Sample Paper 6

ICSE 2024 EXAMINATION
MATHEMATICS

Time: Two and half hours   **Max. Marks: 80**

General Instructions:

1. Answer to this paper must be written on the paper provided separately.
2. You will not be allowed to write during first 15 minutes.
3. This time is to be spent in reading the question paper.
4. The time given at the head of this Paper is the time allowed for writing the answers.
5. Attempt all questions from Section A and any four questions from Section B.
6. All working, including rough work, must be clearly shown, and must be done on the same sheet as the rest of the answer.
7. Omission of essential working will result in loss of marks.
8. The intended marks for questions or parts of questions are given in brackets [ ].
9. Mathematical tables are provided.

SECTION - A

(Attempt all questions from this Section.)
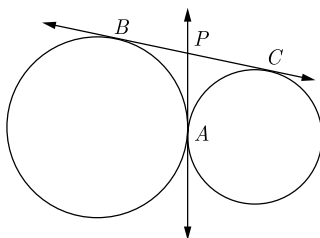
QUESTION 1.

Choose the correct answers to the questions from the given options.   [15]

(Do not copy the questions, write the correct answer only.)

(i)   Seema went to a shop to buy a sewing machines worth ₹10,080. The rate of GST is 12%. He asked the shopkeeper to reduce the price of washing machine to an extent that she has to pay ₹10,080 inclusive GST. What is the reduced price of the machine ?
    (a)   ₹9,250   (b) ₹8,800
    (c)   ₹9,000   (d) ₹8,500

(ii)   Raghav deposited ₹800 per month in a cumulative deposit account of Bank of India for 5 years. If the bank pays interest at a rate of 6% per annum, the amount payable to him at the time of maturity is
    (a)   ₹53,250   (b) ₹55,320
    (c)   ₹52,350   (d) ₹53,520

(iii) If $x \in R$, the solution set of $8 - 3x \geq 28 + 2x$ is:
    (a)   All real numbers less than (-4)
    (b)   All real numbers less than or equal to (-4)
    (c)   All real numbers greater than (-4)
    (d)   All real numbers greater than or equal to (-4)

(iv) If the equation $3x^2 - 6x + k = 0$ has real and distinct roots, then the value of k is:
- (a) $k \le 3$
- (b) $k = 3$
- (c) $k > 3$
- (d) $k < 3$

(v) If $4x = 7y = 9z$, then $x : y : z =$
- (a) $24 : 31 : 19$
- (b) $63 : 36 : 28$
- (c) $4 : 7 : 9$
- (d) $16 : 49 : 81$

(vi) What is the value of the polynomial $3x^3 + 7x^2 + 11x - 1$ at $x = 1$?
- (a) 20
- (b) 30
- (c) -30
- (d) -8

(vii) If $A = [0,\ 1]$ and $B = [1\ 0]$, then the value of $3A + 2B$ is :
- (a) $[2\ \ 3]$
- (b) $[3\ \ 2]$
- (c) $[2\ \ 2]$
- (d) $[3\ \ 3]$

(viii) The 11th term of an AP $-5,\ \dfrac{-5}{2},\ 0,\ \dfrac{5}{2},\ ....,$ is
- (a) -20
- (b) 20
- (c) -30
- (d) 30

(ix) If $A\left(\frac{m}{3},\ 5\right)$ is the mid-point of the line segment joining the points $Q(-6, 7)$ and $R(-2, 3)$, then the value of m is
- (a) -12
- (b) -4
- (c) 12
- (d) -6

(x) Which of the following is the slope of a line perpendicular to AB if $A(-4,\ 2)$ and $B(5,\ 8)$
- (a) $\frac{1}{2}$
- (b) $-\frac{3}{2}$
- (c) $\frac{1}{5}$
- (d) $\frac{3}{2}$

(xi) In a right angled $\triangle ABC$ right angled at B, if P and Q are points on the sides AB and BC respectively, then
- (a) $AQ^2 + CP^2 = 2(AC^2 + PQ^2)$
- (b) $2(AQ^2 + CP^2) = AC^2 + PQ^2$
- (c) $AQ^2 + CP^2 = AC^2 + PQ^2$
- (d) $AQ + CP = \frac{1}{2}(AC + PQ)$

(xii) In the given figure two circles touch each other at A. Line BC and AP are common tangents to these circles. If $BP = 3.8$ cm, then the length of BC is equal to
- (a) 7.6 cm
- (b) 1.9 cm
- (c) 11.4 cm
- (d) 5.7 cm

