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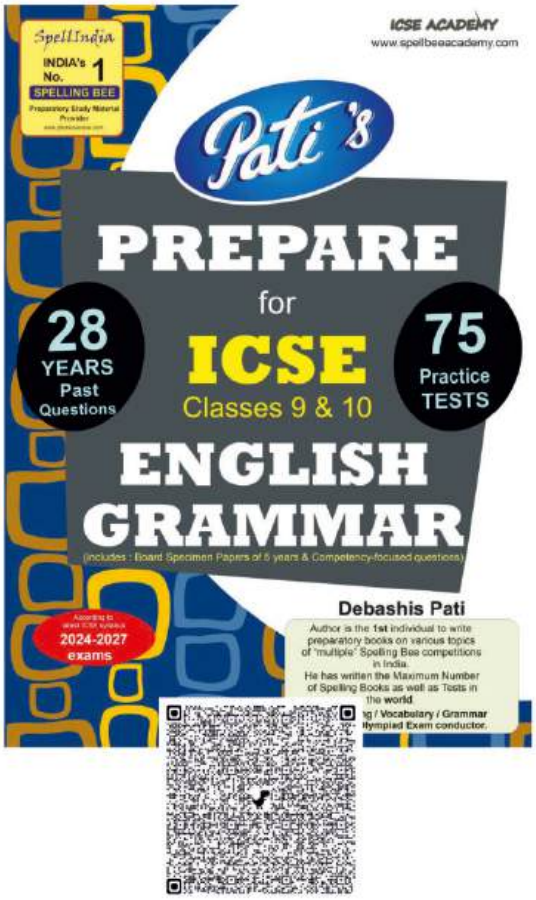

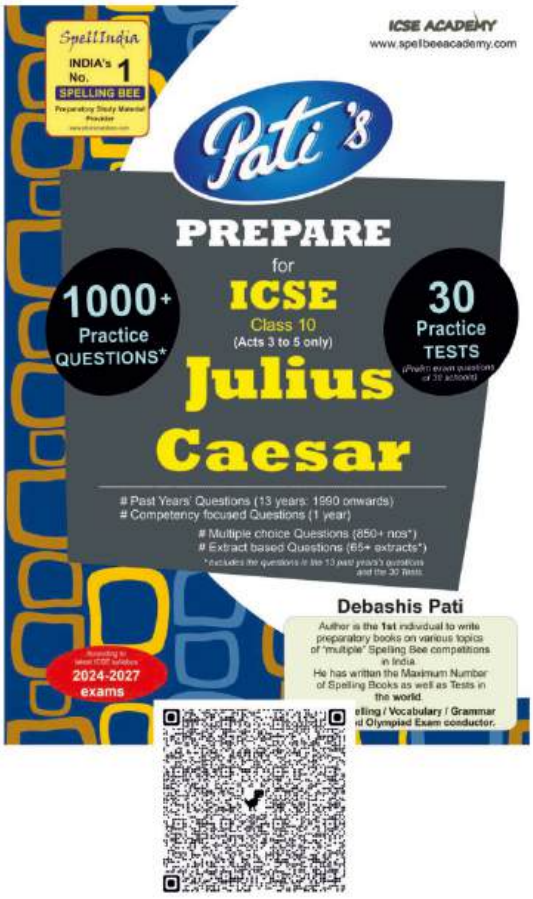

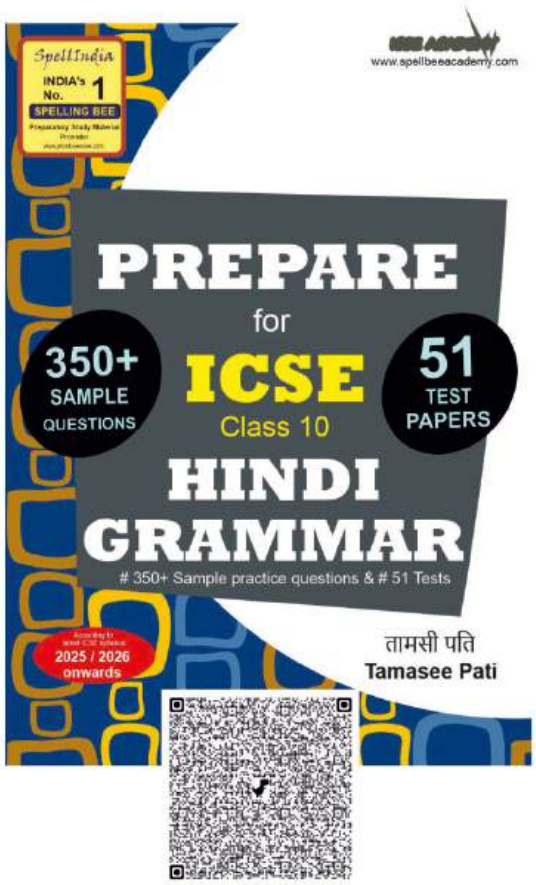

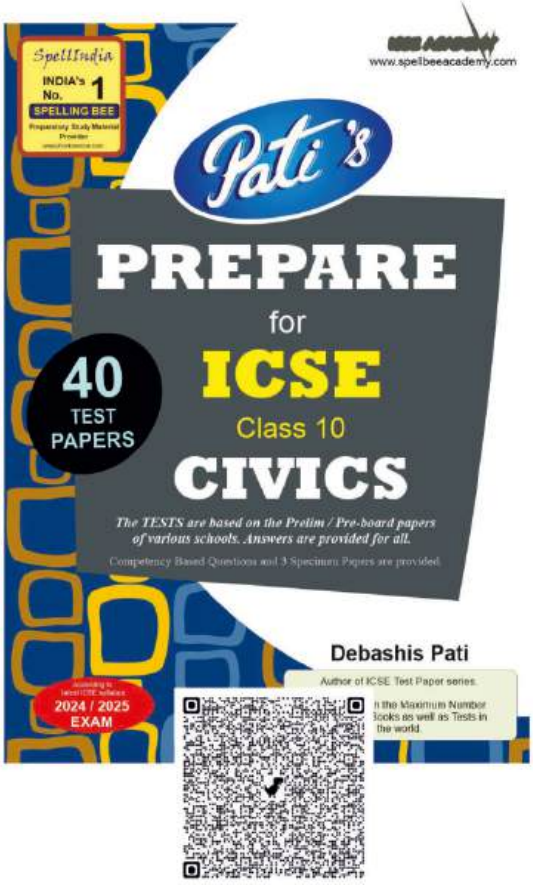

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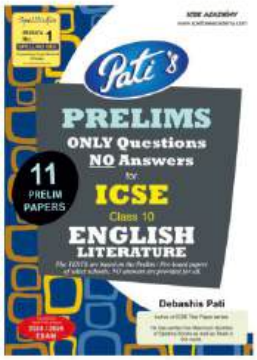

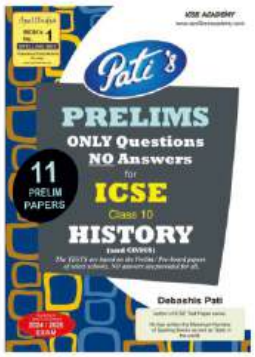

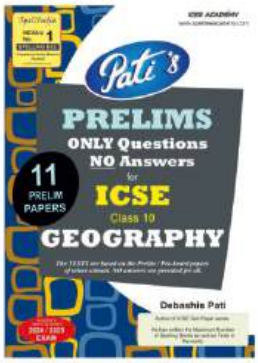

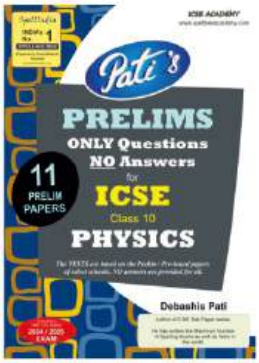

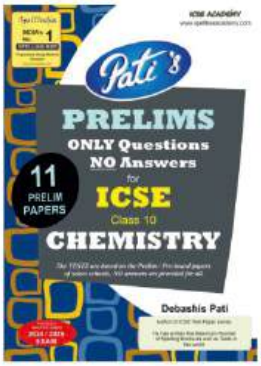

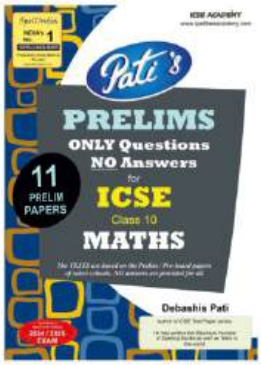

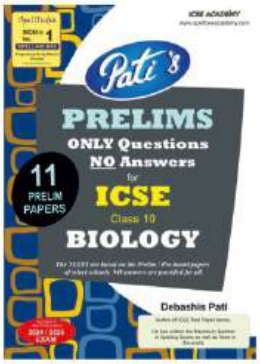

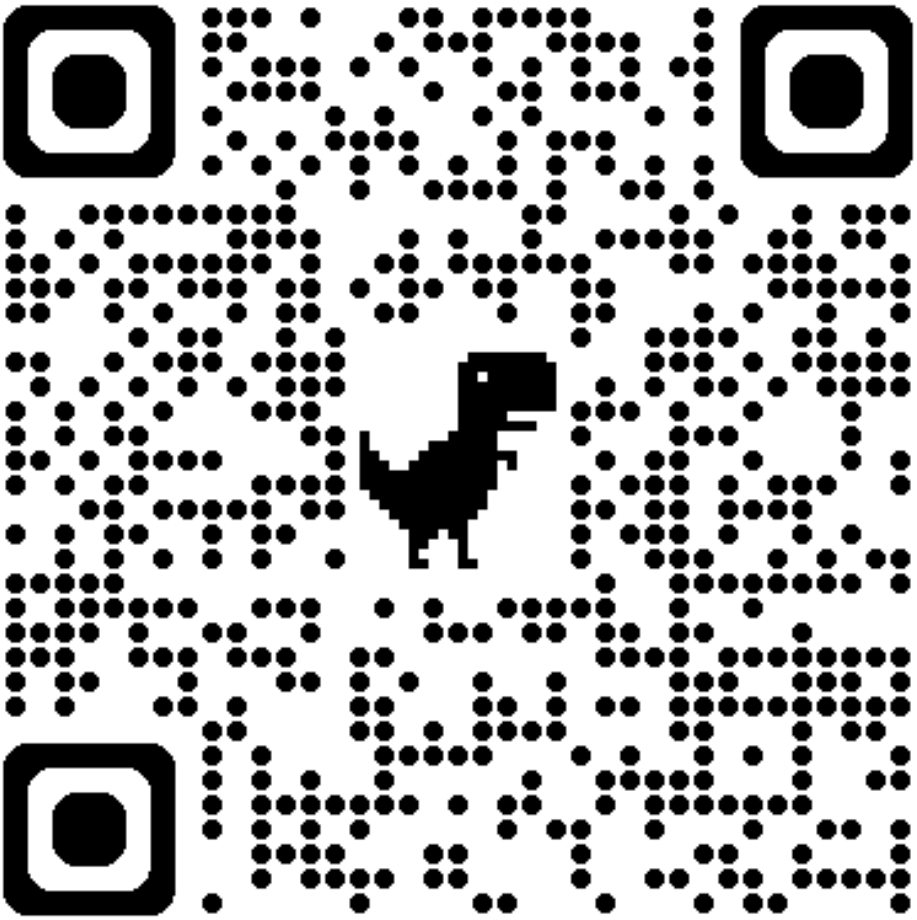

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Specimen Papers

ICSE 2026 EXAMINATION

SPECIMEN QUESTION PAPER

MATHEMATICS

Maximum Marks: 80

Time allowed: Three hours

1. *Answers 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**.*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

SECTION A (40 Marks)

*(Attempt **all** questions from this Section.)*

Question 1

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

(Do not copy the question, write the correct answers only.)

