CLASS IX - ANNUAL EXAMINATION

MATHEMATICS

(Two hours and a half)

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.

*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 working 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

(a)   Rationalize the denominator and simplify to find the value of: [3]

$$\frac{4}{\sqrt{5} + \sqrt{3}}$$

Given that $\sqrt{5}$=2.236 and $\sqrt{3}$=1.732.

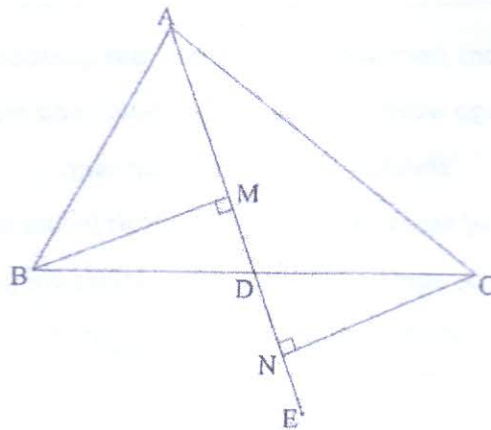(b)   If $x - \dfrac{1}{x} = \dfrac{1}{3}$ [3]

evaluate $x^3 - \dfrac{1}{x^3}$

(c)   In the given figure ABC is a triangle and D is the mid-point of BC. AD is produced   [4]
to E. BM and CN are two perpendiculars dropped from B and C respectively on
AE.

Prove that:

(i)   ΔBMD ≅ Δ CND

(ii)   BM = CN

Question 2

(a)   Evaluate: [3]

$$\left[\frac{1}{4}\right]^{-2} - 3\,(8)^{\frac{2}{3}} \times 4^0 + \left[\frac{9}{16}\right]^{-\frac{1}{2}}$$

(b)   Using ruler and compass only: [3]
Construct a rhombus ABCD with AB = 6 cm and diagonal AC = 7 cm.
Hence measure and write down the length of the diagonal BD.

(c)   Mr. Ram borrows ₹ 20,000 for 2 years compounded annually. The rate of   [4]
interest for the two successive years are 9% and 10% respectively. If he repays
₹ 1,200 at the end of first year, ₹ 1,660 at the end of second year, find the
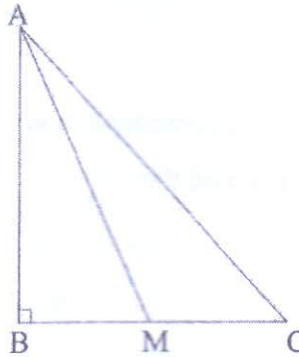amount outstanding at the beginning of the third year.

Question 3

(a) Without using trigonometric tables evaluate the following: [3]

$$\frac{\cot 30°}{\sec 30°} + \frac{\csc 30°}{\tan 45°} - \frac{2\cos 0°}{\sin 30°} + \cos^2 45°$$

(b) ABC is a triangle, right angled at B. M is a point on BC. Prove that: [3]

$AM^2 + BC^2 = AC^2 + BM^2.$

(c) Construct a frequency polygon for the following distribution, using a graph sheet: [4]

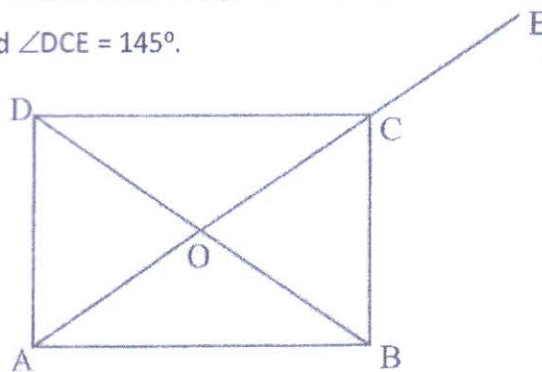| Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
No. of students	6	15	28	34	18	8

Question 4

(a) A is a point on the x-axis and B is (−7, 9). Distance between the points A and B is 15 units. Find the coordinates of point A. [3]

(b) In the given figure, ABCD is a rectangle, whose diagonals intersect at 'O'. Diagonal AC is produced to E and $\angle DCE = 145°$. [3]

Find:

(i) $\angle CAB$

(ii) $\angle AOB$

(iii) $\angle ACB$

(c) Find the altitude and area of an isosceles triangle whose perimeter is 64 cm and whose base is 24 cm. [4]

SECTION B (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) If 13 sin A = 12   [3]

find sec A – tan A.