(xiii) Volume of a spherical shell is given by
    (a) $4\pi\left(R^2 - r^2\right)$ (b) $\pi\left(R^3 - r^3\right)$
    (c) $4\pi\left(R^3 - r^3\right)$ (d) $\frac{4}{3}\pi\left(R^3 - r^3\right)$

(xiv) If $\cos A = \frac{4}{5}$, then the value of $\tan A$ is

    (a) $\frac{3}{5}$ (b) $\frac{3}{4}$

    (c) $\frac{4}{3}$ (d) $\frac{5}{3}$

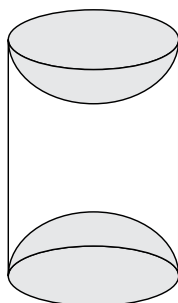(xv) If a regular hexagon is inscribed in a circle of radius r, then its perimeter is
    (a) $3r$ (b) $6r$
    (c) $9r$ (d) $12r$

QUESTION 2.

(i)   A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.   [4]


(ii)   Swamy deposited ₹ 400 at the beginning of every month in a recurring deposit and received ₹ 16398 at the end of 3 years. Find the rate of interest given by the bank.   [4]

(iii) If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.   [4]

QUESTION 3.

(i)   A man invests ₹22500 in ₹50 shares available at 10% discount. If the dividend paid by the company is 12%, calculate   [4]
    (a) then number of shares purchased.
    (b) the annual dividend received.
    (c) The rate of return he gets on his investment. Given your answer correct to the nearest whole number.

(ii) AB and CD are two chords of a circle intersecting at P. Prove that   [4]
$$AP \times PB = CP \times PD$$
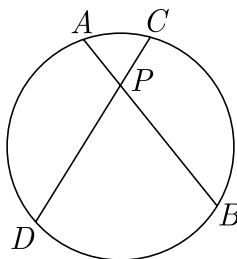
(iii)   Using the data given below construct the cumulative frequency table and draw the ogive.   [5]

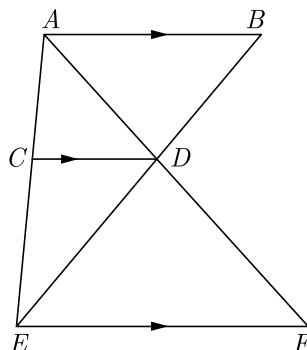| Marks	Number of students
0-10	3
10-20	8
20-30	12
30-40	14
40-50	10
50-60	6
60-70	5
70-80	2

From the ogive, determine the median.

SECTION - B

(Attempt any four questions.)

QUESTION 4.

(i)   If A $= \begin{bmatrix} 1 & 3 \\ -2 & 0 \end{bmatrix}$, B $= \begin{bmatrix} 2 & 4 \\ 5 & 1 \end{bmatrix}$ and C $= \begin{bmatrix} -3 & 4 \\ 6 & 0 \end{bmatrix}$, verify that (AB)C = A(BC)   [3]

(ii)   Construct a regular hexagon of side 4 cm. Construct a circle circumscribing the hexagon.   [3]

(iii)   In the given figure, $AB \parallel CD \parallel EF$. If $CD = 6$ cm and $AC : CE = 2 : 3$, find :   [4]
    (a)   Shows that $\Delta ECD \sim \Delta EAB$.
    (b)   Shows that $\Delta ACD \sim \Delta AEF$.
    (c)   AB and EF
    (d)   area AECD : area ΔEAB

QUESTION 5.

(i) The mean of the following distribution is 48 and sum of all the frequency is 50. Find the missing frequencies x and y. [3]

Class	20-30	30-40	40-50	50-60	60-70
Frequency	8	6	x	11	y

(ii) Prakash bought the following articles from a departmental store: [3]

S. No.	Item	Price	Rate of GST	Discount
(a)	Article A	₹4000	18%	5%
(b)	Article B	₹2400	5%	5%

Find the:
(a) Total GST paid.
(b) Total bill amount including GST.

(iii) From a point T outside a circle of centre O, tangents TP and TQ are drawn to the circle. Prove that OT is the right bisector of line segment PQ. [4]

QUESTION 6.

(i) Find the geometric progression whose 4th term is 54 and the 7th term is 1458. [3]

(ii) Find the middle term of the sequence formed all numbers between 9 and 95, which leave a remainder 1 when divided by 3. Also find the sum of the numbers on both sides of the middle term separately. [3]

(iii)   Use a graph paper for this question, the daily pocket expenses of 200 students in a school are given below :   [4]

Pocket expenses (in Rs.)	Number of students
0-5	10
5-10	14
10-15	28
15-20	42
20-25	50
25-30	30
30-35	14
35-40	12

Draw a histogram representing the above distribution and estimate the mode from the graph.

