SECOND TERMINAL EXAMINATION (2024-25)

Std: IX **Subject: Mathematics**

Duration: 3 hours **Maximum Marks: 80**

MATHEMATICS

Maximum Marks: 80

Time allowed: Three Hours

Answers to this Paper must be written on the paper provided separately.

You will not be allowed to write during the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

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*Attempt **all** questions from **Section A** and any **four** questions from Section B.*

All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.

Omission of essential work will result in loss of marks.

The intended marks for questions or parts of questions are given in brackets [ ].

Mathematical tables are provided.

Section A (40 marks)

Attempt all questions from this Section

Question 1 **[15]**

(i) What is the value of $x^2 + y^2$, if $x + y = 8$ and $xy = 5$?

(a) 59 (b) 54 (c) 50 (d) 58

(ii) Factorization of $x^2 - 4x - 12$ is

(a) $(x+6)(x-2)$ (b) $(x-6)(x+2)$ (c) $(x-6)(x-2)$ (d) $(x+6)(x+2)$

(iii) Which of the following is the correct way to rationalize the denominator of $\frac{15}{\sqrt{63}+\sqrt{20}}$?

(a) $\frac{15}{\sqrt{63}+\sqrt{20}} \times \frac{3\sqrt{7}-2\sqrt{5}}{3\sqrt{7}-2\sqrt{5}}$

(b) $\frac{15+\left(3\sqrt{7}-4\sqrt{5}\right)}{\left(\sqrt{63}+\sqrt{20}\right)\left(3\sqrt{7}-2\sqrt{5}\right)}$

(c) $\frac{15}{\sqrt{63}+\sqrt{20}} \times \frac{3\sqrt{7}-4\sqrt{5}}{3\sqrt{7}-4\sqrt{5}}$

(d) $\frac{15+\left(3\sqrt{7}-2\sqrt{5}\right)}{\left(\sqrt{63}+\sqrt{20}\right)\left(3\sqrt{7}-2\sqrt{5}\right)}$

(iv) The value of $\frac{\sin 58^\circ}{\cos 32^\circ} + \frac{\cos 58^\circ}{\sin 32^\circ}$ is

(a) 1 (b) 0 (c) 2 (d) $\frac{1}{2}$

(v) If $\sin\theta = \frac{a}{b}$ then the value of $\cot\theta$ will be

(a) $\frac{\sqrt{b^2-a^2}}{b}$ (b) $\frac{a}{\sqrt{b^2-a^2}}$ (c) $\frac{\sqrt{b^2-a^2}}{a}$ (d) $\frac{b}{\sqrt{b^2-a^2}}$

(vi) What is the value of m if $\frac{6^{2m-3}}{6^{-9}} = 6^{20}$

(a) 5 (b) 20 (c) 10 (d) 7

(vii) If D and E are the midpoints of sides AB and AC of triangle ABC, what is DE in relation to BC?

(a) DE = BC (b) DE is perpendicular to BC

(c) DE = $\frac{1}{2}$BC (d) DE is double of BC

(viii) What is the distance of the point (5, –12) from the origin?

(a) 11 units (b) 13 units (c) 15 units (d) 16 units

(ix) If α is an acute angle, and $\sqrt{3}\cot 2\alpha = 1$, then the value of α is

(a) 60° (b) 30° (c) 90° (d) 0°

(x) A point P (a, b) is such that $a < 0$, $b > 0$. In which quadrant does the point P lie?

(a) First quadrant (b) Second quadrant (c) Third quadrant (d) Fourth quadrant

(xi) If ABC and DBC are two isosceles triangles on the same base BC. Then:

(a) $\angle ABD = \angle ACD$ (b) $\angle ABD > \angle ACD$ (c) $\angle ABD < \angle ACD$ (d) $\angle BAC = \angle BDC$

(xii) A boy cycles 120 m towards north and 160 m towards west. How far is he from the starting point?

(a) 250 m (b) 200 m (c) 240 m (d) 300 m

(xiii) **Statement I**: The median of an ungrouped data can be calculated by arranging the data in ascending order.
Statement II: The median of an ungrouped data can be calculated by arranging the data in descending order.
Which is the correct option?

