CBSE EXAMINATION PAPER-2024

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.

If $ax + by = a^2 - b^2$ and $bx + ay = 0$, then the value of $x + y$ is:

[1 Marks]

(A) $a + b$

(B) $a^2 - b^2$

(C) $a - b$

(D) $a^2 + b^2$

Question 2.

The HCF of two numbers 65 and 104 is 13. If LCM of 65 and 104 is 40x, then the value of x is:

[1 Marks]

(A) 40

(B) 8

(C) 13

(D) 5

Question 3.

If a polynomial $p(x)$ is given by $p(x) = x^2 - 5x + 6$, then the value of $p(1) + p(4)$ is:

[1 Marks]

(A) -4

(B) 4

(C) 2

(D) 0

Question 4.

If the discriminant of the quadratic equation $3x^2 - 2x + c = 0$ is 16, then the value of c is:

[1 Marks]

(A) -1

(B) $\sqrt{2}$

(C) 1

(D) 0

Question 5. If an arc subtends an angle of 90° at the centre of a circle, then the ratio of its length to the circumference of the circle is:

[1 Marks]

(A) 1 : 4

(B) 2 : 3

(C) 4 : 1

(D) 1 : 3

Question 6.

The area of the sector of a circle of radius 12 cm is 60π cm^2. The central angle of this sector is:

[1 Marks]

(A) 120°

(B) 150°

(C) 6°

(D) 75°

Question 7.

If the difference of mode and median of a data is 24, then the difference of its median and mean is:

[1 Marks]

(A) 8

(B) 12

(C) 24

(D) 36

Question 8. Two dice are tossed simultaneously. The probability of getting odd numbers on both the dice is:

[1 Marks]

(A) 6/36

(B) 3/36

(C) 9/36

(D) 12/36

Question 9. The ratio of total surface area of a solid hemisphere to the square of its radius is:

[1 Marks]

(A) $2\pi : 1$

(B) $4\pi : 1$

(C) $3\pi : 1$

(D) $1 : 4\pi$

Question 10.

If $\sin\theta = 1$, then the value of $(1/2 \sin(\theta/2))$ is:

[1 Marks]

(A) 0

(B) 1/2

(C) $1/\sqrt{2}$

(D) $1/2\sqrt{2}$

Question 11.

Two lines are given to be parallel. The equation of one of these lines is $5x - 3y = 2$. The equation of the second line can be:

[1 Marks]

(A) $-15x - 9y = 5$

(B) $15x + 9y = 5$

(C) $-15x + 9y = 5$

(D) $9x - 15y = 6$

Question 12. Three numbers in A.P. have the sum 30. What is its middle term?

[1 Marks]

(A) 4

(B) 10

(C) 16

(D) 8

Question 13.

In ΔABC, DE || BC.(as shown in the figure). If AD = 4 cm, AB = 9 cm and AC = 13.5 cm, then the length of EC is:

[1 Marks]

(A) 6cm

(B) 5.7cm

(C) 9 cm

(D) 7.5cm

Question 14. At some time of the day, the length of the shadow of a tower is equal to its height. Then, the Sun's altitude at that time is:

[1 Marks]

(A) 30°

(B) 45°

(C) 90°

(D) 60°

Question 15.

In the given figure, AB and AC are tangents to the circle. If ∠ABC = 42°, then the measure of ∠BAC is:

[1 Marks]

(A) 42°

(B) 86°

(C) 96°

(D) 106°

Question 16.

The fourth vertex D of a parallelogram ABCD whose three vertices are A(−2, 3), B(6, 7) and C(8, 3) is:

[1 Marks]

(A) (0,1)

(B) (-1,0)

(C) (0, -1)

(D) (1, 0)

Question 17.

For an event E, if $P(E) + P(\bar{E}) = q$, then the value of $q^2 - 4$ is:

[1 Marks]

(A) 5

(B) 3

(C) −3

(D) −5

Question 18.

In the given figure, QR is a common tangent to two circles touching externally at A. The tangent at A meets QR at P. If AP = 4.2 cm, then the length of QR is:

[1 Marks]

(A) 4.2 cm

(B) 6.3 cm

(C) 8.4 cm

(D) 2.1 cm

Question 19.

Assertion (A) : Mid-point of a line segment divides the line segment in the ratio 1: 1.

Reason (R): The ratio in which the point (-3, k) divides the line segment joining the points (- 5, 4) and (- 2,3)is 1: 2.

[1 Marks]

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

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

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

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

Question 20.

Assertion (A) : If the circumference of a circle is 176 cm, then its radius is 28 cm.

Reason (R): Circumference = 21 x radius of a circle.

[1 Marks]

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

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

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

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

Section B

Question 21. Three bells toll at intervals of 9, 12 and 15 minutes respectively. If they start tolling together, after what time will they next toll together?

[2 Marks]

Question 22. The minute hand of a clock is 14 cm long. Find the area on the face of the clock described by the minute hand in 5 minutes.

[2 Marks]

Question 23. Find the length of the arc of a circle which subtends an angle of 60° at the centre of the circle of radius 42 cm.

[2 Marks]

Question 24.

