CBSE EXAMINATION PAPER-2024

MATHEMATICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 100

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

iv. **Section B** – questions number **21 to 27** are very short answer

v. **Section C** – questions number **28 to 35** are short answer

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

vii. **Section E** – questions number **39 to 44** are long answer

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 pair of linear equations $x + 2y + 5 = 0$ and $-3x = 6y - 1$ has

[1 Marks]

(A) exactly two solutions

(B) infinitely many solutions

(C) unique solution

(D) no solution

Question 2.

The common difference of the A.P.

1/2x, 1 – 4x / 2x, 1 – 8x / 2x, ... is:

[1 Marks]

(A) 2x

(B) –2

(C) –2x

(D) 2

Question 3. Two dice are thrown together. The probability that they show different numbers is:

[1 Marks]

(A) 1/6

(B) 5/6

(C) 1/3

(D) 2/3

Question 4.

The probability of guessing the correct answer to a certain test question is x/6. If the probability of not guessing the correct answer is 2/3, then the value of x is:

[1 Marks]

(A) 4

(B) 6

(C) 3

(D) 2

Question 5.

If $a = 2^2 \times 3^x$, $b = 2^2 \times 3 \times 5$, $c = 2^2 \times 3 \times 7$ and LCM(a, b, c) = 3780, then x is equal to

[1 Marks]

(A) 1

(B) 2

(C) 0

(D) 3

Question 6.

The zeroes of the quadratic polynomial $2x^2 – 3x – 9$ are:

[1 Marks]

(A) 3, –3/2

(B) 3, 3/2

(C) -3, -3/2

(D) –3, 3/2

Question 7.

From a point on the ground, which is 30 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is 60°. The height (in metres) of the tower is:

[1 Marks]

(A) 30

(B) 60

(C) $10\sqrt{3}$

(D) $30\sqrt{3}$

Question 8.

If $\cos\theta = \sqrt{3}/2$ and $\sin\varnothing = 1/2$, then $\tan(\theta + \varnothing)$ is:

[1 Marks]

(A) $\sqrt{3}$

(B) 1

(C) not defined

(D) 1/√3

Question 9. Maximum number of common tangents that can be drawn to two circles intersecting at two distinct points is:

[1 Marks]

(A) 4

(B) 3

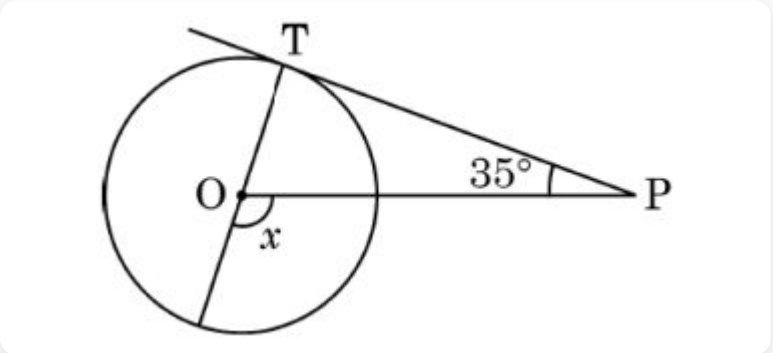
(C) 1

(D) 2

Question 10.

In the given figure, if PT is a tangent to a circle with centre O and ∠TPO = 35°, then the measure of ∠x is:

[1 Marks]



(A) 115°

(B) 120°

(C) 125°

(D) 110°

Question 11.

If the diagonals of a quadrilateral divide each other proportionally, then it is a:

[1 Marks]

(A) rectangle

(B) parallelogram

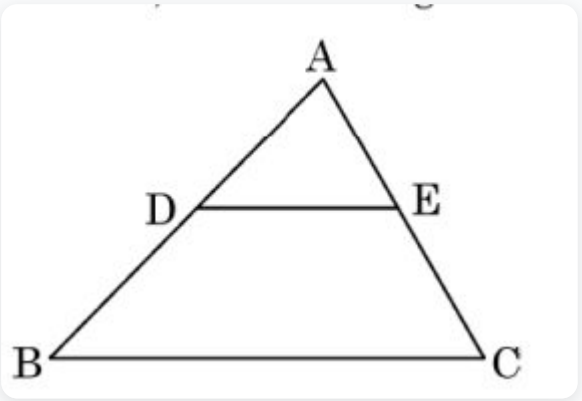
(C) trapezium

(D) square

Question 12.

In ΔABC, DE ∥ BC (as shown in the figure). If AD = 2 cm, BD = 3 cm, BC = 7.5 cm, then the length of DE (in cm) is:

[1 Marks]



(A) 2.5

(B) 6

(C) 3

(D) 5

Question 13.

Given HCF(2520, 6600) = 40, LCM(2520, 6600) = 252 × k, then the value of k is:

[1 Marks]

(A) 1650

(B) 1600

(C) 165

(D) 1625

Question 14.

A pair of irrational numbers whose product is a rational number is:

[1 Marks]

(A) (√16,√4)

(B) (√3,√27)

(C) (√5,√2)

(D) (√36,√2

Question 15.