(i) $(x-2)$ and $(x+2)$ are the factors of x^3+x^2-4x-4. The third factor of the given polynomial is:

(a) $(x-1)$

(b) $(x-4)$

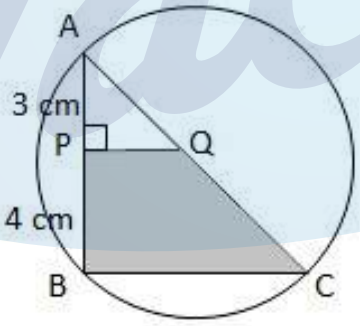
(c) $(x+1)$

(d) $(x+4)$ **[Analyze]**

(iii) In the figure given below, AC is a diameter of the circle.

AP = 3 cm and PB = 4 cm and QP ⊥ AB.

If the area of ΔAPQ is18 cm^2, then the area of shaded portion QPBC is:



(a) 32 cm^2

(b) 49 cm^2

(c) 80 cm^2 **[Understanding & Analysis]**

(d) 98 cm^2

(ii) Radha deposited ₹400 per month in a recurring deposit account for 18 months.

The qualifying sum of money for the calculation of interest is:

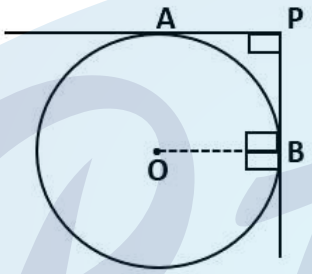
(a) ₹ 3,600

(b) ₹ 7,200

(c) ₹ 68,400

(d) ₹ 1,36,800 **[Application]**

(iv) In the given diagram, the radius of the circle with centre O is 3 cm. PA and PB are the tangents to the circle which are at right angle to each other. The length of OP is:



(a) $\frac{3}{\sqrt{2}} cm$

(b) $3\ cm$

(c) $3\sqrt{2}\ cm$

(d) $6\sqrt{2}\ cm$ **[Analysis & Evaluation]**

(v) **Assertion (A):** If $sec\theta + tan\theta = a\ and\ sec\theta - tan\theta = b$ then ab =1

Reason (R): $sec^2\theta - tan^2\theta = 1$

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true and (R) is the correct explanation of (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation of (A). **[Analysis & Evaluation]**

(vi) A solid sphere is cut into two identical hemispheres.

Assertion (A): The total volume of two hemispheres is equal to the volume of the original sphere.

Reason (R): The total surface area of two hemispheres together is equal to the surface area of the original sphere.

(a) (A) is true, (R) is false.

(b) (A) is false, (R) is true. **[Analysis]**

(c) Both (A) and (R) are true and (R) is the correct explanation of (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(vii) Given that the sum of the squares of the first seven natural numbers is 140, then their mean is:

(a) 20

(b) 70

(c) 280 **[Understanding & Evaluation]**

(d) 980

(viii) A bag contains 3 red and 2 blue marbles. A marble is drawn at random. The probability of drawing a black marble is:

(a) 0

(b) $\frac{1}{5}$

(c) $\frac{2}{5}$

(d) $\frac{3}{5}$ **[Application]**

(ix) If matrix A=$[-1 \quad 2]$ and matrix B=$\begin{bmatrix}3\\4\end{bmatrix}$, then matrix AB is equal to:

(a) $[-3]$

(b) $[8]$

(c) $[5]$

(d) $\begin{bmatrix}-1 & 2\\3 & 4\end{bmatrix}$ **[Analysis]**

(x) A mixture of paint is prepared by mixing 2 parts of red pigments with 5 parts of the base. Using the given information in the following table, find the values of a, b & c to get the required mixture of paint.

Parts of red pigment	2	4	**b**	6
Parts of base	5	**a**	12.5	**c**

(a) a = 10, b = 10, c = 10

(b) a = 5, b = 2, c = 5

(c) a = 10, b = 5, c = 10

(d) a = 10, b = 5, c = 15

[Application & Evaluation]

(xi) An article which is marked at ₹ 1,200 is available at a discount of 20% and the rate of GST is 18%. The amount of SGST is:

(a) ₹ 216.00

(b) ₹ 172.80

(c) ₹ 108.00

(d) ₹ 86.40

[Analysis & Evaluation]

(xii) The sum of money required to buy 50, ₹ 40 shares at ₹ 38.50 is:

(a) ₹ 1,920

(b) ₹ 1,924

(c) ₹ 1,925

(d) ₹ 1,952

[Application]

(xiii) The roots of quadratic equation $x^2 - 1 = 0$ are:

(a) 0, 0

(b) 1, 1

(c) -1, -1

(d) +1, -1

[Analysis & Evaluation]

(xiv) Which of the following equations represents a line equally inclined to the axes?

(a) $2x - 3y + 7 = 0$

(b) $x - y = 7$

(c) $x = 7$

(d) $y = -7$

[Analysis & Evaluation]

(xv) Given, $x + 2 \leq \frac{x}{3} + 3$ and x is a prime number. The solution set for x is:

(a) $\emptyset$

(b) $\{0\}$

(c) $\{1\}$

(d) $\{0, 1\}$

[Understanding & Analysis]

Question 2

(i) While factorizing a given polynomial, using remainder & factor theorem, a student finds that $(2x + 1)$ is a factor of $2x^3 + 7x^2 + 2x - 3$. [4]

(a) Is the student's solution correct stating that $(2x + 1)$ is a factor of the given polynomial?

(b) Give a valid reason for your answer.

Also, factorize the given polynomial completely.

[Analysis & Application]

(ii) P is a point on the x- axis which divides the line joining A (- 6, 2) and B (9, - 4). Find: [4]

(a) the ratio in which P divides the line segment AB.

(b) the coordinates of the point P.

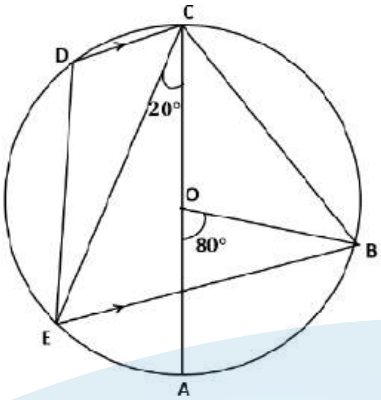
(c) equation of a line parallel to AB and passing through (-3, -2).

[Analysis & Evaluation]

(iii) In the given figure, AC is the diameter of the circle with centre O. [4]

CD is parallel to BE.

$\angle AOB = 80^0$ and $\angle ACE = 20^0$.



[Analysis & Evaluation]

Calculate:

(a) $\angle$ BEC

(b) $\angle$ BCD

(c) $\angle$CED

Question 3

(i) -11, -7, -3, ……,49, 53 are the terms of a progression. [4]

Answer the following:

(a) What is the type of progression?

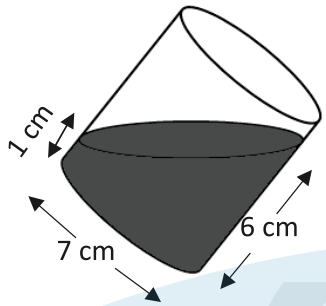
(b) How many terms are there in all?

(c) Calculate the value of middle most term.

[Analysis & Evaluation]

(ii) In the diagram given below, a tilted right circular cylindrical vessel with base diameter 7 cm contains a liquid. When placed vertically, the height of the liquid in the vessel is the mean of two heights shown in the diagram. Find the area of wet surface, when the cylinder is placed vertically on a horizontal surface. [4]

(Use $\pi = \frac{22}{7}$).



[Application & Evaluation]

(iii) Use a ruler and compass to answer this question. [5]

(a) Construct a circle of radius 4.5cm and draw a chord AB of length 6.5 cm.

(b) At A, construct ∠CAB=75°, where C lies on the circumference of the circle.

(c) Construct the locus of all points equidistant from A and B.

(d) Construct the locus of all points equidistant from CA and BA.

(e) Mark the point of intersection of the two loci as P. Measure and write down the length of CP.

[Analysis & Understanding]

SECTION B (40 Marks)

*(Attempt **any four** questions from this Section.)*

Question 4

(i) Ms. Kaur invested ₹ 8,000 in buying ₹100 shares of a company paying 6% dividend at ₹ 80. After a year, she sold these shares at ₹75 each and invested the proceeds including the dividend received during the first year in buying ₹ 20 shares, paying 15% dividend at ₹ 27 each. Find the: [3]

(a) dividend received by her during the first year.

(b) number of shares purchased by her using the total proceeds.