(a) Statement I is correct (b) Statement II is correct (c) Both I and II are correct (d) Both I and II are incorrect

(xiv) In two triangles, ABC and PQR, $\angle A = 30°$, $\angle B = 70°$, $\angle P = 70°$, $\angle Q = 80°$ and AB = RP, then

(a) $\Delta ABC \cong \Delta PQR$ (b) $\Delta ABC \cong \Delta QRP$ (c) $\Delta ABC \cong \Delta RPQ$ (d) $\Delta ABC \cong \Delta RQP$

(xv) **Assertion (A):** A chord of a circle, which is twice as long as its radius, is a diameter of the circle.
Reason (R): Any chord, whose length is twice as long as the radius of the circle, passes through the centre of the circle.

(a) A is true, R is false

(b) A is false, R is true

(c) both A and R are true

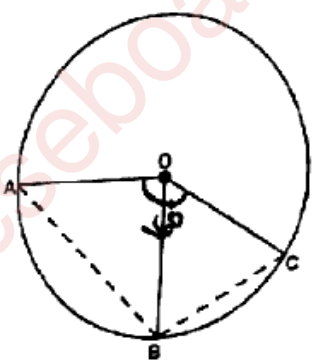
(d) both A and R are false

Question 2

(i) In a two-digit number, the units digit is thrice the tens digit. If 54 is added to the number, the digits interchange their place. Find the number. [4]

(ii) In the given figure, the lengths of arcs AB and BC are in the ratio 3 : 2.If $\angle AOB = 96°$, find [4]

(a) $\angle BOC$ (b) $\angle ABC$.

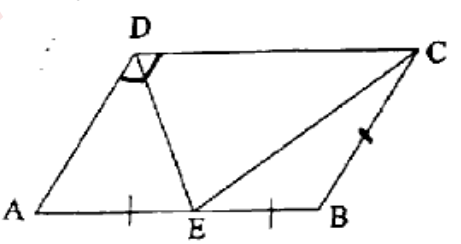


(iii) ABCD is a parallelogram. E is the mid-point of AB and DE bisects $\angle D$. Prove that [4]

(a) BC = BE

(b) CE bisects $\angle C$

(c) $\angle DEC = 90°$



Question 3

(i) Find the values of the rational numbers a and b if: $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - b\sqrt{3}$ [4]

(ii) Find the value of $\frac{4}{3}\tan^2 30° + \sin^2 60° - 2\cos^2 60° + \frac{3}{4}\tan^2 60° - 2\tan^2 45°$ [4]

(iii) Solve the given equations graphically. [5]

$x - y + 1 = 0$

$2x + y = 4$

Section B (40 marks)

Attempt any four questions from this Section.

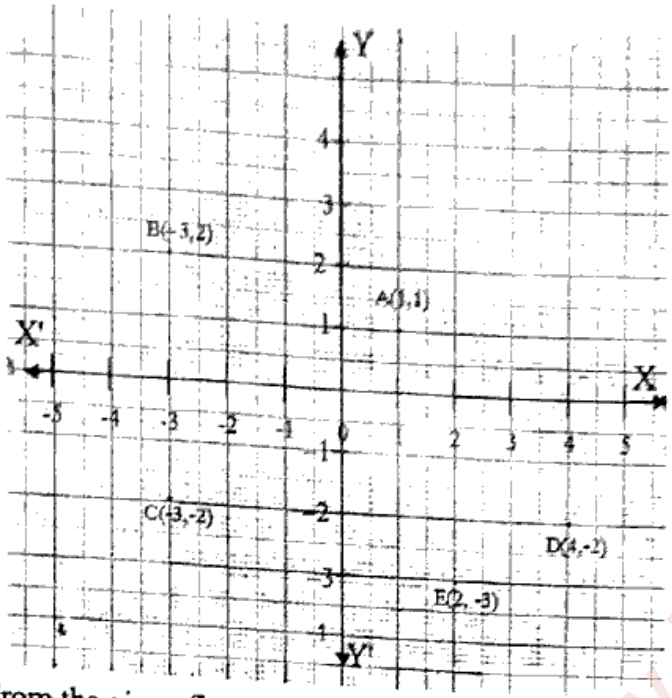
Question 4

(i) Simplify $\frac{5^{n+2} - 6 \times 5^{n+1}}{13 \times 5^n - 2 \times 5^{n+1}}$ [3]

(ii) Evaluate the following [3]

$$\frac{\sin^2 63^\circ + \sin^2 27^\circ}{\cos^2 17^\circ + \cos^2 73^\circ}$$

(iii) [4]



From the given figure, write the following:

(a) The points in quadrant IV.