QUESTION 7.

(i) $A(7, -5)$, $B(5,3)$ and $C(-9,1)$ form a triangle. Find the   [5]
       (a)   slope of BC.
       (b)   equation of altitude through A.
       (c)   equation of median through B

(ii)   An observer notes that the angle of elevation from point A to the top of a space shuttle is $45°$. From a point 20 meters further from the space shuttle, the angle of elevation is $30°$.
       (a)   Find the height of the space shuttle.   [5]
       (b)   Find the distance of point A from space shuttle.
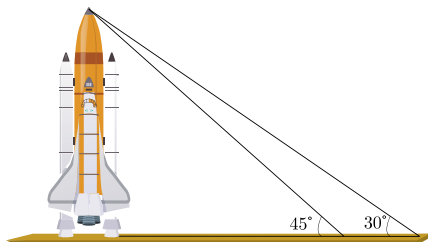
QUESTION 8.

(i)   Solve the following equation, write down the solution set and represent it on the real number line.   [3]
       $-2 + 10x \le 13x + 10 < 24 + 10x$, $x \in Z$

(ii)   In the given figure, AB is parallel to DC, $\angle BCE = 80°$ and $\angle BAC = 25°$. Find   [3]
    (a) $\angle CAD$.

    (b) $\angle CBD$.

   (c) $\angle ADC$.
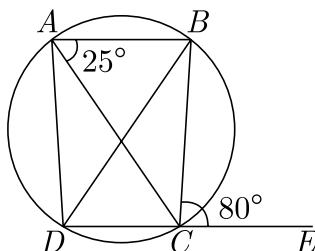
(iii)   Three consecutive vertices's of a parallelogram ABCD are A (10,–6), B (2,–6) and (–4, –2), find the fourth vertex D.   [4]

QUESTION 9.

(i)   If $x = \frac{\sqrt{2a+1}+\sqrt{2a-1}}{\sqrt{2a+1}-\sqrt{2a-1}}$, prove that $x^2 - 4ax + 1 = 0$.   [3]

(ii)   The numerator of a fraction is 3 less than its denominator. If 2 is added to both the numerator and the denominator, then the sum of the new fraction and original fraction is $\frac{29}{20}$. Find the original fraction.   [3]

(iii)   Use ruler and compass only for the following question. All construction lines and arcs must be clearly shown.   [4]

    (a)   Construct a $\triangle ABC$ in which $BC = 6.5$ cm, $\angle ABC = 60°$, $AB = 5$ cm.

    (b)   Construct the locus of points at a distance of 3.5 cm from A.

    (c)   Construct the locus of points equidistant from AC and BC.

    (d)   Mark 2 points X and Y which are at a distance of 3.5 cm from A and also equidistant from AC and BC. Measure XY.

QUESTION 10.

(i)   Using the remainder theorem find the remainders obtained when $x^3 + (kx + 8)x + k$ is divided by $x+1$ and $x-2$. Hence find k, if the sum of the two remainders is 1.   [3]

(ii) Deepika can hit the rectangular target shown 100% of the time at a range of 80 m. Assuming the probability the target is hit is related to its area, answer the following. [3]

(a)   What is the probability the Deepika hits within the triangle ?

(b)   What is the probability the Deepika hits within the circle ?

(c)   What is the probability the Deepika hits within the circle but outside the triangle ?

(d)   What is the probability the Deepika hits within the rectangle but outside the circle ?
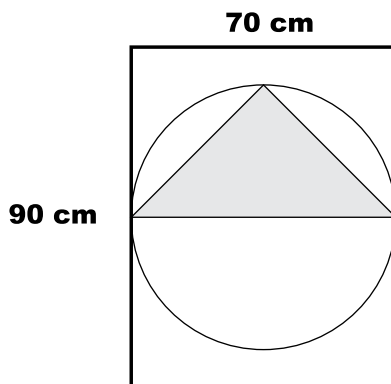
(iii) Use graph paper for this question. (Take 2 cm $= 1$ unit along both X and Y-axis) $ABCD$ is a quadrilateral whose vertices are $A(2,2)$, $B(2,-2)$, $C(0,-1)$ and $D(0,1)$.   [4]

(a)   Reflect quadrilateral $ABCD$ on the y-axis and name it as $A'B'CD$.

(b)   Write down the coordinates of A' and B'.

(c)   Name two points which are invariant under the above reflection.

(d)   Name the polygon $A'B'CD$.

****