Application & Evaluation]

(ii) Solve the following inequation, write the solution set, and represent it on the real number line. [3]

$5x - 21 < \frac{5x}{7} - 6 \leq -3\frac{3}{7} + x, x \in R.$

[Evaluation]

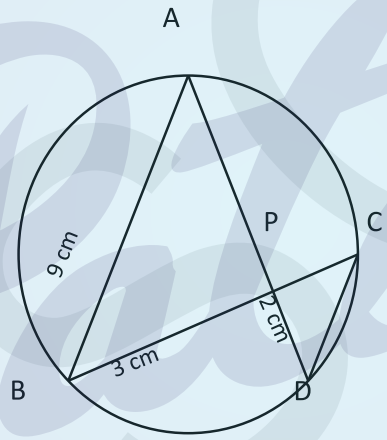
(iii) Prove the following trigonometry identity: [4]

$(\sin\theta + \cos\theta)(\operatorname{cosec}\theta - \sec\theta) = \operatorname{cosec}\theta.\sec\theta - 2\tan\theta$

[Application & Analysis]

Question 5

(i) In the given figure (not drawn to scale) chords AD and BC intersect at P, where AB = 9 cm, PB = 3 cm and PD = 2 cm. [3]



(a) Prove that ΔAPB ~ ΔCPD.

(b) Find the length of CD.

(c) Find area ΔAPB : area ΔCPD.

[Application & Evaluation]

(ii) Mr. Sam has a recurring deposit account and deposits ₹ 600 per month for 2 years. If he gets ₹ 15,600 at the time of maturity, find the rate of interest earned by him. [3]

[Application & Evaluation]

(iii) Using step-deviation method, find mean for the following frequency distribution: [4]

Class	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90
Frequency	3	4	7	6	8	2

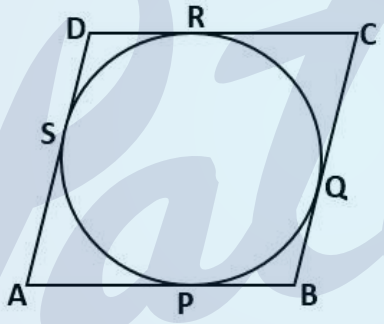
[Application & Evaluation]

Question 6

(i) Find the coordinates of the centroid P of the ΔABC, whose vertices are A(–1, 3), B(3, –1) and C(0, 0). Hence, find the equation of a line passing through P and parallel to AB. [3]

[Analysis & Evaluation]

(ii) In the given figure, the parallelogram ABCD circumscribe a circle, touching circle at P, Q, R and S. [3]



(a) Prove that: AB = BC

[Analysis & Application]

(b) What special name can be given to the parallelogram ABCD?

(iii) The following bill shows the GST rate and the marked price of articles: [4]

Rajdhani Departmental Store				
S. No.	Item	Marked Price	Discount	Rate of GST
(a)	Dry fruits (1 kg)	₹ 1200	₹100	12%
(b)	Packed Wheat flour (5kg)	₹ 286	Nil	5%
(c)	Bakery products	₹ 500	10%	12%

[Application & Evaluation]

Find the total amount to be paid (including GST) for the above bill.

Question 7

(i) Draw the necessary diagram for this question. [5]

A man on the top of a lighthouse observes the angle of depression of two ships on the opposite sides of the lighthouse as 30° and 50° respectively. If the height of the lighthouse is 80m, find the distance between the two ships. Give your answer correct to the nearest meter.

(Use Mathematical Tables for this Question)

[Understanding, Application & Evaluation]

(ii) The marks of 200 students in a test were recorded as follows: [5]

Marks %	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
No. of students	5	7	11	20	40	52	36	15	9	5

Using a graph sheet draw ogive for the given data and use it to find the:

(a) median.

(b) number of students who obtained more than 65% marks.

(c) number of students who did not pass, if the pass percentage was 35.

[Application, Analysis & Evaluation]

Question 8

(i) A box containing cards numbered between 0 and 100 are shuffled and a card is picked at random. Find the probability of getting a card which is: [3]

(a) divisible by 6.

(b) not divisible by 6.

[Application & Evaluation]

(ii) If x, y and z are in continued proportion, prove that: [3]

$$\frac{x}{y^2.z^2}+\frac{y}{z^2.x^2}+\frac{z}{x^2.y^2}=\frac{1}{x^3}+\frac{1}{y^3}+\frac{1}{z^3}$$

[Application & Analysis]

(iii) A manufacturing company prepares spherical ball bearings, each of radius 7 mm and mass 4 gm. These ball bearings are packed into boxes. Each box can have a maximum of 2156 cm^3 of ball bearings. Find the: [4]

(a) maximum number of ball bearings that each box can have.

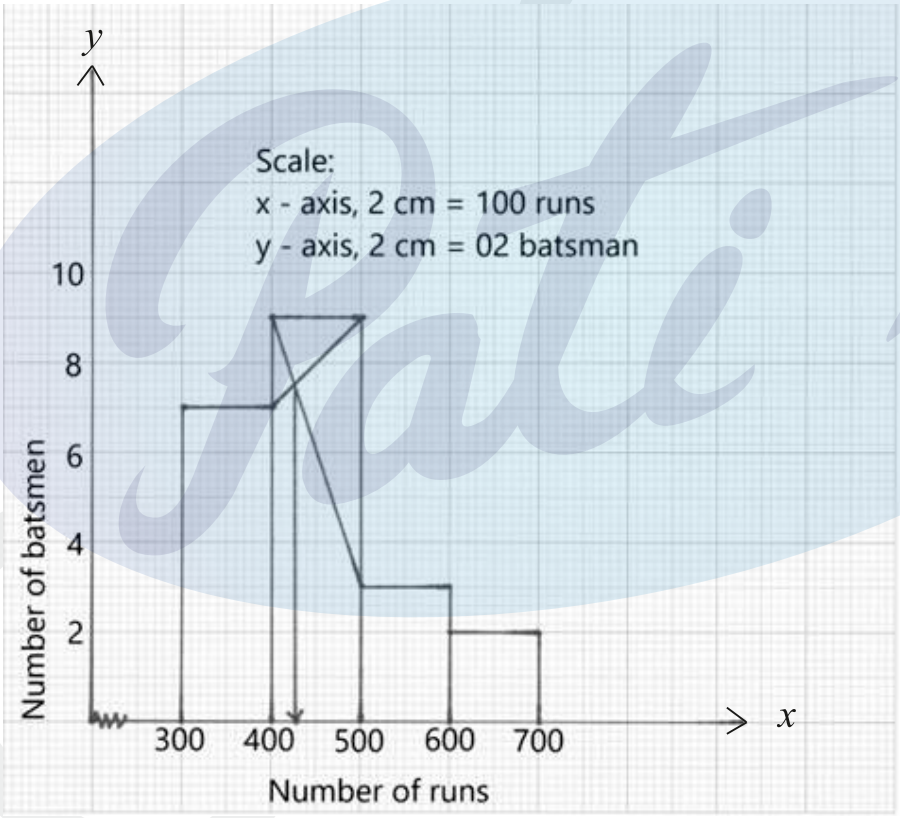
(b) mass of each box of ball bearings in kg.

(Use $\pi = \frac{22}{7}$)

[Analysis, Application & Evaluation]

Question 9

(i) Study the graph given below and answer the following: [3]



(a) Number of batsmen who scored 500 to 700 runs

(b) Modal class interval

(c) The value of mode

[Analysis & Evaluation]

(ii) An Arithmetic Progression (A.P.) has 3 as its first term. The sum of the first 8 terms is twice the sum of the first 5 terms. Find the common difference of the A.P. [3] **[Analysis, Application & Evaluation]**

(iii) The roots of equation $(q - r)\,x^2 + (r - p)\,x + (p - q) = 0$ are equal.

Prove that: $2q = p + r$, that is, p, q & r are in A.P. [4] **[Application & Analysis]**

Question 10

(i) The sum of the squares of three consecutive even numbers is 596. Find the numbers. [3] **[Analysis, Application & Evaluation]**

(ii) Given matrix, $X = \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$ *and* $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, prove that $X^2 = 4X + 5I$. [3] **[Application & Evaluation]**

(iii) Use a graph sheet for this question. Take 1 cm = 1 unit along both the x and y axis. Plot ABCDE, where A (4, 0), B (4, 2), C (2, 2), D (2,4) and E (0,4). [4]

(a) Reflect the points A, B, C and D on the y-axis and name them as F, G, H and I respectively.

(b) Join the points A, B, C, D, E, I, H, G and F in order. Reflect the figure ABCDEIHGF on the x-axis and name it as AMNPQRSTF.

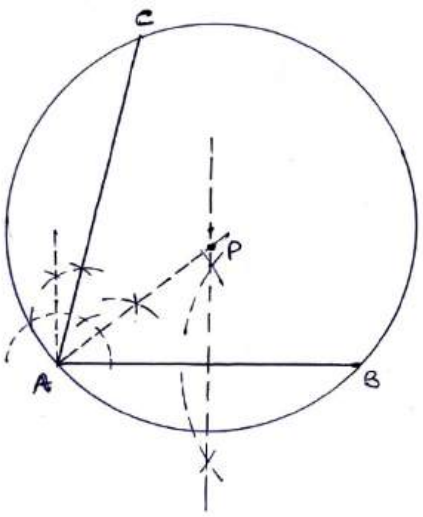
(c) Give the geometrical name of the closed figure AEFQ. **[Understanding]**