(b) The points with the same abscissa.

(c) The points with the same ordinate.

(d) Point whose ordinate is –3.

Question 5

(i) Sulekha deposits ₹8000 in a bank every year at the beginning of the year at 10% per annum compound interest. Calculate the amount due to her at the end of three years. [3]

(ii) If $q \tan A = p$ evaluate without using tables: [3]

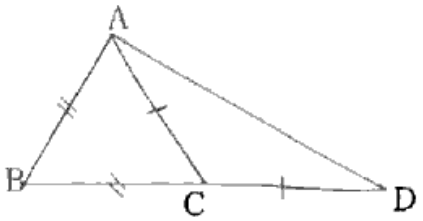
$$\frac{p \sin A - q \cos A}{p \sin A + q \cos A}$$

(iii) The inner dimensions of a closed wooden box are 2 m, 1.2 m and 0.75 m. The thickness of the wood is 2.5 cm. Find the cost of wood required to make the box if 1 m^3 of wood costs ₹5400. [4]

Question 6

(i) Factorise $9x^2 + 12x + 4 - 16y^2$ [3]

(ii) In the given figure prove that $\angle BAD : \angle ADB = 3 : 1$ [3]



(iii) A chord of length 24 cm is at a distance of 5 cm from the centre of the circle. Find the length of the chord of the same circle which is at a distance of 12 cm from the centre. [4]

Question 7

(i) A wire is bent in the form of an equilateral triangle of the largest area. If it encloses an area of $49\sqrt{3}\ cm^2$, find the area enclosed by the same wire when bent to form: [5]

(a) a square.

(b) a rectangle of length 12 cm.

(ii) Prove that the line segment joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides of trapezium and is equal to half the difference of these sides. [5]

Question 8

(i) Write the following real numbers in descending order: $3\sqrt{2},\ 2\sqrt{3},\ \sqrt{15}, 4$ [3]

(ii) In a Park, there are 28 trees of different heights. The heights can be measured in centimetres, and the range of the trees lies between 100-350 cm. [3]

Range of height of tree (in cm)	100-150	150-200	200-250	250-300	300-350
Number of trees	2	10	6	3	7

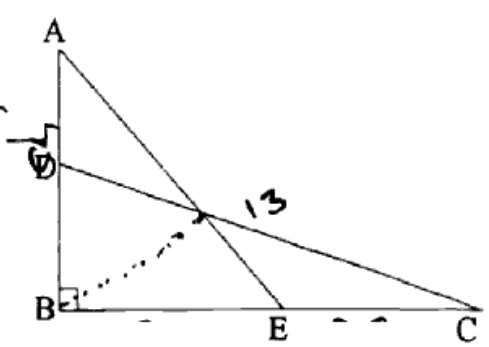
Draw a histogram for the above data.

(iii) If $x^4 + \frac{1}{x^4} = 194$, find the values of: [4]

(a) $x^2 + \frac{1}{x^2}$ (b) $x + \frac{1}{x}$ (c) $x^3 + \frac{1}{x^3}$

Question 9

(i) In the given figure, AE = DC = 13 cm, BE = 5 cm, $\angle ABC = 90°$ and AD = EC = x cm. Calculate the length of AB and the value of x. [3]



(ii) A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string. [3]

(iii) Divya invests ₹16000 in a bank scheme which pays 10% compound interest annually. If interest is compounded half-yearly, find the amount and compound interest after 18 months. [4]

Question 10

(i) The mean age of 20 students in a college is 18 years. If one more student is included, the mean age becomes 18.5 years. Find the age of the new student. [3]

(ii) Prove that A (16, – 8), B (4, –3) and C (–8, 2) are collinear. [3]

(iii) In the given figure, OA = OC and AB = BC. [4]

(a) Prove that ∠AOB = 90°

(b) ΔAOD ≅ ΔCOD

(c) AD = CD