Evaluate: $5\cos^2 60° + 4\sec^2 30° - \tan^2 45° / \sin^2 30° + \sin^2 60°$

[2 Marks]

Question 25.

If $\sin(A - B) = 1/2$, $\cos(A + B) = 1/2$; $0 < A + B \leq 90°$, $A > B$; find $\angle A$ and $\angle B$.

[2 Marks]

Question 26. In the given figure, O is the centre of the circle. If $\angle AOB = 145°$, then find the value of x.

[2 Marks]

Question 27. In the given figure, $\Delta AHK \sim \Delta ABC$. If AK = 8 cm, BC = 3.2 cm and HK = 6.4 cm, then find the length of AC.

[2 Marks]

Section C

Question 28.

Prove that $\sin\theta - \cos\theta + 1 / \sin\theta + \cos\theta - 1 = 1 / \sec\theta - \tan\theta$

[3 Marks]

Question 29.

Three coins are tossed simultaneously. What is the probability of getting

(i) at least one head?

(ii) exactly two tails?

(iii) at most one tail?

[3 Marks]

Question 30.

A box contains 90 discs numbered 1 to 90. Find the probability that the disc bears

(i) a 2-digit number less than 40.

(ii) a number divisible by 5 and greater than 50.

(iii) a perfect square number.

[3 Marks]

Question 31.

Rehana went to a bank to withdraw ₹ 2,000 She asked the cashier to

give her ₹ 50 and ₹ 100 notes only. Rehana got 25 notes in all. Find how many notes of ₹ 50 and ₹ 100 did she received.

[3 Marks]

Question 32. Find the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients.

[3 Marks]

Question 33.

If α and β are zeroes of the polynomial $x^2 + x - 2$, find the value of $\alpha/\beta + \beta/\alpha$.

[3 Marks]

Question 34.

Prove that $2-\sqrt{3}/5$ is an irrational number, given that $\sqrt{3}$ is irrational.

[3 Marks]

Question 35. Prove that a parallelogram circumscribing a circle is a rhombus.

[3 Marks]

Section D

Question 36.

Ryan, from a very young age, was fascinated by the twinkling of stars

and the vastness of space. He always dreamt of becoming an astronaut

one day. So he started to sketch his own rocket designs on the graph

sheet. One such design is given below :

Based on the above, answer the following questions :

(1) What are the coordinates of the point D?

[1 Marks]

(2) Find the mid-point of the segment joining F and G.

[1 Marks]

(3)

What is the distance between the points A and C?

[2 Marks]

(4)

Find the coordinates of the point which divides the line segment joining the points A and B in the ratio 1:3 internally.

[2 Marks]

Question 37.

Treasure Hunt is an exciting and adventurous game where participants follow a series of clues/numbers/maps to discover hidden treasures. Players engage in a thrilling quest, solving puzzles and riddles to unveil the location of the coveted prize.

While playing a treasure hunt game, some clues (numbers) are hidden in various spots collectively forming an A.P. If the number on the nth spot is 20 + 4n, then answer the following questions to help the players in spotting the clues:

(1) Which number is on first spot?

[1 Marks]

(2)

Which spot is numbered as 112?

[2 Marks]

(3)

Which number is on the $(n - 2)^{th}$ spot?

[1 Marks]

(4)

What is the sum of all the numbers on the first 10 spots?

[2 Marks]

Question 38.

Tamper-proof tetra-packed milk guarantees both freshness and security. This milk ensures uncompromised quality, preserving the nutritional values within and making it a reliable choice for health-conscious individuals. 500 mL milk is packed in a cuboidal container of dimensions 15 cm × 8 cm × 5 cm. These milk packets are then packed in cuboidal cartons of dimensions 30 cm × 32 cm × 15 cm.

Based on the above given information, answer the following questions

(1) Find the volume of the cuboidal carton.

[1 Marks]

(2)

Find the total surface area of a milk packet.

[2 Marks]

(3) How much milk can the cup (as shown in the figure) hold?

[1 Marks]

(4)

How many milk packets can be filled in a carton?

[2 Marks]

Section E

Question 39. Two pillars of equal lengths stand on either side of a road which is 100 m wide, exactly opposite to each other. At a point on the road between the pillars, the angles of elevation of the tops of the pillars are 60° and 30°. Find the length of each pillar and distance of the point on the road from the pillars. (Use $\sqrt{3} = 1.732$)

[5 Marks]

Question 40. E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that Δ ABE ~ Δ CFB.

[5 Marks]

Question 41. Sides AB, BC and the median AD of Δ ABC are respectively proportional to sides PQ, QR and the median PM of another Δ PQR. Prove that Δ ABC ~ Δ PQR.

[5 Marks]

Question 42. A train travels a distance of 90 km at a constant speed. Had the speed been 15 km/h more, it would have taken 30 minutes less for the journey. Find the original speed of the train.

[5 Marks]

Question 43. Find the value of 'c' for which the quadratic equation $(c + 1)x^2 - 6(c + 1)x + 3(c + 9) = 0$; $c \neq -1$ has real and equal roots.

[5 Marks]

Question 44.

The following table shows the ages of the patients admitted in a hospital during a year:

Find the mode and mean of the data given above.

[5 Marks]