ICSE 2026 SPECIMEN

DRAFT MARKING SCHEME – MATHEMATICS

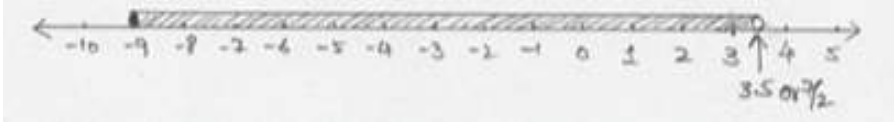
Question 1		
(i)	(c) (x+1)	.[15]
(ii)	(c) ₹ 68,400	
(iii)	(c) 80 cm^2	
(iv)	(c) $3\sqrt{2}$	
(v)	(c) Both (A) and (R) is true and (R) is the correct reason for (A).	
(vi)	(a) (A) is true, (R) is false.	
(vii)	(a) 20	
(viii)	(a) 0	
(ix)	(c) [5]	
(x)	(d) a = 10, b = 5, c = 15	
(xi)	(d) ₹ 86.40	
(xii)	(c) ₹1925	
(xiii)	(d) +1, -1	
(xiv)	(b) $x - y = 7$	
(xv)	(a) ∅	
Question 2		
(i)	$f(x) = \mathbf{2x^3 + 7x^2 + 2x - 3}$ $f\left(-\frac{1}{2}\right) = 2\left(-\frac{1}{2}\right)^3 + 7\left(-\frac{1}{2}\right)^2 + 2\left(-\frac{1}{2}\right) - 3 \neq 0$ $\therefore (2x+1)\ is\ not\ a\ factor\ of\ f(x).$ $f\left(\frac{1}{2}\right) = 2\left(\frac{1}{2}\right)^3 + 7\left(\frac{1}{2}\right)^2 + 2\left(\frac{1}{2}\right) - 3 = 0$ $\therefore (2x-1)\ is\ a\ factor\ of\ f(x)$	[4]

	$$\begin{array}{r} x^2+4x+3 \\ 2x-1\overline{)\,2x^3+7x^2+2x-3} \\ \underline{2x^3-x^2} \\ 8x^2+2x \\ \underline{8x^2-4x} \\ 6x-3 \\ \underline{6x-3} \\ \times\times \end{array}$$ $$f(x)=(2x-1)(x^2+4x+3)$$ $$f(x)=(2x-1)(x+3)(x+1)$$	
(ii)	(a) $y=0$ $\frac{-4m+2n}{m+n}=0,\ 4m=2n\rightarrow m:n=1:2$ (b) $x=\frac{9\times1+2\times(-6)}{3}=-1$ $P(-1,0)$ (c) $m_{AB}=\frac{-4-2}{9+6}=\frac{-6}{15}=-\frac{2}{5}$ $y+2=-\frac{2}{5}(x+3)\rightarrow 2x+5y=-16$	[4]
(iii)	(a) $\angle BOC=180°-80°=100°\rightarrow\angle BEC=\frac{1}{2}\times100°=50°$ ($\angle$ *at centre is twice the* $\angle$ *in remaining segment*) (b) $\angle BCD=\angle BCA+\angle ACE+\angle ECD=40°+20°+50°=110°$ (c) $\angle CED=180°-110°-50°=20°$	[4]
Question 3		
(i)	(a) *A.P.* (b) $l=53, a+(n-1)d=53$ $-11+(n-1)4=53\rightarrow n=17$ (c) Middle term $=\left(\frac{17+1}{2}\right)^{th}$ *term* $=9^{th}$*term* $T_9=a+8d=-11+8\times4=21$	[4]
(ii)	$h=\frac{1}{2}(1+6),$ *given* $\rightarrow h=\frac{7}{2}$ *Area of wet surface* $=\pi r^2+2\pi rh\rightarrow\pi r(r+2h)$ $=\frac{22}{7}\times\frac{7}{2}\left(\frac{7}{2}+2\times\frac{7}{2}\right)=115.5\ cm^2$	[4]

(iii)	 (a) $Length\ of\ CP = 4.9\ cm.$	[5]

SECTION – B

Question 4

(i)	(a) $No.of\ shares = \frac{8000}{80} = 100$ $Annual\ Dividend = \frac{6 \times 100 \times 100}{100} = ₹600$ (b) $Sale\ proceeds = ₹75 \times 100 = ₹7500$ $and\ Total\ proceeds = ₹8100$ $No.of\ shares = \frac{8100}{27} = 300$	[3]
(ii)	$5x - 21 < \frac{5x}{7} - 6 \leq -3\frac{3}{7} + x, x \in R$ $5x - 21 < \frac{5x}{7} - 6$ $5x - \frac{5x}{7} < -6 + 21$ $\frac{35x - 5x}{7} < 15$ $30x < 105$ $x < 3.5$ $\frac{5x}{7} - 6 \leq -3\frac{3}{7} + x$ $\frac{5x}{7} - x \leq -\frac{24}{7} + 6$ $\frac{5x - 7x}{7} \leq \frac{-24 + 42}{7}$ $-2x \leq 18$ $x \geq -9$ $\left\{x: -9 \leq x < \frac{7}{2}, x \in R\right\}$ 	[3]

(iii) [4]

$$LHS = (\sin\theta + \cos\theta)(\operatorname{cosec}\theta - \sec\theta)$$

$$= (\sin\theta + \cos\theta)\left(\frac{1}{\sin\theta} - \frac{1}{\cos\theta}\right) = (\sin\theta + \cos\theta)\left(\frac{\cos\theta - \sin\theta}{\sin\theta.\cos\theta}\right)$$

$$= \frac{\cos^2\theta - \sin^2\theta}{\sin\theta.\cos\theta} = \frac{1 - 2\sin^2\theta}{\sin\theta.\cos\theta} = \frac{1}{\sin\theta.\cos\theta} - \frac{2\sin^2\theta}{\sin\theta.\cos\theta}$$

$$= \operatorname{cosec}\theta.\sec\theta - 2\tan\theta = RHS$$

Question 5

(i) [3]

(a) $In\ \Delta APB\ and\ \Delta CPD, \angle BAP = \angle DCP\ \ (\angle s\ on\ same\ segment)$

$\angle ABP = \angle CDP\ \ (\angle s\ on\ same\ segment)$

$\therefore \Delta APB \sim \Delta CPD\ \ (AA\ axiom)$

(b) $\frac{AB}{CD} = \frac{3}{2}\ \therefore CD = 6cm$

(c) $\frac{area\ (\Delta APB)}{area\ \Delta CPD} = \frac{BP^2}{DP^2} = \frac{9}{4} \rightarrow 9:4$

(ii) [3]

$$Interest = \frac{600 \times 24 \times 25}{2} \times \frac{r}{100} \times \frac{1}{12} = 150\,r$$

$$Maturity\ Value = ₹15600$$

$$600 \times 24 + 150r = ₹15600$$

$$150r = ₹15600 - ₹14400 \rightarrow r = \frac{1200}{150} = 8\%$$

(iii) [4]

Class	x	$u = d/i$	f	fu
0 – 15	7.5	-3	3	-9
15 – 30	22.5	-2	4	- 8
30 – 45	37.5	-1	7	-7
45 – 60	52.5	0	6	0
60 – 75	67.5	1	8	8
75 – 90	82.5	2	2	4
			30	-12

$$Mean = A + \frac{\sum fu}{\sum f} \times i = 52.5 + \frac{-12}{30} \times 15 = 52.5 - 6 = 46.50$$

Question 6

(i) [3]

(a) $P\left(\frac{-1+3+0}{3}, \frac{3+(-1)+0}{3}\right) = P\left(\frac{2}{3}, \frac{2}{3}\right)$

(b) $m_{AB} = \frac{-1-(3)}{3-(-1)} = \frac{-4}{4} = -1 \qquad m_{CD} = -1$

$$Required\ equation, y - \frac{2}{3} = -1\left(x - \frac{2}{3}\right) \rightarrow 3x + 3y = 4$$

(ii) [3]

(a) $AP = AS, BP = BQ, DR = DS$ and $CR = CQ$

(tangents drawn to a circle from an external pt. equal)

$Adding, (AP + BP) + (DR + CR) = (AS + DS) + (BQ + CQ)$

$AB + DC = AD + BC \rightarrow 2\,AB = 2\,BC \therefore AB = BC$

(b) Rhombus

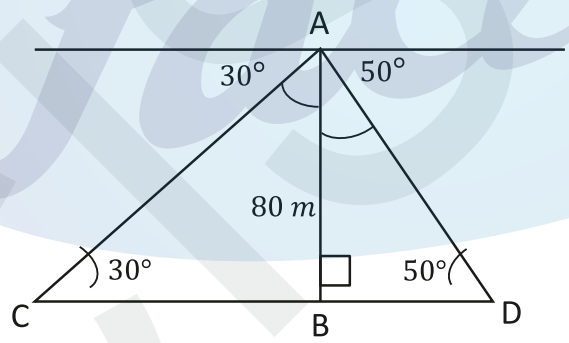
(iii) [4]

Rajdhani Departmental Store

S. No.	*Item*	*Marked Price*	*Discounted Price*	*GST*	*Tax*
1.	*Dry Fruits (1kg)*	₹ 1200	₹ 1100	12%	$\frac{12 \times 1100}{100} = 132$
2.	*Wheat Flour*	₹ 286	₹ 286	5%	$\frac{5 \times 286}{100} = 14.30$
3.	*Bakery Products*	₹ 500	₹ 450	12%	$\frac{12 \times 450}{100} = 54$
Total			₹1836		₹ 200.30
Grand total		₹ 2036.30			

Question 7

(i) [5]



$In\ \Delta ABC, \quad \frac{AB}{BC} = \tan 30°$

$\frac{80}{BC} = \frac{1}{\sqrt{3}} \rightarrow BC = 80\sqrt{3} = 80 \times 1.7321\ m$

$In\ \Delta ABD, \quad \frac{AB}{BD} = \tan 50°\ or\ \frac{BD}{AB} = tan40°$

$\frac{BD}{80} = 0.8391 \rightarrow BD = 80 \times 0.8391\ m$

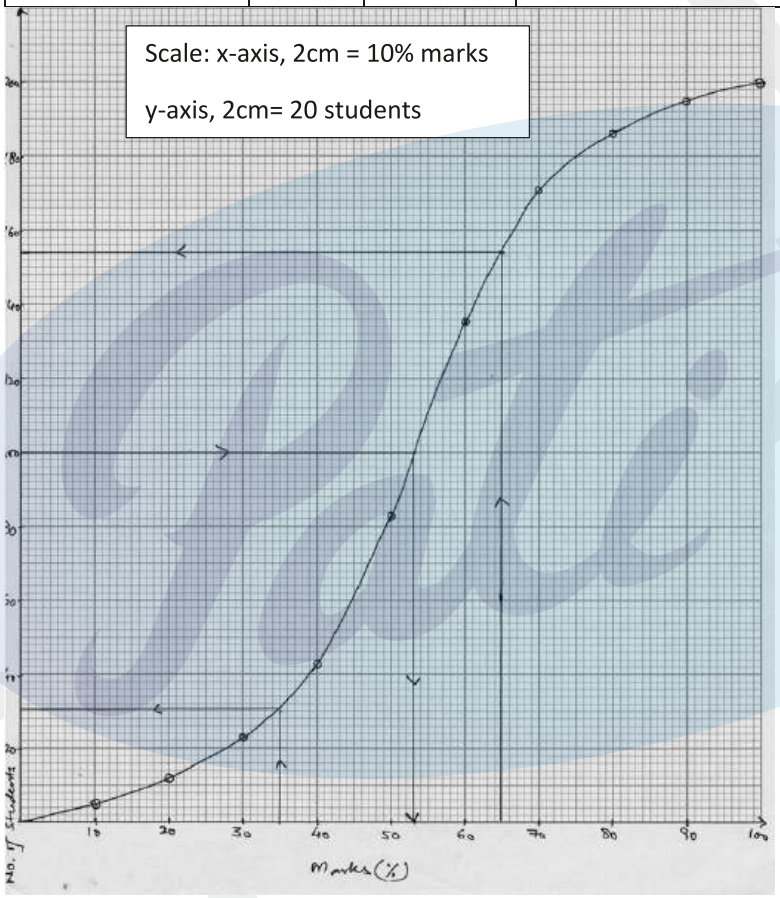
$CD = 80 \times 1.732\ m + 80 \times 0.839\ m = 80(1.7321 + 0.8391)\ m$

