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 the sum of zeroes of the polynomial $p(x) = 2x^2 - k\sqrt{2}x + 1$ is $\sqrt{2}$, then value of k is:

[1 Marks]

(A) $\sqrt{2}$

(B) 2

(C) $2\sqrt{2}$

(D) 1/2

Question 2.

If the probability of a player winning a game is 0.79, then the probability of his losing the same game is

[1 Marks]

(A) 0.31

(B) 1.79

(C) 0.21

(D) 0.21%

Question 3.

If the roots of the equation $ax^2 + bx + c = 0, a \neq 0$ are real and equal, then which of the following relation is true?

[1 Marks]

(A) $c=b^2/a$

(B) $ac=b^2/4$

(C) $b^2=ac$

(D) $a=b^2/c$

Question 4.

In an AP, if the first term $a = 7$, nth term $a_n = 84$ and the sum of first n terms $S_n = 2093/2$, then n is equal to

[1 Marks]

(A) 23

(B) 22

(C) 26

(D) 24

Question 5.

If two positive integers p and q can be expressed as $p = 18\ a^2b^4$ and $q = 20\ a^3\ b^2$, where a and b are prime numbers, then LCM (p, q) is

[1 Marks]

(A) $2\ a^2b^2$

(B) $180\ a^2\ b^2$

(C) $12\ a^2\ b^2$

(D) $180\ a^3\ b^4$

Question 6.

AD is a median of Δ ABC with vertices A(5,-6) B (6,4) C (0,0) Length AD is equal to:

[1 Marks]

(A) $2\sqrt{15}$ units

(B) 10 units

(C) $\sqrt{101}$ units

(D) $\sqrt{68}$ units

Question 7.

If $\sec\theta \times \tan\theta = m$, then the value of $\sec\theta + \tan\theta$ is

[1 Marks]

(A) 1/m

(B) m^2-1

(C) -m

(D) 1-1/m

Question 8.

From the data 1, 4, 7, 9, 16, 21, 25, if all the even numbers are removed, then the probability of getting at random a prime number from the remaining data is

[1 Marks]

(A) 2/5

(B) 1/5

(C) 2/7

(D) 1/7

Question 9.

For some data $x_1, x_2, ...x_n$, with respective frequencies $f_1, f_2, ...f_n$, the value of ${}^{n}\sum_{1} f_i (x_i - \bar{x})$ equal to:

[1 Marks]

(A) 0

(B) 1

(C) $\sum f_i$

(D) $n\bar{x}$

Question 10.

The zeroes of a polynomial $x^2 + p x + q$ are twice the zeroes of the polynomial $4x^2 - 5x + 6$. The value of p is:

[1 Marks]

(A) -5/2

(B) 5/2

(C) -5

(D) 10

Question 11.

If the distance between the points (3, -5) and (x,- 5) is 15 units, then the values of x are:

[1 Marks]

(A) 12,-18

(B) -12,18

(C) -9,-12

(D) 18,5

Question 12.

if cos (α+β)=0,then pf cos (α+β / 2) is equal to :

[1 Marks]

(A) √2

(B) 1/2

(C) 0

(D) 1 / √2

Question 13.

A solid sphere is cut into two hemispheres. The ratio of the surface areas of the sphere to that of two hemispheres taken together, is:

[1 Marks]

(A) 1:1

(B) 2:3

(C) 1:4

(D) 3:2

Question 14.

The middle most observation of every data arranged in order is called:

[1 Marks]

(A) Median

(B) Mean

(C) Mode

(D) Deviation

Question 15.

The volume of the largest right circular cone that can be carved out from a solid cube of edge 2 cm is:

[1 Marks]

(A) $2\pi/3$ cu cm

(B) $5\pi/3$ cu cm

(C) $4\pi/3$ cu cm

(D) $8\pi/3$ cu cm

Question 16.

Two dice are rolled together. The probability of getting sum of numbers on the two dice as 2, 3 or 5 is:

[1 Marks]

(A) 7/36

(B) 5/36

(C) 4/9

(D) 11/36

Question 17.

The centre of a circle is at (2, 0). If one end of a diameter is at (6, 0), then the other end is at:

[1 Marks]

(A) (-6,0)

(B) (-2,0)

(C) (0,0)

(D) (4,0)

Question 18.

In the given figure, graphs of two linear equations are shown. The pair of these linear equations is

[1 Marks]

(A) inconsistent but can be made consistent by extending these lines

(B) inconsistent

(C) consistent with infinitely many solutions

(D) consistent with unique solution

Question 19.

Assertion (A) : The tangents drawn at the end points of a diameter of a circle, are parallel.

Reason(R) : Diameter of a circle is the longest chord.

[1 Marks]

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

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

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

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

Question 20.

Assertion (A) : If the graph of a polynomial touches x-axis at only one point, then the polynomial cannot be a quadratic polynomial.

Reason (R): A polynomial of degree n(n >1) can have at most n Zeroes.

[1 Marks]

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

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

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

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

Section B

Question 21. Solve the following system of linear equations: $7x - 2y = 5$ and $8x + 7y = 15$ and verify your answer.

[2 Marks]

Question 22. In a pack of 52 playing cards, one card is lost. From the remaining cards, a card is drawn at random. Find the probability that the drawn card is queen of hearts if the lost card is a black card.