(b) A sum of ₹ 10,000 yields ₹ 3310 as compound interest in 3 years.   [3]

If interest is compounded yearly, find the:

(i) amount

(ii) rate of interest

(c) In the given figure O is the centre of the two concentric circles. A line 'l' cuts the   [4]

circles at A, B, C and D as shown in the figure. OP is perpendicular to AD.

Given OA = 34 cm, OP = 16 cm and AB = 18 cm

Find:

(i) length of chord AD

(ii) length of chord BC

(iii) radius of the smaller circle
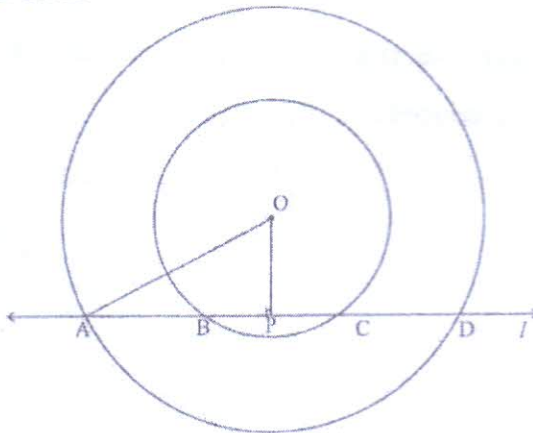
Question 6

(a)   If the mean of the observations a, a + 6, a + 2, a + 8 and a + 4 is 11, find: [3]

    (i)   the value of 'a'

    (ii)   the median

(b)   Factorize: [3]

$$25a^2 - 9b^2 + 12bc - 4c^2$$

(c)   In the given figure ABCD is a trapezium,   [4]

P is the mid-point of side AD and PR//AB//DC.

    (i)   Prove that R is the mid-point of side BC

    (ii)   Find the length of PR, if AB = 12 cm and DC = 8 cm
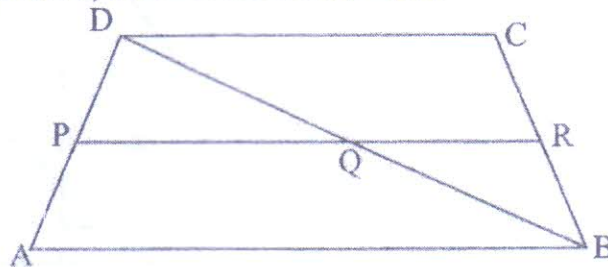
Question 7

(a)   Solve the following pair of linear equations using cross multiplication method: [3]

$$2x - 5y = 14$$
$$x + 2y = -2$$

(b)   In the given figure ABCD is a quadrilateral. BP is drawn parallel to AC and BP   [3]

meets DC produced at P. Prove that:

    (i)   area of △AOB = Area of △COP

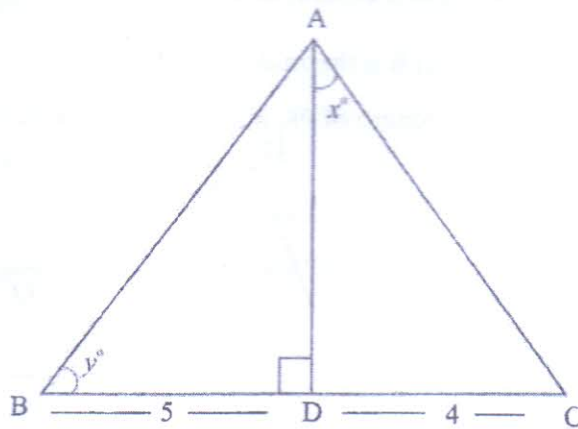   (ii)   area of quadrilateral ABCD = area of △APD.
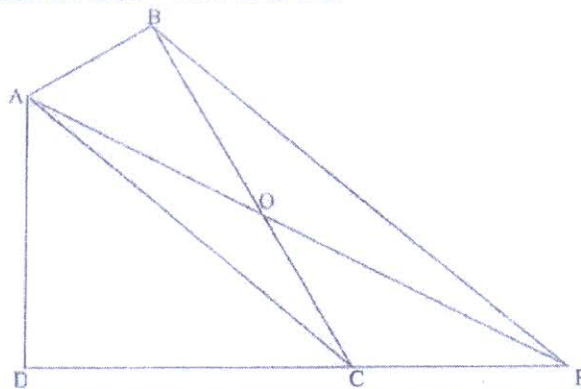
(c) The cost of mowing a circular field at ₹ 16 per sq m is ₹ 2464. Find: [4]

    (i) the total area of the field.