$80(2.5712) = 205.696\ m = 206\ m$

(ii)

Marks (%)	f	cf
0 – 10	5	5
10 – 20	7	12
20 – 30	11	23
30 – 40	20	43
40 – 50	40	83
50 – 60	52	135
60 – 70	36	171
70 – 80	15	186
80 – 90	09	195
90 – 100	05	200

(a) $Median = 53 \pm 1$
(b) $More\ than\ 65\% = 46 \pm 2$
(c) $Didn't\ pass = 31 \pm 2$



[5]

Question 8

(i) (a) {6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96}

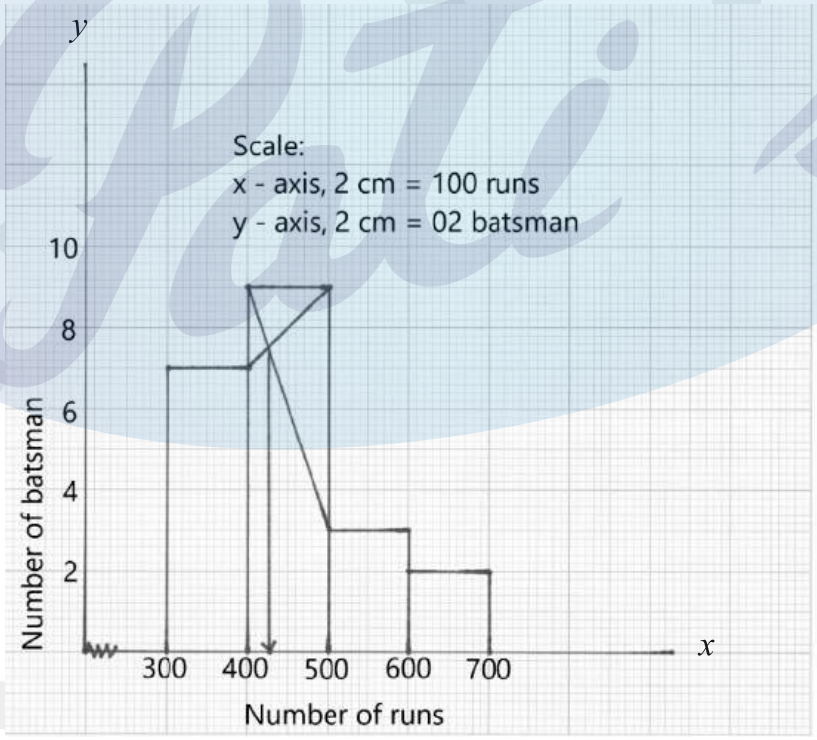
$$P(divisible\ by\ 6) = \frac{16}{99}$$

(b) $P(not\ divisible\ by\ 6) = 1 - \frac{16}{99} = \frac{83}{99}$

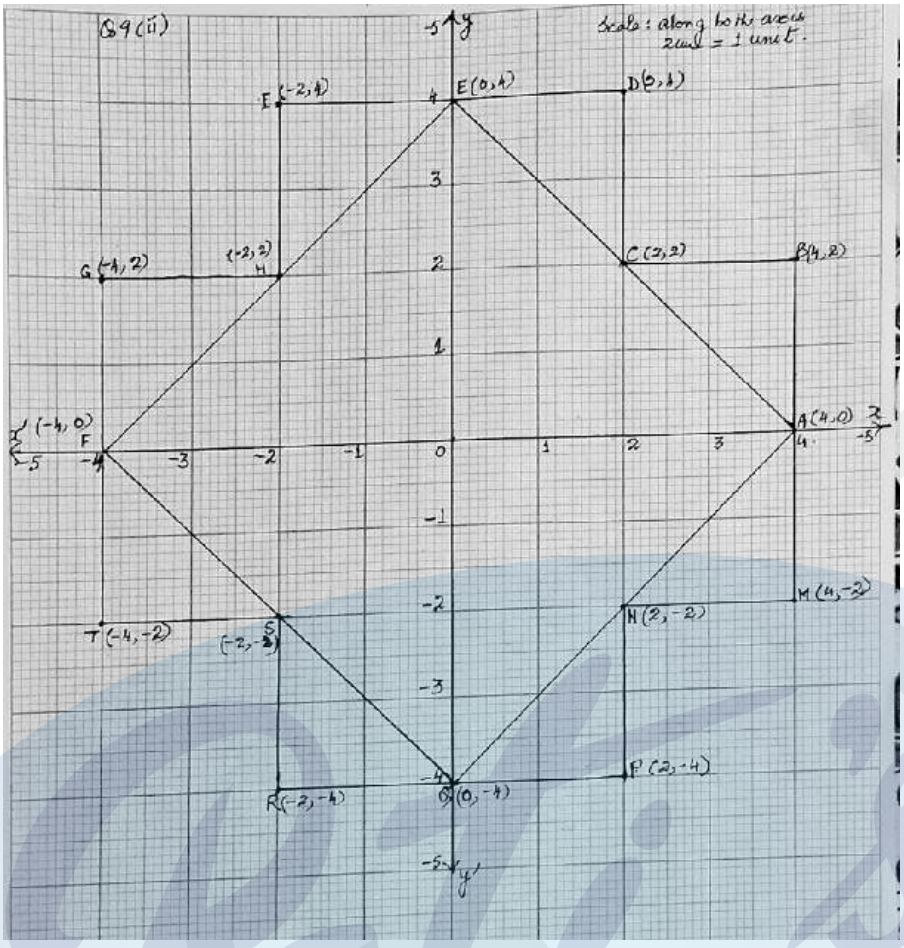
[3]

(ii) $$\frac{x}{y} = \frac{y}{z} \rightarrow y^2 = xz$$

[3]

	$$LHS = \frac{x}{y^2.z^2} + \frac{y}{z^2.x^2} + \frac{z}{x^2.y^2} = \frac{x^3+y^3+z^3}{x^2.y^2z^2}$$ $$\frac{x^3+y^3+z^3}{x^3z^3} = \frac{x^3}{x^3z^3} + \frac{y^3}{x^3z^3} + \frac{z^3}{x^3z^3}$$ $$= \frac{1}{z^3} + \frac{y^3}{y^6} + \frac{1}{x^3} = \frac{1}{z^3} + \frac{1}{y^3} + \frac{1}{x^3} = RHS$$	
(iii)	$(a)\quad No.of\ ball\ bearings = \frac{2156}{\frac{4}{3}\times\pi\times r^3} = \frac{2156}{\frac{4}{3}\times\frac{22}{7}\times\left(\frac{7}{10}\right)^3}$ $= \frac{2156\times3\times7\times10\times10\times10}{4\times22\times7\times7\times7} = 1500$ (b) $Mass\ of\ each\ box = 4\ gm \times 1500 = 6\ kg$	[4]
Question 9		
(i)	(a) 5 (b) 400 – 500 (c) Mode = 430 runs 	[3]
(ii)	$a = 3, \quad S_8 = 2\,S_5 \rightarrow \frac{8}{2}[2\times3+(8-1)d] = 2\left\{\frac{5}{2}[2\times3+(5-1)d]\right\}$ $4[6+7d] = 5[6+4d] \rightarrow 24+28d = 30+20d \rightarrow d = \frac{3}{4}$	[3]

(iii)	$a = q - r, b = r - p \text{ and } c = p - q$ $\text{for equal roots}, b^2 = 4ac \rightarrow (r-p)^2 = 4(q-r)(p-q)$ $r^2 + p^2 - 2pr = 4[pq - q^2 - pr + qr)$ $r^2 + p^2 - 2pr + 4pr = 4[pq - q^2 + qr]$ $(p+r)^2 = 4[q(p+r) - q^2]$ $(p+r)^2 - 4q(p+r) + 4q^2 = 0$ $let\ (p+r) = y$ $y^2 - 4qy + 4q^2 = 0$ $(y-2q)^2 = 0$ $y - 2q = 0$ $or\ p + r = 2q \qquad proved$	[4]
Question 10		
(i)	$let\ three\ numbers\ be\ (x-2), x\ and\ (x+2)$ $(x-2)^2 + x^2 + (x+2)^2 = 596 \rightarrow 3x^2 = 588 \rightarrow x^2 = 196 \quad \therefore x = 14$ The required numbers are 12, 14 & 16	[3]
(ii)	$X^2 = \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}\begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$ $= \begin{bmatrix} 1\times 1 + (1)\times(8) & 1\times(1) + (1)\times 3 \\ (8)\times 1 + 3\times(8) & (8)\times(1) + 3\times 3 \end{bmatrix}$ $= \begin{bmatrix} 1+8 & 1+3 \\ 8+24 & 8+9 \end{bmatrix}$ $\therefore X^2 = \begin{bmatrix} 9 & 4 \\ 32 & 17 \end{bmatrix}$ $and\ 4X = 4\begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix} = \begin{bmatrix} 4 & 4 \\ 32 & 12 \end{bmatrix}$ $4X + 5I = \begin{bmatrix} 4 & 4 \\ 32 & 12 \end{bmatrix} + \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix} = \begin{bmatrix} 9 & 4 \\ 32 & 17 \end{bmatrix}$ $\therefore X^2 = 4X + 5I, \qquad proved$	[3]

(iii)	(a) Square 	[4]

ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER

MATHEMATICS

Maximum Marks: 80

Time allowed: ~~Two and half hours~~ Three hours

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

You will not be allowed to write during 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**.*

Instruction for the Supervising Examiner

Kindly read aloud the Instructions given above to all the candidates present in the Examination Hall.