[2 Marks]

Question 23. Evaluate: $2\sqrt{2} \cos 45° \sin 30° + 2\sqrt{3} \cos 30°$.

[2 Marks]

Question 24.

If $A = 60°$ and $B = 30°$, verify that:

$\sin(A+B) = \sin A \cos B + \cos A \sin B$.

[2 Marks]

Question 25.

In the given figure, ABCD is a quadrilateral. Diagonal BD bisects $\angle B$ and $\angle D$ both. Prove that:

(i) $\Delta ABD \sim \Delta CBD$

(ii) $AB = BC$.

[2 Marks]

Question 26.

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

[2 Marks]

Question 27. Show that the number $5 \times 11 + 11 \times 17 + 3 \times 11$ is a composite number.

[2 Marks]

Section C

Question 28.

Find the ratio in which the point (8/5,y) divides the line segment joining the points (1, 2) and (2, 3). Also, find the value of y.

[3 Marks]

Question 29.

ABCD is a rectangle formed by the points A (-1, -1), B (-1, 6), C (3, 6) and D (3, -1). P, Q, R and S are midpoints of sides AB, BC, CD and DA respectively. Show that diagonals of the quadrilateral PQRS bisect each other.

[3 Marks]

Question 30. In a teachers' workshop, the number of teachers teaching French, Hindi and English are 48, 80 and 144 respectively. Find the minimum number of rooms required if in each room the same number of teachers are seated and all of them are of the same subject.

[3 Marks]

Question 31.

Prove that: $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1+\sec\theta\,\text{cosec}\theta$

[3 Marks]

Question 32. Three years ago, Rashmi was thrice as old as Nazma. Ten years later, Rashmi will be twice as old as Nazma. How old are Rashmi and Nazma now?

[3 Marks]

Question 33. In the given figure, AB is a diameter of the circle with centre O. AQ, BP, and PQ are tangents to the circle. Prove that $\angle POQ = 90^\circ$.

[3 Marks]

Question 34.

A circle with centre O and radius 8 cm is inscribed in a quadrilateral ABCD in which P, Q, R, S are the points of contact as shown. If AD is perpendicular to DC, BC = 30 cm and BS = 24 cm, then find the length DC.

[3 Marks]

Question 35. The difference between the outer and inner radii of a hollow right circular cylinder of length 14 cm is 1 cm. If the volume of the metal used in making the cylinder is 176 cm^3, find the outer and inner radii of the cylinder.

[3 Marks]

Section D

Question 36. A rectangular floor area can be completely tiled with 200 square tiles. If the side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.

(1) Write the corresponding quadratic equation in standard form.

[1 Marks]

(2) Find the value of x, the length of side of a tile by factorisation.

[2 Marks]

(3) Assuming the original length of each side of a tile be x units, make a quadratic equation from the above information.

[1 Marks]

(4) Solve the quadratic equation for x, using quadratic formula.

[2 Marks]

Question 37.

BINGO is a game of chance. The box has 75 balls numbered 1 through 75. Each card has some numbers written on it. The participant cancels the number on the card when called out a number written on the ball selected at random. Whoever cancels all the numbers on his/her card says BINGO and wins the game. The table below shows data of one such game where 48 balls were used before Tara said 'BINGO'.

Based on the above information, answer the following :

(1) Write the median class.

[1 Marks]

(2) When the first ball was picked up, what was the probability of calling out an even number?

[1 Marks]

(3) Find the median of the given data.

[2 Marks]

(4) Find the mode of the given data.

[2 Marks]

Question 38.

A backyard is in the shape of a right angled triangle ABC with right angle at B. AB = 7 m and BC = 15 m. A circular pit was dug inside it such that it touches the walls AC, BC and AB at P, Q and R respectively such that AP =x m.

Based on the above information, answer the following questions :

(1) Find the length PC in terms of x and hence find the value of x.

[2 Marks]

(2) Write the type of quadrilateral BQOR.

[1 Marks]

(3) Find the length of AR in terms of x.

[1 Marks]

(4) Find x and hence find the radius r of the circle.

[2 Marks]

Section E

Question 39.

An arc of a circle of radius 21 cm subtends an angle of 60° at the centre. Find

(i) the length of the arc

(ii) the area of the minor segment of the circle made by the corresponding chord.

[5 Marks]

Question 40. The sum of first and eighth terms of an A.P. is 32 and their product is 60. Find the first term and common difference of the A.P. Hence, also find the sum of its first 20 terms.

[5 Marks]

Question 41. In an A.P. of 40 terms, the sum of first 9 terms is 153 and the sum of last 6 terms is 687. Determine the first term and common difference of the A.P. Also, find the sum of all the terms of the A.P.

[5 Marks]

Question 42.

If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

[5 Marks]

Question 43.

In the given figure PA, QB and RC are each perpendicular to AC. If Ap= x, BQ = y and CR = z, then prove that 1/x+1/z=1/y

[5 Marks]

Question 44. A pole 6 m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point P on the ground is 60°, and the angle of depression of

the point P from the top of the tower is 45°. Find the height of the tower and the distance of point P from the foot of the tower. (Use $\sqrt{3} = 1.73$)

[5 Marks]