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.

The number of polynomials having zeroes -3 and 5 is:

[1 Marks]

(A) at most two

(B) exactly two

(C) only one

(D) infinite

Question 2.

The pair of equations ax + 2y = 9 and 3x + by = 18 represent parallel lines, where a, b are integers, if:

[1 Marks]

(A) ab = 6

(B) 2a = 3b

(C) 3a = 2b

(D) a = b

Question 3.

The common difference of the A.P. whose n^{th} term is given by an = 3n + 7, is:

[1 Marks]

(A) 1

(B) 7

(C) 3n

(D) 3

Question 4.

In the given figure, DE ∥ BC. The value of x is:

[1 Marks]

(A) 10

(B) 6

(C) 12.5

(D) 8

Question 5.

A quadratic equation whose roots are $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$ is:

[1 Marks]

(A) $x^2 + 4x + 1 = 0$

(B) $x^2 - 1 = 0$

(C) $x^2 - 4x + 1 = 0$

(D) $4x^2 - 3 = 0$

Question 6.

If $\tan\theta = 5/12$, then the value of $\sin\theta + \cos\theta / \sin\theta - \cos\theta$ is :

[1 Marks]

(A) 17/ 13

(B) 17/7

(C) -7/13

(D) -17/7

Question 7.

The distance between the points P(-11 / 3,5) and Q(-2/3 , 5) is:

[1 Marks]

(A) 3 units

(B) 2 units

(C) 4 units

(D) 6 units

Question 8.

In the given figure, AB = BC = 10 cm. If AC = 7 cm, then the length of BP is:

[1 Marks]

(A) 6.5 cm

(B) 7 cm

(C) 5 cm

(D) 3.5 cm

Question 9.

Water in a river which is 3 m deep and 40 m wide is flowing at the rate of 2 km/h. How much water will fall into the sea in 2 minutes?

[1 Marks]

(A) 800 m^3

(B) 8000 m^3

(C) 2000 m^3

(D) 4000 m^3

Question 10.

If the mean and the median of a data are 12 and 15 respectively, then its mode is:

[1 Marks]

(A) 13.5

(B) 6

(C) 14

(D) 21

Question 11.

In the given figure, AB is a tangent to the circle centered at O. If OA = 6 cm and $\angle OAB = 30^\circ$, then the radius of the circle is:

[1 Marks]

(A) 3 cm

(B) $3\sqrt{3}$ cm

(C) 2 cm

(D) √3 cm

Question 12.

(2 tan 30° / 1 + tan² 30°)is equal to:

[1 Marks]

(A) sin 60°

(B) cos 60°

(C) tan 60°

(D) sin 30°

Question 13.

In Δ ABC and Δ DEF , AB / DE= BC/FD Which of the following makes the two triangles similar?

[1 Marks]

(A) ∠A =∠ D

(B) ∠A = ∠F

(C) ∠B = ∠D

(D) ∠B = ∠E

Question 14.

The 11th term from the end of the A.P.: 10, 7, 4, ..., -62 is:

[1 Marks]

(A) 25

(B) 0

(C) -32

(D) 16

Question 15. Two coins are tossed together. The probability of getting at least one tail is:

[1 Marks]

(A) 1/4

(B) 1/2

(C) 3/4

(D) 1

Question 16.

In the given figure, AC and AB are tangents to a circle centered at O. If ∠COD = 120°, then ∠BAO is equal to:

[1 Marks]

(A) 30°

(B) 90°

(C) 60°

(D) 45°

Question 17.

Which of the following numbers cannot be the probability of happening of an event?

[1 Marks]

(A) 7/0.01

(B) 0.07

(C) 0

(D) 0.07/3

Question 18. If every term of the statistical data consisting of n terms is decreased by 2, then the mean of the data:

[1 Marks]

(A) remains unchanged

(B) decreases by 2

(C) decreases by 2n

(D) decreases by 1

Question 19.

Assertion (A) : If the points A(4, 3) and B(x, 5) lie on a circle with centre 0(2, 3), then the value of x is 2.

Reason (R): Centre of a circle is the mid-point of each chord of the circle.

[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 number 5^{th} cannot end with the digit 0, where n is a natural number.

Reason (R): Prime factorisation of 5 has only two factors, 1 and 5.

[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 the correct explanation of the 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 the correct explanation of the Assertion (A).

Section B

Question 21. The line segment joining the points A(4, 5) and B(4, 5) is divided by the point P such that AP : AB = 2 : 5. Find the coordinates of P.

[2 Marks]

Question 22. Point P(x, y) is equidistant from points A(5, 1) and B(1, 5). Prove that x = y.

[2 Marks]

Question 23.

In the given figure, PT is a tangent to the circle centered at O. OC is perpendicular to chord AB. Prove that $PA.\ PB = PC^2 - AC^2$.

[2 Marks]

Question 24. Using prime factorisation, find HCF and LCM of 96 and 120.