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 question, write the correct answers only.)

(i) A polynomial in 'x' is divided by $(x - a)$ and for $(x - a)$ to be a factor of this polynomial, the remainder should be:

(a) $-a$

(b) 0

(c) a

(d) $2a$ **[Analyze]**

(ii) Radha deposited ₹400 per month in a recurring deposit account for 18 months.

The qualifying sum of money for the calculation of interest is:

(a) ₹ 3600

(b) ₹ 7200

(c) ₹ 68,400

(d) ₹ 1,36,800 **[Application]**

(iii) In the adjoining figure, AC is a diameter of the circle.

AP = 3 cm and PB = 4 cm and QP ⊥ AB.

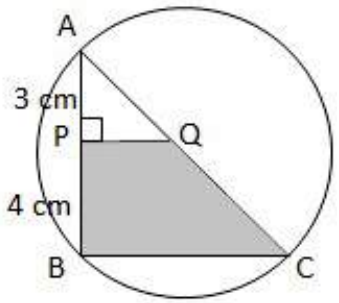
If the area of ΔAPQ is18 cm^2 , then the area of shaded portion QPBC is:

(a) 32 cm^2

(b) 49 cm^2

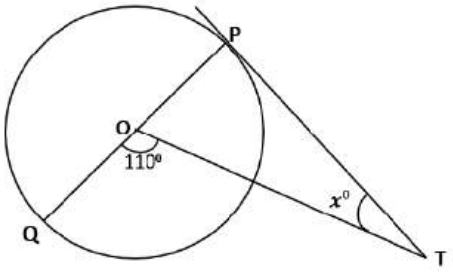
(c) 80 cm^2

(d) 98 cm^2



[Understanding & Analysis]

(iv) In the adjoining diagram, O is the centre of the circle and PT is a tangent. The value of x is:



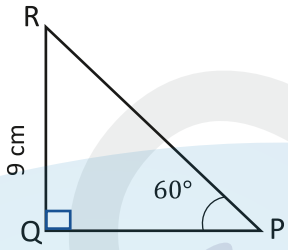
(a) 20°

(b) 40°

(c) 55°

(d) 70° **[Application]**

(v) In the adjoining diagram the length of PR is:



(a) $3\sqrt{3}$ cm

(b) $6\sqrt{3}$ cm

(c) $9\sqrt{3}$ cm

(d) 18 cm **[Application]**

(vi) A solid sphere is cut into two identical hemispheres.

Statement 1: The total volume of two hemispheres is equal to the volume of the original sphere.

Statement 2: The total surface area of two hemispheres together is equal to the surface area of the original sphere.

Which of the following is valid?

(a) Both the statements are true.

(b) Both the statements are false.

(c) Statement 1 is true, and Statement 2 is false.

(d) Statement 1 is false, and Statement 2 is true. **[Analysis]**

(vii) Given that the sum of the squares of the first seven natural numbers is 140, then their mean is:

(a) 20

(b) 70

(c) 280 **[Understanding & Evaluation]**

(d) 980

(viii) A bag contains 3 red and 2 blue marbles. A marble is drawn at random. The probability of drawing a black marble is:

(a) 0

(b) $\frac{1}{5}$

(c) $\frac{2}{5}$

(d) $\frac{3}{5}$ **[Application]**

(ix) If A = $[3 \quad -2]$ and B = $\begin{bmatrix} -1 & 4 \\ 2 & 0 \end{bmatrix}$

Assertion (A): Product AB of the two matrices A and B is possible.

Reason (R): Number of columns of matrix A is equal to number of rows in matrix B.

(a) A is true, R is false.

(b) A is false, R is true.

(c) Both A and R are true, and R is the correct reason for A.

(d) Both A and R are true, and R is incorrect reason for A. **[Analysis]**

(x) A mixture of paint is prepared by mixing 2 parts of red pigments with 5 parts of the base. Using the given information in the following table, find the values of a, b & c to get the required mixture of paint.

Parts of red pigment	2	4	**b**	6
Parts of base	5	**a**	12.5	**c**

(a) a = 10, b = 10, c = 10

(b) a = 5, b = 2, c = 5

(c) a = 10, b = 5, c = 10 **[Application & Evaluation]**

(d) a = 10, b = 5, c = 15

(xi) An article which is marked at ₹ 1200 is available at a discount of 20% and the rate of GST is 18%. The amount of SGST is:

(a) ₹ 216.00

(b) ₹ 172.80

(c) ₹ 108.00

(d) ₹ 86.40

[Analysis & Evaluation]

(xii) The sum of money required to buy 50, ₹ 40 shares at ₹ 38.50 is:

(a) ₹1920

(b) ₹1924

(c) ₹1925

(d) ₹1952

[Application]

(xiii) The roots of quadratic equation $x^2 - 1 = 0$ are:

(a) 0

(b) 1

(c) -1

(d) ±1

[Analysis & Evaluation]

(xiv) Which of the following equation represents a line equally inclined to the axes?

(a) $2x - 3y + 7 = 0$

(b) $x - y = 7$

(c) $x = 7$

(d) $y = -7$

[Analysis & Evaluation]

(xv) Given, $x + 2 \leq \frac{x}{3} + 3$ and x is a prime number. The solution set for x is:

(a) $\emptyset$

(b) {0}

(c) {1}

(d) {0, 1}

[Understanding & Analysis]

Question 2

(i) While factorizing a given polynomial, using remainder & factor theorem, [4]

a student finds that $(2x + 1)$ is a factor of $2x^3 + 7x^2 + 2x - 3$.

(a) Is the student's solution correct stating that $(2x + 1)$ is a factor of the given polynomial?

(b) Give a valid reason for your answer.

[Analysis & Application]

Also, factorize the given polynomial completely.

(ii) A line segment joining P (2, –3) and Q (0, –1) is cut by the x-axis at the point R. A line AB cuts the y axis at T(0,6) and is perpendicular to PQ at S. [4]

Find the:

(a) equation of line PQ

(b) equation of line AB

(c) coordinates of points R and S.

[Analysis & Evaluation]

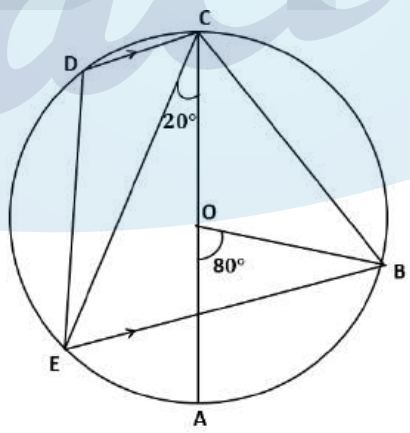
(iii) In the given figure AC is the diameter of the circle with centre O. CD is parallel to BE. [4]

$\angle AOB = 80^\circ$ and $\angle ACE = 20^\circ$. Calculate

(a) $\angle$ BEC

(b) $\angle$ BCD

(c) $\angle$CED



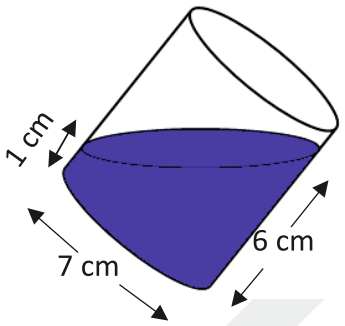
[Analysis & Evaluation]

Question 3

(i) In a Geometric Progression (G.P.) the first term is 24 and the fifth term is 8. Find the ninth term of the G.P. [4]

[Analysis & Evaluation]

(ii) In the adjoining diagram, a tilted right circular cylindrical vessel with basediameter 7 cm contains a liquid. When placed vertically, the height of the liquid in the vessel is the mean of two heights shown in the diagram. Find the area of wet surface, when the cylinder is placed vertically on a horizontal surface. (Use $\pi = \frac{22}{7}$). [4]



[Application & Evaluation]

(iii) Study the graph and answer each of the following: [5]

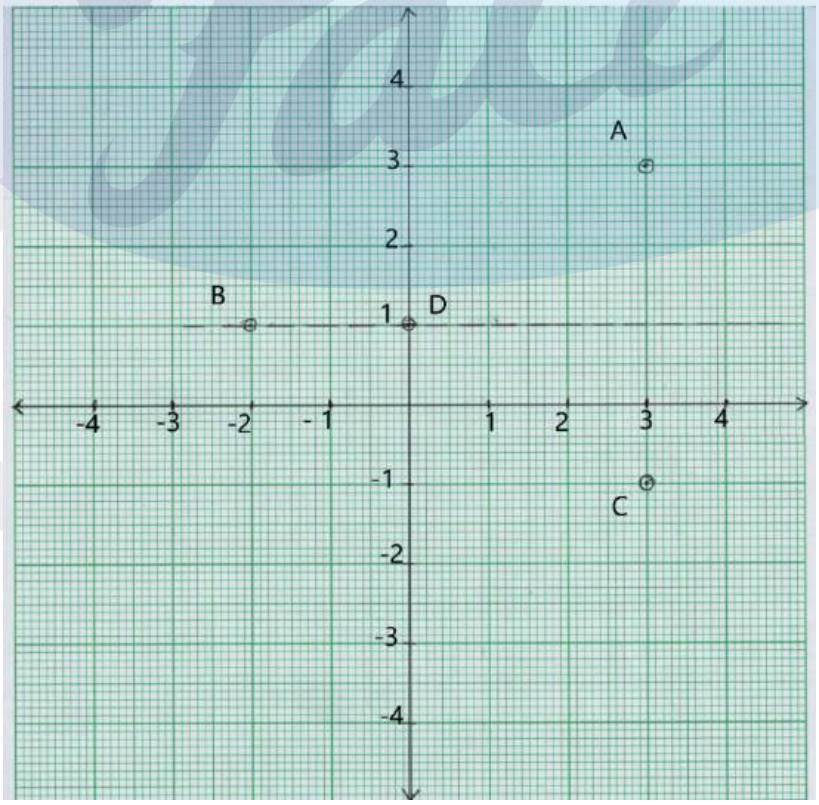
(a) Write the coordinates of points A, B, C & D.

(b) Given that, point C is the image of point A. Name and write the equation of the line of reflection.

(c) Write the coordinates of the image of the point D under reflection in *y*-axis.

