the quadrilateral PQRS circumscribes a circle. Here PA + CS is equal to:

(a) QR
(b) PR
(c) PS
(d) PQ

Q.16 [1 mark]

If alpha and beta are the zeroes of the quadratic polynomial p(x) = x^2 - ax - b, then the value of alpha^2 + beta^2 is:

(a) a^2 - 2b

(b) a^2 + 2b
(c) b^2 - 2a
(d) b^2 + 2a

Q.17 [1 mark]

The area of the triangle formed by the line x/a + y/b = 1 with the coordinate axes is:

(a) ab
(b) (1/2)*ab
(c) (1/4)*ab
(d) 2ab

Q.18 [1 mark]

In the given figure, AB is parallel to PQ. If AB = 6 cm, PQ = 2 cm and OB = 3 cm, then the length of OP is:

(a) 9 cm
(b) 3 cm
(c) 4 cm
(d) 1 cm

Q.19 [1 mark]

Assertion (A): A tangent to a circle is perpendicular to the radius through the point of contact.
Reason (R): The lengths of tangents drawn from an external point to a circle are equal.

Which of the following is correct?

(a) Both A and R are true, and R is the correct explanation of A
(b) Both A and R are true, but R is NOT the correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true

Q.20 [1 mark]

Assertion (A): The polynomial p(x) = x^2 + 3x + 3 has two real zeroes.
Reason (R): A quadratic polynomial can have at most two real zeroes.

Which of the following is correct?

(a) Both A and R are true, and R is the correct explanation of A
(b) Both A and R are true, but R is NOT the correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true

Section B

Very Short Answer Questions (2 marks each)

Q.22 [2 marks]

If 4*cot^2(45) - sec^2(60) + sin^2(60) + p = 3/4, then find the value of p.

OR

Q.22 [2 marks]

If cos A + cos^2 A = 1, then find the value of sin^2 A + sin^4 A.

Q.24 [2 marks]

The length of the shadow of a tower on the plane ground is sqrt(3) times the height of the tower. Find the angle of elevation of the sun.

OR

Q.24 [2 marks]

The angle of elevation of the top of a tower from a point on the ground which is 30 m away from the foot of the tower, is 30 degrees. Find the height of the tower.

Q.25 [2 marks]

In the given figure, O is the centre of the circle. AB and AC are tangents drawn to the circle from point A. If angle BAC = 65 degrees, then find the measure of angle BOC.

Q.26 [2 marks]

Find by prime factorisation the LCM of the numbers 18180 and 7575. Also, find the HCF of the two numbers.

OR

Q.26 [2 marks]

Three bells ring at intervals of 6, 12 and 18 minutes. If all the three bells rang at 6 a.m., when will they ring together again?

Section C

Short Answer Questions (3 marks each)

Q.28 [3 marks]

If Q(0, 1) is equidistant from P(5, -3) and R(x, 6), find the values of x.

Q.29 [3 marks]

A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle of 120 degrees. Find the total area cleaned at each sweep of the two blades.

Q.30 [3 marks]

If the system of linear equations 2x + 3y = 7 and 2ax + (a + b)y = 28 have infinite number of solutions, then find the values of 'a' and 'b'.

OR

Q.30 [3 marks]

If 217x + 131y = 913 and 131x + 217y = 827, then solve the equations for

the values of x and y.

Q.32 [3 marks]

How many terms of the arithmetic progression 45, 39, 33, ... must be taken so that their sum is 180? Explain the double answer.

Section D

Long Answer Questions (5 marks each)

Q.33 [5 marks]

As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30 degrees and 60 degrees. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. (Use sqrt(3) = 1.73)

OR

Q.33 [5 marks]

From a point on the ground, the angle of elevation of the bottom and top of a transmission tower fixed at the top of a 30 m high building are 30 degrees and 60 degrees respectively. Find the height of the transmission tower. (Use sqrt(3) = 1.73)

Q.34 [5 marks]

A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table below. Find the mean and median of the following data.

Number of cars: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80
Frequency: 7, 14, 13, 12, 20, 11, 15, 8

Q.36(a) [5 marks]

Case Study: In an annual day function of a school, the organizers wanted to give a cash prize along with a memento to their best students. Each memento is made as shown in the figure and its base ABCD is shown from the front side. The rate of silver plating is Rs. 20 per cm^2. A circle with centre O and radius 7 cm is inscribed, with DC = 7 cm (top chord), and the base AB is the diameter.

(i) What is the area of the quadrant ODCO?

Q.36(b) [5 marks]

Case Study (continued): The circle has centre O and radius 7 cm. AB is the diameter at the base.

(ii) Find the area of triangle AOB.

Q.36(c) [5 marks]

Case Study (continued): The memento has a circle with centre O, radius 7 cm, DC = 7 cm at the top, and AB is the diameter at the bottom. The shaded part ABCD needs silver plating at Rs. 20 per cm^2.

(iii)(a) What is the total cost of silver plating the shaded part ABCD?

OR

Q.36(c) [5 marks]

Case Study (continued): In the figure with circle of radius 7 cm.

(iii)(b) What is the length of arc CD?

Q.37(a) [4 marks]

Case Study: In a coffee shop, coffee is served in two types of cups. One is

cylindrical in shape with diameter 7 cm and height 14 cm, and the other is hemispherical with diameter 21 cm.

(i) Find the area of the base of the cylindrical cup.

Q.37(b) [4 marks]

Case Study (continued): The hemispherical cup has diameter 21 cm.

(ii)(a) What is the capacity of the hemispherical cup?

OR

Q.37(b) [4 marks]

Case Study (continued): The cylindrical cup has diameter 7 cm and height 14 cm.

(ii)(b) Find the capacity of the cylindrical cup.

Q.37(c) [4 marks]

Case Study (continued): The cylindrical cup has diameter 7 cm and height 14 cm.

(iii) What is the curved surface area of the cylindrical cup?

Q.38(a) [4 marks]

Case Study: Computer-based learning (CBL) refers to any teaching methodology that makes use of computers for information transmission. A survey was done on 1000 elementary and secondary schools of Assam and they were classified by the number of computers they had.

Number of Computers: 1-10, 11-20, 21-50, 51-100, 101 and more
Number of Schools: 250, 200, 290, 180, 80

(i) Find the probability that the school chosen at random has more than 100 computers.

Q.38(b) [4 marks]

Case Study (continued):
Number of Computers: 1-10, 11-20, 21-50, 51-100, 101 and more
Number of Schools: 250, 200, 290, 180, 80

(ii)(a) Find the probability that the school chosen at random has 50 or fewer computers.

OR

Q.38(b) [4 marks]

Case Study (continued):
Number of Computers: 1-10, 11-20, 21-50, 51-100, 101 and more
Number of Schools: 250, 200, 290, 180, 80

(ii)(b) Find the probability that the school chosen at random has no more than 20 computers.

Q.38(c) [4 marks]

Case Study (continued):
Number of Computers: 1-10, 11-20, 21-50, 51-100, 101 and more
Number of Schools: 250, 200, 290, 180, 80

(iii) Find the probability that the school chosen at random has 10 or less than 10 computers.