If a digit is chosen at random from the digits 1,2,3,4,5,6,7,8,9, then the probability that this digit is an odd prime number is:

[1 Marks]

(A) 2/3

(B) 5/9

(C) 4/9

(D) 1/3

Question 16.

The mean of five observations is 15. If the mean of first three observations is 14 and that of last three observations is 17, then the third observation is

[1 Marks]

(A) 18

(B) 19

(C) 20

(D) 17

Question 17.

Perimeter of a sector of a circle whose central angle is 90° and radius 7 cm is:

[1 Marks]

(A) 35 cm

(B) 25 cm

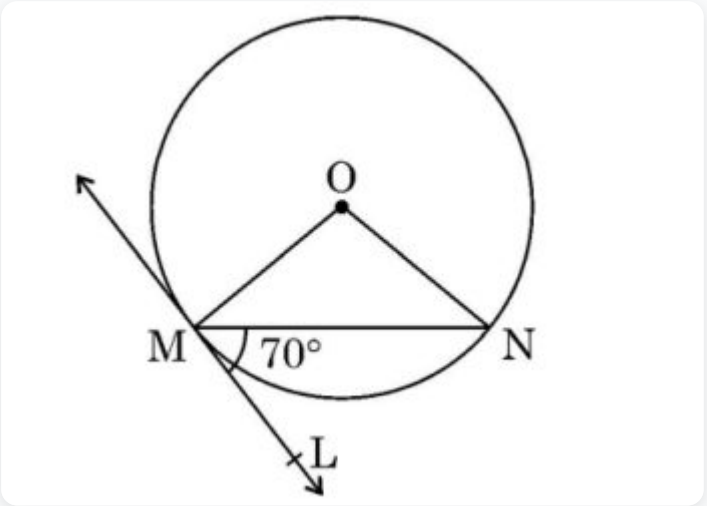
(C) 11 cm

(D) 22 cm

Question 18.

In the given figure, O is the centre of the circle. MN is the chord and the tangent ML at point M makes an angle of 70° with MN. The measure of ∠MON is:

[1 Marks]



(A) 120°

(B) 140°

(C) 70°

(D) 90°

Question 19.

Assertion (A) : The point which divides the line segment joining the points A (1, 2) and B(-1, 1) internally in the ratio 1 : 2 is (-1/3,5/3) Reason (R) : The coordinates of the point which divides the line segment joining the points A (x_1, y_1) and B(x_2, y_2) in the ratio m_1: m_2 are [$m_1x_2 + m_2x_1 / m_1 + m_2$, $m_1y_2 + m_2y_1 / m_1+m_2$

[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 false, but Reason (R) is true.

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

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

Question 20.

Assertion (A) : In a cricket match, a batsman hits a boundary 9 times out of 45 balls he plays. The probability that in a given ball, he does not hit the boundary is 4/5. Reason (R) : P(E) + P(not E) =1

[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 () is false, but Reason (R) is true.

Section B

Question 21.

One card is drawn at random from a well shuffled deck of 52 cards. Find the probability that the card drawn

(i) is queen of hearts:

(ii) is not a jack.

[2 Marks]

Question 22. If 2x + y = 13 and 4x – y = 17, find the value of (x – y).

[2 Marks]

Question 23. Sum of two numbers is 105 and their difference is 45. Find the numbers.

[2 Marks]

Question 24. Find a relation between x and y such that the point P(x, y) is equidistant from points A(7, 1) and B(3, 5).

[2 Marks]

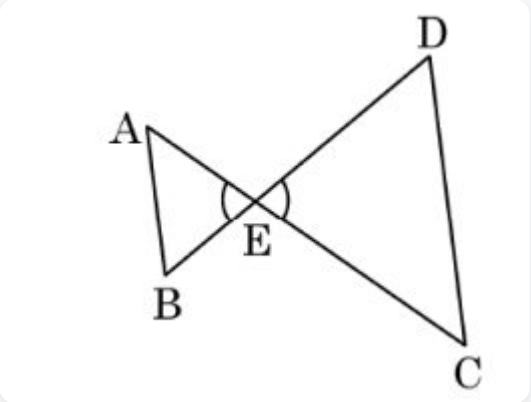
Question 25. Points A(–1, y) and B(5, 7) lie on a circle with centre O(2, –3y) such that AB is a diameter of the circle. Find the value of y. Also, find the radius of the circle.

[2 Marks]

Question 26.

In the given figure, EA/EC = EB/ED, prove that ΔEAB ~ ΔECD.

[2 Marks]



Question 27.

Evaluate: cos 45° + sin 60° / sec 30° + cosec 30°.

[2 Marks]

Section C

Question 28.

If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of its first 20 terms.

[3 Marks]

Question 29. Find the zeroes of the quadratic polynomial $x^2 – 15$ and verify the relationship between the zeroes and the coefficients of the polynomial.

[3 Marks]

Question 30.