(d) What is the name given to a point whose image is the point itself?

(e) On joining the points A, B, C, D and A in order, a figure is formed. Name the closed figure.



[Analyze & Application]

SECTION B

*(Attempt **any four** questions from this Section.)*

Question 4

(i) A man buys 250, ten-rupee shares each at ₹ 12.50. If the rate of dividend is 7%, find the: [3]

(a) dividend he receives annually.

(b) percentage return on his investment.

[Application & Evaluation]

(ii) Solve the following inequation, write the solution set and represent it on the real number line. [3]

$5x - 21 < \frac{5x}{7} - 6 \leq -3\frac{3}{7} + x, x \in R.$

[Evaluation]

(iii) Prove the following trigonometry identity: [4]

$(\sin\theta + \cos\theta)(\operatorname{cosec}\theta - \sec\theta) = \operatorname{cosec}\theta.\sec\theta - 2\tan\theta$

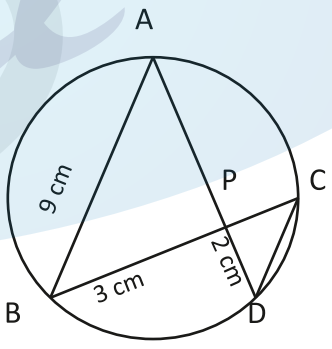
[Application & Analysis]

Question 5

(i) In the given figure (drawn not to scale) [3]

chords AD and BC intersect at P,

where AB = 9 cm, PB = 3 cm and PD = 2 cm.



(a) Prove that ΔAPB ~ ΔCPD.

(b) Find the length of CD.

(c) Find area ΔAPB : area ΔCPD.

[Application & Evaluation]

(ii) Mr. Sameer has a recurring deposit account and deposits ₹ 600 per month for 2 years. If he gets ₹ 15600 at the time of maturity, find the rate of interest earned by him. [3]

[Application & Evaluation]

(ii) Using step-deviation method, find mean for the following frequency distribution [4]

Class	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75	75 – 90
Frequency	3	4	7	6	8	2

[Application & Evaluation]

Question 6

(i) Find the coordinates of the centroid P of the ΔABC, whose vertices are A(–1, 3), B(3, –1) and C(0, 0). Hence, find the equation of a line passing through P and parallel to AB. [3]

[Analysis & Evaluation]

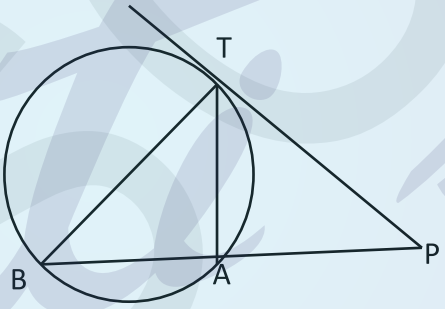
(ii) In the given figure PT is a tangent to the circle. [3]

Chord BA produced meets the tangent PT at P.

Given PT=20cm and PA= 16cm.

(a) Prove ΔPTB ~ΔPAT

(b) Find the length of AB.



[Analysis & Evaluation]

(iii) The following bill shows the GST rate and the marked price of articles: [4]

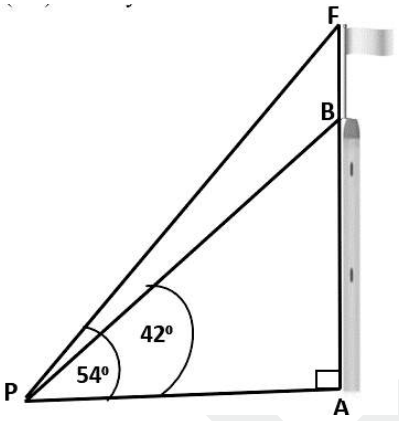
Rajdhani Departmental Store				
S. No.	Item	Marked Price	Discount	Rate of GST
(a)	Dry fruits (1 kg)	₹ 1200	₹100	12%
(b)	Packed Wheat flour (5kg)	₹ 286	Nil	5%
(c)	Bakery products	₹ 500	10%	12%

[Application & Evaluation]

Find the total amount to be paid (including GST) for the above bill.

Question 7

(i) A vertical tower standing on a horizontal plane is surmounted by a vertical flagstaff. At a point 100m away from the foot of the tower, the angle of elevation of the top and bottom of the flagstaff are 54^o and 42^o respectively. Find the height of the flagstaff. Give your answer correct to nearest metre. [5]



[Application & Evaluation]

(ii) The marks of 200 students in a test were recorded as follows: [5]

Marks %	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
No. of students	5	7	11	20	40	52	36	15	9	5

Using graph sheet draw ogive for the given data and use it to find the,

(a) median,

(b) number of students who obtained more than 65% marks

(c) number of students who did not pass, if the pass percentage was 35.

[Application, Analysis & Evaluation]

Question 8

(i) In a TV show, a contestant opts for video call a friend life line to get an answer from three of his friends, named Amar, Akbar & Anthony. The question which he asks from one of his friends has four options. Find the probability that: [3]

(a) Akbar is chosen for the call.

(b) Akbar couldn't give the correct answer.

[Analysis & Evaluation]

(ii) If x, y and z are in continued proportion, Prove that: [3]

$$\frac{x}{y^2.z^2}+\frac{y}{z^2.x^2}+\frac{z}{x^2.y^2}=\frac{1}{x^3}+\frac{1}{y^3}+\frac{1}{z^3}$$

[Application & Analysis]

(iii) A manufacturing company prepares spherical ball bearings, each of radius 7 mm and mass 4 gm. These ball bearings are packed into boxes. Each box can have maximum of 2156 cm^3 of ball bearings. Find the: [4]

(a) maximum number of ball bearings that each box can have.

(b) mass of each box of ball bearings in kg.

(use $\pi = \frac{22}{7}$)

[Analysis, Application & Evaluation]

Question 9

(i) The table given below shows the runs scored by a cricket team during the overs of a match. [3]

Overs	*Runs scored*
20 – 30	37
30 – 40	45
40 – 50	40
50 - 60	60
60 – 70	51
70 - 80	35

Use graph sheet for this question.

Take 2 cm = 10 overs along one axis and 2 cm = 10 runs along the other axis.

(a) Draw a histogram representing the above distribution.

(b) Estimate the modal runs scored.

[Application & Evaluation]

(ii) An Arithmetic Progression (A.P.) has 3 as its first term. The sum of the first 8 terms is twice the sum of the first 5 terms. Find the common difference of the A.P. [3]

[Analysis, Application & Evaluation]

(iii) The roots of equation $(q - r)\,x^2 + (r - p)\,x + (p - q) = 0$ are equal. [4]

Prove that: $2q = p + r$, that is, p, q & r are in A.P.

[Application & Analysis]

Question 10

(i) A car travels a distance of 72 km at a certain average speed of x km per hour and then travels adistance of 81 km at an average speed of 6 km per hour more than its original average speed. If it takes 3 hours to complete the total journey then form a quadratic equation and solve it to find its original average speed. [3]

[Analysis, Application & Evaluation]

(ii) Given matrix, X = $\begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$ *and* $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, prove that $X^2 = 4X + 5I$ [3]

[Application & Evaluation]

(iii) Use ruler and compasses for the following question taking a scale of 10 m=1 cm. [4]

A park in a city is bounded by straight fences AB, BC, CD and DA.

Given that AB = 50 m, BC = 63 m, ∠ABC = 75°. D is a point equidistant from the fences AB and BC. If ∠BAD = 90°, construct the outline of the park ABCD.

Also locate a point P on the line BD for the flag post which is equidistant from the corners of the park A and B.

[Analysis & Creativity]

ICSE 2024 EXAMINATION

SPECIMEN QUESTION PAPER

MATHEMATICS

Maximum Marks: 80

Time allowed: Two and half hours

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

You will not be allowed to write during 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

*(Attempt **all** questions from this Section.)*

Question 1

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

(Do not copy the question, write the correct answers only.)

(i) $If\ A = [-1 \quad 2]\ and\ B = \begin{bmatrix} 1 & -2 \\ 0 & 3 \end{bmatrix}$

Which of the following operation is possible?

(a) A – B

(b) A + B

(c) AB

(d) BA

(ii) If $x^2 + kx + 6 = (x - 2)(x - 3)$ for all values of x, then the value of k is:

(a) -5

(b) -3

(c) -2

(d) 5

(iii) A retailer purchased an item for ₹1500 from a wholesaler and sells it to a customer at 10% profit. The sales are intra-state and the rate of GST is 10%. The amount of GST paid by the customer:

(a) ₹15

(b) ₹30

(c) ₹150

(d) ₹165

(iv) If the roots of equation $x^2 - 6x + k = 0$ are real and distinct, then value of k is:

(a) > -9

(b) > -6

(c) < 6

(d) < 9

(v) Which of the following is/are an Arithmetic Progression (A.P.)?

1. 1, 4, 9, 16,.....
2. $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}, 4\sqrt{3}$,.....
3. 8, 6, 4, 2,.....

(a) only 1.

(b) only 2.

(c) only 2. and 3.

(d) all 1., 2. and 3.

(vi) The table shows the values of x and y, where x is proportional to y.

x	6	12	N
y	M	18	6

What are the values of M and N?

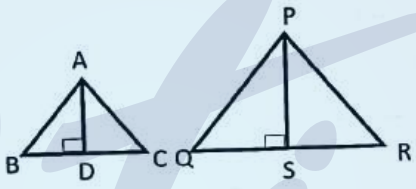
(a) M = 4, N = 9

(b) M = 9, N = 3

(c) M = 9, N = 4

(d) M = 12, N = 0

(vii) In the given diagram, $\Delta ABC \sim \Delta PQR$ and $\frac{AD}{PS} = \frac{3}{8}$. The value of AB : PQ is:



(a) 8 : 3

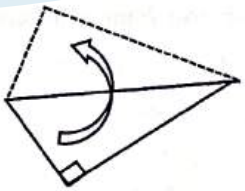
(b) 3 : 5

(c) 3 : 8

(d) 5 : 8

(viii) A right angle triangle shaped piece of hard board is rotated completely about its hypotenuse, as shown in the diagram. The solid so formed is always:

1. a single cone
2. a double cone



Which of the statement is valid?

(a) only 1.

(b) only 2.

(c) both 1. and 2.

(d) neither 1. nor 2.

(ix) Event A: The sun will rise from east tomorrow.

