CBSE EXAMINATION PAPER-2023

MATHEMATICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 88

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **44 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 20** are multiple choice questions Each question carries **1 marks.**

iv. **Section B** – questions number **21 to 27** are very short answer Each question carries **2 marks.**

v. **Section C** – questions number **28 to 35** are short answer Each question carries **3 marks.**

vi. **Section D** – questions number **36 to 38** are case based questions

vii. **Section E** – questions number **39 to 44** are long answer Each question carries **5 marks.**

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1.

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

[1 Marks]

(A) $-x^2 + 4x + 4 = 0$

(B) $\sqrt{2}x^2 - 4/\sqrt{2}\, x + 1 = 0$

(C) $2x^2 - 4x + 8 = 0$

(D) $4x^2 - 4x + 4 = 0$

Question 2.

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

[1 Marks]

(A) 11 cm

(B) 88 cm

(C) 44 cm

(D) 22 cm

Question 3.

If Δ ABC ~ Δ PQR, with ∠A= 32° and ∠R= 65° then the measure of ∠B is:

[1 Marks]

(A) 65°

(B) 97°

(C) 32°

(D) 83°

Question 4.

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

[1 Marks]

(A) p+q

(B) q

(C) p

(D) pq

Question 5.

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:

[1 Marks]

(A) (0, 3)

(B) (4, 0)

(C) (4, 3)

(D) (3, 4)

Question 6.

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

[1 Marks]

(A) 1/2

(B) -2

(C) -1/2

(D) 2

Question 7.

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?

[1 Marks]

(A) 1/20

(B) 1/25

(C) 7/100

(D) 3/50

Question 8. The pair of equations x = a and y = b graphically represents lines which are:

[1 Marks]

(A) parallel

(B) intersecting at (b, a)

(C) coincident

(D) intersecting at (a, b)

Question 9.

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

[1 Marks]

(A) -6

(B) -4

(C) 4

(D) 6

Question 10.

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

[1 Marks]

(A) $1/2\ \pi d^2$

(B) $2\pi d^2$

(C) $3\pi d^2$

(D) $3/4\ \pi\ d^2$

Question 11.

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

[1 Marks]

(A) 7/8

(B) 4/8

(C) 5/8

(D) 3/8

Question 12.

In the given figure, DE || BC. If AD = 2 units, DB = AE = 3 units and EC = x units, then the value of x is:

[1 Marks]

(A) 9/2

(B) 3

(C) 5

(D) 2

Question 13.

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:

[1 Marks]

(A) 35°

(B) (35/4)°

(C) 70°

(D) (35/2)°

Question 14.

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

[1 Marks]

(A) 1, 3

(B) -1, 3

(C) 1, -3

(D) -1, -3

Question 15.

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

[1 Marks]

(A) PR

(B) PQ

(C) PS

(D) QR

Question 16.

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

[1 Marks]

(A) $b^2 - 2a$

(B) $a^2 + 2b$

(C) $b^2 + 2a$

(D) $a^2 - 2b$

Question 17.

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

[1 Marks]

(A) ab

(B) ½ ab

(C) 2ab

(D) ¼ ab

Question 18.

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

[1 Marks]

(A) 9 cm

(B) 1 cm

(C) 3 cm

(D) 4 cm

Question 19.

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.

[1 Marks]

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

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

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

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

Question 20.

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.

[1 Marks]

(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

Question 21. Prove that $2 + \sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

[2 Marks]

Question 22.

If $4 \cot^2 45° + \sec^2 60° + \sin^2 60° + p = 3/4$, then find the value of p.

[2 Marks]

Question 23. If $\cos A + \cos^2 A = 1$, then find the value of $\sin^2 A + \sin^4 A$.

[2 Marks]

Question 24.

Show that the points (-2, 3), (8, 3) and (6, 7) are the vertices of a right-angled triangle.

[2 Marks]

Question 25.

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.

[2 Marks]

Question 26. 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°. Find the height of the tower.

[2 Marks]

Question 27. In the given figure, O is the centre of the circle. AB and AC are tangents drawn to the circle from point A. If $\angle BAC = 65°$, then find the measure of $\angle BOC$.

[2 Marks]

Section C

Question 28. Find by prime factorisation the LCM of the numbers 18180 and 7575. Also, find the HCF of the two numbers.

[3 Marks]

Question 29. 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?

[3 Marks]

Question 30.

Prove that: $(1/\cos\theta - \cos\theta)(1/\sin\theta - \sin\theta) = 1/\tan\theta + \cot\theta$.

[3 Marks]

Question 31. If Q(0, 1) is equidistant from P(5, -3) and R(x, 6), find the value(s) of x.

[3 Marks]

Question 32. A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle of 120°. Find the total area cleaned at each sweep of the two blades.

[3 Marks]

Question 33.

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'

[3 Marks]

Question 34.

If $217x + 131y = 913$ and

$131x + 217y = 827$,

then solve the equations for the values of x and y.

[3 Marks]

Question 35.

In the given figure, O is the centre of the circle and QPR is a tangent to it at P. Prove that $\angle QAP + \angle APR = 90°$.

[3 Marks]

Section D

Question 36.

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.

Based on the above, answer the following questions :

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

[1 Marks]

(2)

Find the area of ΔAOB.

[1 Marks]

(3)

What is the total cost of silver plating the shaded part ABCD?

[2 Marks]

(4)

What is the length of arc CD?

[2 Marks]

Question 37.

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.

Based on the above, answer the following questions :

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

[1 Marks]

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

[1 Marks]

(3)

What is the capacity of the hemispherical cup?

[2 Marks]

(4)

Find the capacity of the cylindrical cup.

[2 Marks]

Question 38.

Computer-based learning (CBL) refers to any teaching methodology that makes use of computers for information transmission. At an elementary school level, computer applications can be used to display multimedia lesson plans. A survey was done on 1000 elementary and secondary schools of Assam and they were classified by the number of computers they had.

One school is chosen at random. Then :

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

[1 Marks]

(2)

Find the probability that the school chosen at random has 50 or fewer computers.

[2 Marks]

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

[1 Marks]

(4)

Find the probability that the school chosen at random has no more than 20 computers.

[2 Marks]

Section E

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

[5 Marks]

Question 40. As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30° and 60°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. (Use $\sqrt{3} = 1.73$)

[5 Marks]

Question 41. 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° and 60°, respectively. Find the height of the transmission tower. (Use $\sqrt{3} = 1.73$)

[5 Marks]

Question 42.

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 given below. Find the mean and median of the following data.

[5 Marks]

Question 43. Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of triangle PQR (denoted ABC ~ PQR).

[5 Marks]

Question 44. Through the mid-point M of the side CD of a parallelogram ABCD, the line BM is drawn intersecting AC in L and AD (produced) in E. Prove that EL = 2BL.

[5 Marks]