[2 Marks]

Question 25.

Find the ratio in which y-axis divides the line segment joining the points (5, -6) and (-1, -4).

[2 Marks]

Question 26. If $a \cos \theta + b \sin \theta = m$ and $a \sin \theta - b \cos \theta = n$, then prove that $a^2 + b^2 = m^2 + n^2$.

[2 Marks]

Question 27.

Prove that: $\sqrt{\sec A - 1} / \sqrt{\sec A + 1} + \sqrt{\sec A + 1} / \sqrt{\sec A - 1} = 2 \operatorname{cosec} A$

[2 Marks]

Section C

Question 28. Prove that $\sqrt{3}$ is an irrational number.

[3 Marks]

Question 29. The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 a.m., at what time will they change together next?

[3 Marks]

Question 30.

If p^{th} term of an A.P. is q and q^{th} term is p, then prove that its n^{th} term is (p + q – n).

[3 Marks]

Question 31.

In the given figure, CD is the perpendicular bisector of AB. EF is perpendicular to CD. AE intersects CD at G. Prove that CF / CD = FG / DG .

[3 Marks]

Question 32. In the given figure, ABCD is a parallelogram. BE bisects CD at M and intersects AC at L. Prove that EL = 2BL.

[3 Marks]

Question 33. Two people are 16 km apart on a straight road. They start walking at the same time. If they walk towards each other with different speeds, they will meet in 2 hours. Had they walked in the same direction with same speeds as before, they would have met in 8 hours. Find their walking speeds.

[3 Marks]

Question 34.

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

[3 Marks]

Question 35.

Find the mean of the following frequency distribution:

[3 Marks]

Section D

Question 36.

A golf ball is spherical with about 300 - 500 dimples that help increase its velocity while in play. Golf balls are traditionally white but are available in colours also. In the given figure, a golf ball has diameter 4.2 cm and the surface has 315 dimples (hemi-spherical) of radius 2 mm.

Based on the above, answer the following questions :

> **(1) Find the surface area of one such dimple.**

[1 Marks]

(2) Find the volume of the material dug out to make one dimple.

[1 Marks]

(3) Find the total surface area exposed to the surroundings.

[2 Marks]

(4)

Find the volume of the golf ball.

[2 Marks]

Question 37.

A middle school decided to run the following spinner game as a fund-raiser on Christmas Carnival.

Making Purple : Spin each spinner once. Blue and red make purple. So, if one spinner shows Red (R) and another Blue (B), then you 'win'. One such outcome is written as 'RB'.

Based on the above, answer the following questions :

(1) List all possible outcomes of the game.

[1 Marks]

(2)

Find the probability of 'Making Purple'.

[1 Marks]

(3) For each win, a participant gets ₹10, but if he/she loses, he/she has to pay ₹5 to the school. If 99 participants played, calculate how much fund could the school have

collected.

[2 Marks]

(4) If the same amount of ₹5 has been decided for winning or losing the game, then how much fund had been collected by school? (Number of participants = 99).

[2 Marks]

Question 38.

In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after t seconds is given by $h = 20t - 16t^2$.

Based on the above, answer the following questions :

(1) Find zeroes of polynomial $p(t) = 20t - 16t^2$.

[1 Marks]

(2) Which of the following types of graph represents p(t)?

[1 Marks]

(3)

What would be the value of h at t = 3 /2 ? Interpret the result.

[2 Marks]

(4) How much distance has the dolphin covered before hitting the water level again?

[2 Marks]

Section E

Question 39.

One observer estimates the angle of elevation to the basket of a hot air balloon to be 60°, while another observer 100 m away estimates the angle of elevation to be 30°. Find:

(a) The height of the basket from the ground.

(b) The distance of the basket from the first observer's eye..

(c) The horizontal distance of the second observer from the basket.

[5 Marks]

Question 40.

A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC are of lengths 10 cm and 8 cm respectively. Find the lengths of the sides AB and AC, if it is given that area Δ ABC = 90 cm².

[5 Marks]

Question 41. Two circles with centres O and O' of radii 6 cm and 8 cm respectively intersect at two points P and Q such that OP and O'P are tangents to the two circles. Find the length of the common chord PQ.

[5 Marks]

Question 42. A train travels at a certain average speed for a distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the journey, what was its first average speed?

[5 Marks]

Question 43.

Two pipes together can fill a tank in 15/8 hours. The pipe with larger diameter takes 2 hours less than the pipe with smaller diameter to fill the tank separately. Find the time in which each pipe can fill the tank separately.

[5 Marks]

Question 44. A horse is tied to a peg at one corner of a square-shaped grass field of side 15 m by means of a 5 m long rope. Find the area of that part of the field in which the horse can graze. Also, find the increase in grazing area if length of rope is increased to 10 m. (Use π = 3.14)

[5 Marks]