    (ii) the radius of the circular field.

    (iii) cost of fencing the field at ₹12 per metre.

Question 8

(a) In the given triangle ABC, AD ⊥ BC. AB = 13 cm, BD = 5 cm, DC = 4 cm. [3]

Find the value of:

    (i) AD

    (ii) $\tan x° + \cot y°$

(b) $\log_2 a = 3$, $\log_3 b = 2$, $\log_4 c = 1$ [3]

Find the value of $3a + 2b - 10c$

(c) Use graph paper for this question. Draw the graph of $3x - 2y = 5$ and $2x = 3y$ on the same axes. Use 2cm = 1 unit on the both the axes and plot only 3 points per line. Write down the co-ordinates of the point of intersection of the two lines. Also find the area of the triangle formed by the lines and the y-axis. [4]

Question 9

(a) Solve for x. [3]

$$\left(\sqrt[3]{\frac{3}{5}}\right)^{2x+1} = \frac{125}{27}$$

(b) If 1 is subtracted from the numerator of a fraction it becomes $\frac{2}{3}$, but if 5 is added   [3]

to the denominator of the fraction it becomes $\frac{1}{2}$. Find the fraction?

(c) In the given figure PQR is a triangle where PS, QS and RS are the bisectors of   [4]

∠P, ∠Q and ∠R respectively.
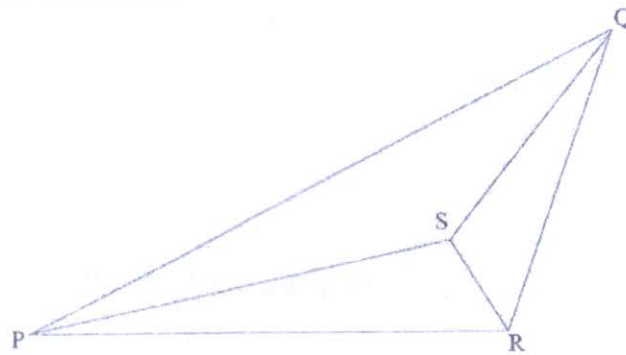
(i) If ∠PRQ > ∠PQR, prove that SQ > SR

(ii) If∠PRQ = 110° and ∠PQR = 40°, prove that SP > SQ

Question 10

(a) Evaluate without using trigonometric tables: [3]

$$\tan 20° \cdot \tan 40° \, \tan 50° \, \tan 70°$$

(b) Factorize: $x^3 - 3x^2 - x + 3$ [3]

(c) In the given figure, 'O' is the centre of the circle. Arc AB = Arc BC = Arc CD.   [4]

If ∠OAB = 48°, find:

(i) ∠AOB
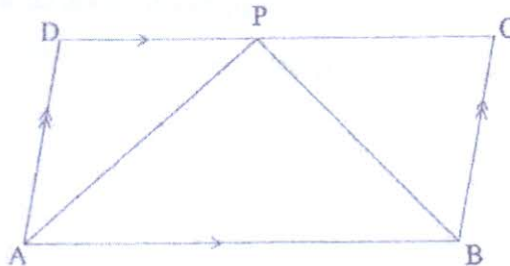
(ii) ∠BOD

(iii) ∠OBD
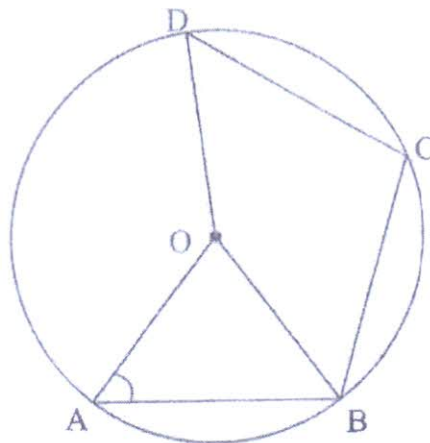
Question 11.

(a) ABCD is a prallelogram in which ∠DAB = 80°. Bisector of ∠A and ∠B meets CD   [3]

at P. Prove that:

(i)   AD = DP

(ii) CP = CB

(iii) DC = 2AD

(b) Given three points P(--1, 2), A (2, k) and B(k, −1). Given the PA = PB.   [3]

Find the value of k.

(c) The length, breadth and height of a closed wooden box are 20 cm, 12 cm and   [4]

8 cm. The thickness of the wood used to make the box is 10 mm. Find:

(i)   the volume of the wood.

(ii) the cost of the wood required to make the box, if 1 cm³ of wood costs

₹ 8.50.