Solve the following system of linear equations graphically:

x – y + 1 = 0

x + y = 5

[3 Marks]

Question 31.

Find the ratio in which the line segment joining the points (5, 3) and (–1, 6) is divided by Y-axis.

[3 Marks]

Question 32.

Prove that $\sin\theta - 2\sin^3\theta / 2\cos^3\theta - \cos\theta = \tan\theta$.

[3 Marks]

Question 33. Prove that the tangents drawn at the end points of a chord of a circle make equal angles with the chord.

[3 Marks]

Question 34.

The ratio of the 10^{th} term to its 30th term of an A.P. is 1 : 3 and the sum of its first six terms is 42. Find the first term and the common difference of A.P.

[3 Marks]

Question 35.

P(–2, 5) and Q(3, 2) are two points. Find the coordinates of the point R on line segment PQ such that PR = 2QR.

[3 Marks]

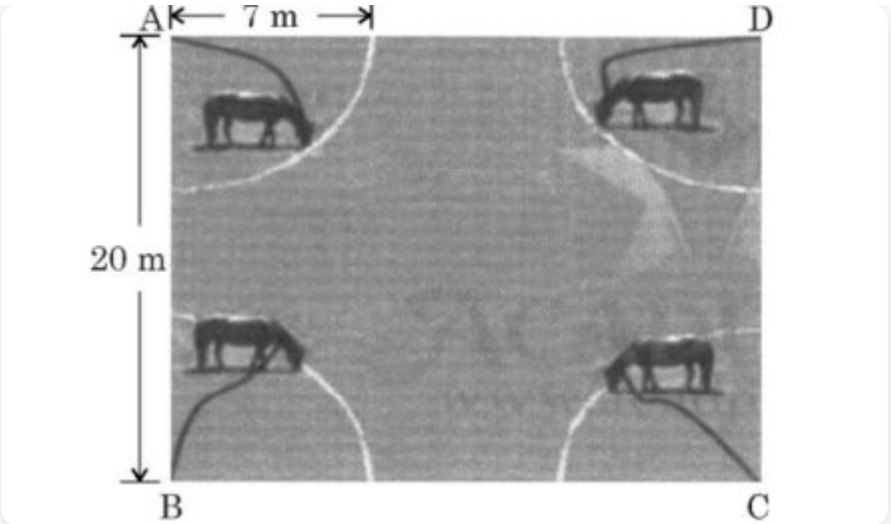
Section D

Question 36.

A stable owner has four horses. He usually ties these horses with 7 m long rope to pegs at each corner of a square shaped grass field of 20 m length, to graze in his farm. But tying with rope sometimes results in injuries to his horses, so he decided to build a fence around the area so that each horse can graze.

Based on the above, answer the following questions :

[4 Marks]



(1)

(a) Find the area of the total field in which these horses can graze.

[2 Marks]

(2) Find the area of the square shaped grass field.

[1 Marks]

(3)

What is area of the field that is left ungrazed, if the length of the rope of each horse is 7 cm?

[1 Marks]

(4)

If the length of the rope of each horse is increased from 7 m to 10 m, find the area grazed by one horse. (Use π = 3.14)

[2 Marks]

Question 37.

Vocational training complements traditional education by providing practical skills and hands-on experience. While education equips individuals with a broad knowledge base, vocational training focuses on job-specific skills, enhancing employability thus making the student selfreliant. Keeping

this in view, a teacher made the following table giving the frequency distribution of students/adults undergoing vocational training from the training institute.

From the above answer the following questions :

[4 Marks]



Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of participants	62	132	96	37	13	11	10	4

(1) What is the lower limit of the modal class of the above data?

[1 Marks]

(2)

Find the median class of the above data.

[2 Marks]

(3) Give the empirical relationship between mean, median and mode.

[1 Marks]

(4)

Find the number of participants of age less than 50 years who undergo vocational training.

[2 Marks]

Question 38.

Teaching Mathematics through activities is a powerful approach that enhances students' understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to second student. Second student also multiplied it by a prime number and passed it to third student. In this way by multiplying to a prime number, the last student got 173250.

Now, Mukta asked some questions as given below to the students :

[4 Marks]

(1) What is the least prime number used by students?

[1 Marks]

(2) Which prime number has been used maximum times?

[1 Marks]

(3)

How many students are in the class?

[2 Marks]

(4)

What is the highest prime number used by students?

[2 Marks]

Section E

Question 39. In a flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 km/h and by doing so, the time of flight is increased by 30 minutes. Find the original duration of the flight.

[5 Marks]

Question 40.

The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is 2 X 16 / 21, find the fraction.

[5 Marks]

Question 41. State and prove Basic Proportionality theorem.

[5 Marks]

Question 42. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

[5 Marks]

Question 43. A solid iron pole consists of a solid cylinder of height 200 cm and base diameter 28 cm, which is surmounted by another cylinder of height 50 cm and radius 7 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass.

[5 Marks]

Question 44. A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 4 mm. Find its surface area. Also, find its volume.

[5 Marks]

