

ANNUAL EXAMINATION, FEBRUARY 2021

Grade IX

MATHEMATICS

Marks: 80

Time: 2 ½ Hrs.

Section A

Answer all the questions

(4 x 10 =40)

Question 1

a. Simplify : $\frac{5^{n+3} - 6 \times 5^{n+1}}{9 \times 5^n - 2^2 \times 5^n}$ (3)

b. Without using trigonometric tables, evaluate

$(\cos^2 26^\circ + \cos 64^\circ \sin 26^\circ + \frac{\tan 36^\circ}{\cot 54^\circ})$ (3)

c. Factorise $4a^2 - 9b^2 - 16c^2 + 24bc$ (4)

Question 2

a. Solve using any method : (4)

$$\frac{3}{5}x - \frac{2}{3}y + 1 = 0$$

$$\frac{2}{5}x + \frac{1}{3}y = 4$$

b. Find the slope and y- intercept of the line $2y+5x = 7$ (3)

c. A sum of ₹10,000 yields ₹3310 as compound interest in 3 years. If the interest is compounded yearly, find the: (3)

(i) Amount

(ii) Rate of interest

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Question 3

a. Given three points P (-1, 2), A (2, k) and B (k, -1). If PA = PB, find the value of k. (3)

b. Prove that: $\frac{1}{\sqrt{2}+1} + \frac{1}{\sqrt{3}+\sqrt{2}} + \frac{1}{2+\sqrt{3}} = 1$ (3)

c. If $x \neq 0$ and $x + \frac{1}{x} = 2$, find: (4)

(i) $x^2 + \frac{1}{x^2}$

(ii) $x^4 + \frac{1}{x^4}$

Question 4

a. A footpath of uniform width runs all around the inside of a rectangular field 38 m long and 32 m wide. If the path occupies 600 m^2 , find its width. (4)

b. A metal cube of edge 5 cm is melted and casted into a cuboid whose base is 2.50 cm x 0.50 cm. find the height of the cuboid. Also find the surface areas of cube and cuboid. (4)

c. If $\sin A = \frac{3}{5}$, find $\tan A$ and $\cos A$. (2)

Section B

Answer any four questions

Question 5

a. Prove that $\sqrt{2}$ is an irrational number. (4)

b. 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

c. Evaluate: $(\frac{1}{4})^{-2} - 3(8)^{\frac{2}{3}} \times 4^0 + [\frac{9}{16}]^{-\frac{1}{2}}$ (3)

Question 6

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. Solve: $\frac{7+x}{5} - \frac{2x-y}{4} = 3y - 5$

$$\frac{5y-7}{2} + \frac{4x-3}{6} = 18 - 5x \quad (4)$$

c. Expand $(3x - 2y + 4)(3x - 2y - 4)$ (3)

Question 7

a. ABC is a triangle which is right – angled at B. M is a point on BC. Prove that $AM^2 + BC^2 = AC^2 + BM^2$ (4)

b. Use graph paper for this question. Draw the graph of $3x-2y = 5$ and $2x = 3y$ on the same axes. Write down the coordinates of point of intersection of the two lines. Also find the area of the triangle formed by the lines and the y-axis. (4)

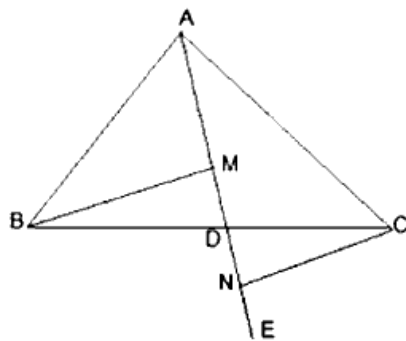
c. If $\tan A + \cot A = 2$; find the value of $\tan^2 A + \cot^2 A$ (2)

Question 8

a. In the given figure ABC is a triangle and D is the midpoint of BC. AD is produced to E. BM and CN are two perpendiculars dropped from B and C respectively on AE. Prove that

(i) $\Delta BMD \cong \Delta CND$

(ii) $BM = CN$ (5)



b. Draw a combined histogram and frequency polygon for the following frequency distribution: (5)

Class intervals	0-4	4-8	8-12	12-16	16-20	20 -24
Frequency	4	7	10	15	11	6

Question 9

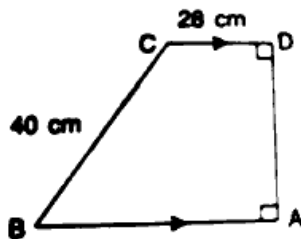
- a. The length, breadth and height of a closed wooden box are 20 cm, 12 cm and 8 cm. the thickness of the wood used to make the box is 10mm. find: (4)
- The volume of the wood
 - The cost of wood required to make the box, if 1 cm^3 of wood costs ₹ 8.50
- b. A machine depreciates at the rate of 20% of its value at the beginning of every year. The machine was purchased for ₹ 2,50,000 when new and the scrap value realised when sold was ₹ 1,28,000. Find the number of years that the machine was used. (4)
- c. Find the area of an equilateral triangle, whose height is 20 cm (2)

Question 10

- a. The ratio between an exterior angle and an interior angle of a regular polygon is 2: 3; find the number of side in the polygon. (3)
- b. Two equal chords AB and CD of a circle with centre O, intersect each other at a point P inside the circle. Prove that:
- $AP = CP$
 - $BP = DP$ (4)
- c. In a triangle ABC; D is the midpoint of AB and E is the midpoint of AC. Through E, a straight line is drawn parallel to AB to meet BC at F. Prove that BDEF is a parallelogram. (3)

Question 11

- a. In the given figure, ABCD is a trapezium with angle C = 120° , DC = 28 cm and BC = 40 cm. Find: (4)



- AB
 - AD
 - The area of trapezium
- b. Factorise $(p^2 + q^2 - r^2)^2 - 4p^2q^2$ (3)
- c. Solve : $2x + 3y = 6$ (3)
 $6x - 5y = 4$