Event B: It will rain on Monday.

Event C: February month has 29 days in a leap year.

Which of the above event(s) has probability equal to 1?

(a) all events A, B and C

(b) both events A and B

(c) both events B and C

(d) both events A and C

(x) The three vertices of a scalene triangle are always equidistant from a fixed point.

The point is:

(a) Orthocentre of the triangle.

(b) Incentre of the triangle.

(c) Circumcentre of the triangle.

(d) Centroid of the triangle.

(xi) In a circle with radius R, the shortest distance between two parallel tangents is equal to:

(a) R

(b) 2R

(c) $2\pi R$

(d) πR

(xii) An observer at point E, which is at a certain distance from the lamp post AB, finds the angle of elevation of top of lamp post from positions C, D and E as α, β and γ. It is given that B, C, D and E are along a straight line.

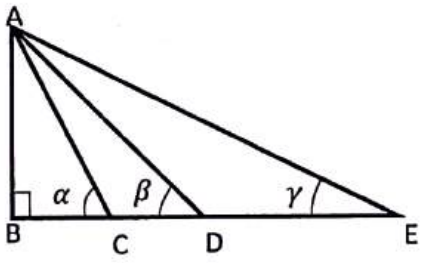
Which of the following condition is satisfied?

(a) $\tan\alpha > \tan\beta$

(b) $\tan\beta < \tan\gamma$

(c) $\tan\gamma > \tan\alpha$

(d) $\tan\alpha < \tan\beta$



(xiii) 1. Shares of company A, paying 12%, ₹100 shares are at ₹80.

2. Shares of company B, paying 12%, ₹100 shares at ₹100.

3. Shares of company C, paying 12%, ₹100 shares are at ₹120.

Shares of which company are at premium?

(a) Company A

(b) Company B

(c) Company C

(d) Company A and C

(xiv) Which of the following equation represent a line passing through origin?

(a) $3x - 2y + 5 = 0$

(b) $2x - 3y = 0$

(c) $x = 5$

(d) $y = -6$

(xv) For the given 25 variables: $x_1, x_2, x_3 \ldots \ldots \ldots \ldots \ldots x_{25}$

Assertion (A): To find median of the given data, the variate needs to be arranged in ascending or descending order.

Reason (R): The median is the central most term of the arranged data.

(a) A is true, R is false

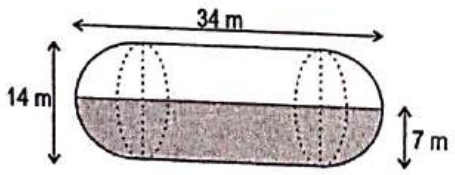
(b) A is false, R is true

(c) both A and R are true

(d) both A and R are false

Question 2

(i) Shown below is a horizontal water tank composed of a cylinder and two hemispheres. The tank is filled up to a height of 7 m. Find the surface area of the tank in contact with water. Use $\pi = \frac{22}{7}$. [4]



(ii) In a recurring deposit account for 2 years, the total amount deposited by a person is ₹ 9600. If the interest earned by him is one-twelfth of his total deposit, then find: [4]

(a) the interest he earns.

(b) his monthly deposit.

(c) the rate of interest.

(iii) Find: [4]

(a) $(\sin\theta + cosec\,\theta)^2$

(b) $(\cos\theta + \sec\theta)^2$

Using the above results prove the following trigonometry identity.

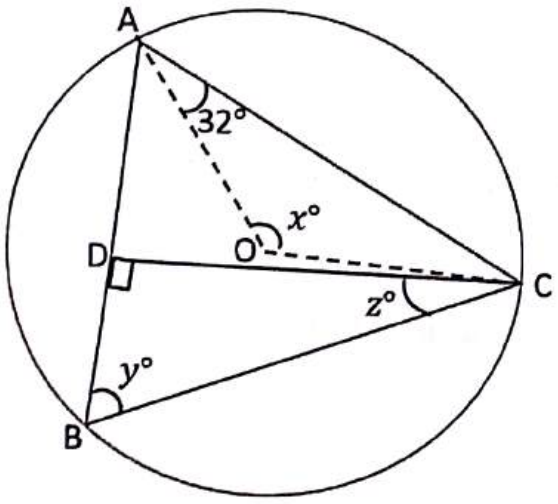
$(\sin\theta + cosec\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + tan^2\theta + cot^2\theta$

Question 3

(i) If a, b and c are in continued proportion, then prove that: [4]

$$\frac{3a^2 + 5ab + 7b^2}{3b^2 + 5bc + 7c^2} = \frac{a}{c}$$

(ii) In the given diagram, O is the centre of circle circumscribing the ΔABC. CD is perpendicular to chord AB. ∠OAC=32°. Find each of the unknown angles x, y and z. [4]



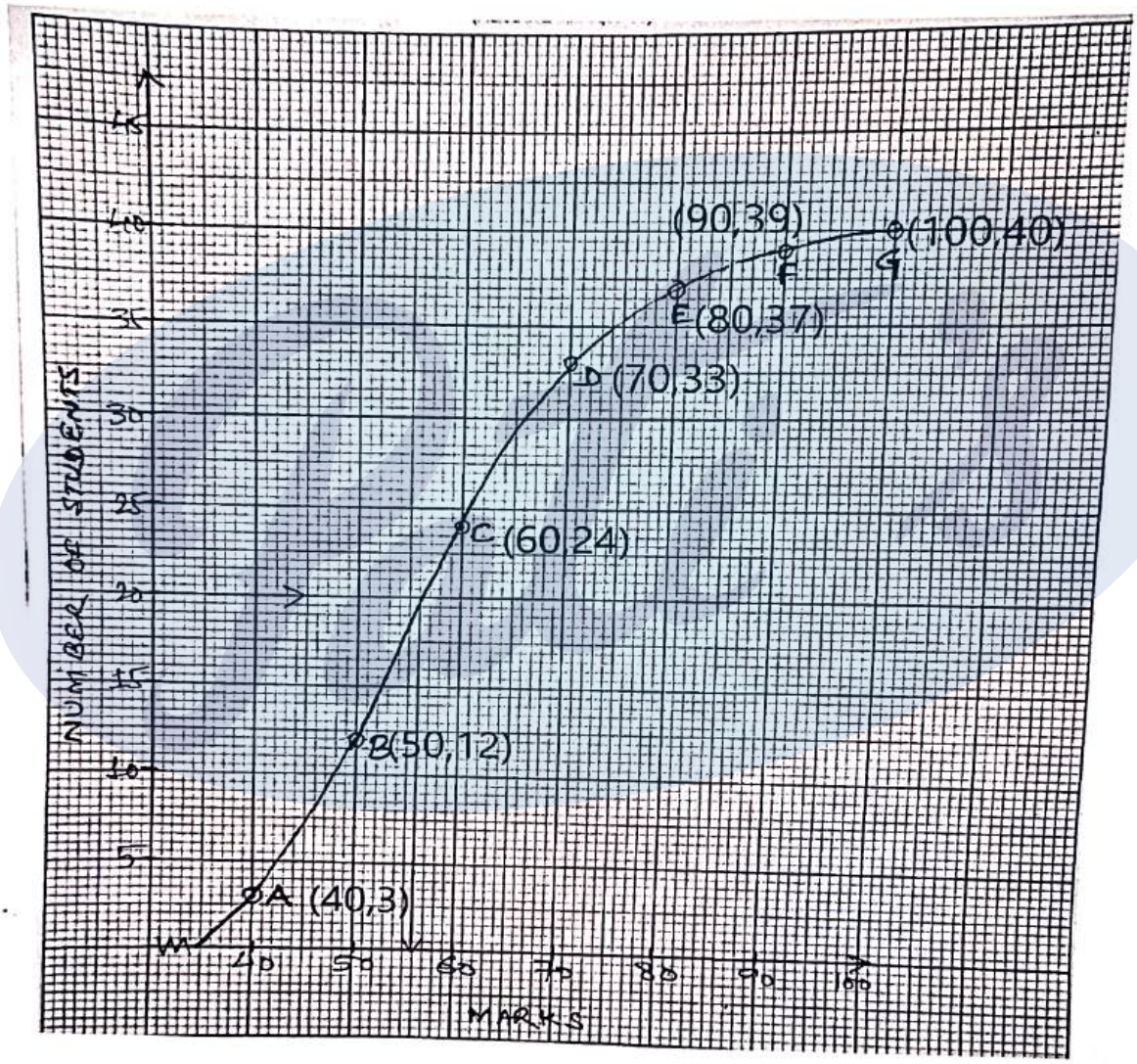
(iii) Study the graph and answer each of the following: [5]

(a) Name the curve plotted

(b) Total number of students

(c) The median marks

(d) Number of students scoring between 50 and 80 marks



SECTION B

*(Attempt **any four** questions from this Section.)*

Question 4

(i) If $A = \begin{bmatrix} 4 & -4 \\ -4 & 4 \end{bmatrix}$, find A^2. If $A^2 = p\,A$, then find the value of p. [3]

(ii) Solve the given equation $x^2 - 4x - 2 = 0$ and express your answer correct to two places of decimal. [3]

(You may use mathematical tables for this question).

(iii) In the given diagram, ΔABC is right angled at B. BDFE is a rectangle. [4]

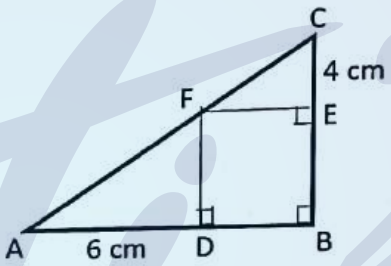
AD = 6 cm, CE = 4 cm and BC = 12 cm

(a) prove that ΔADF ~ΔFEC

(b) prove that ΔADF ~ΔABC

(c) find the length of FE

(d) find area ΔADF : area ΔABC



Question 5

(i) Shown below is a table illustrating the monthly income distribution of a company with 100 employees. [3]

Monthly Income (in ₹10, 000)	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24
Number of employees	55	15	06	08	12	4

Using step- deviation method, find the mean monthly income of an employee.

(ii) The following bill shows the GST rate and the marked price of articles: [3]

Vidhyut Electronics				
S. No.	Item	Marked Price	Quantity	Rate of GST
(a)	LED TV set	₹ 12000	01	28%
(b)	MP4 player	₹ 5000	01	18%

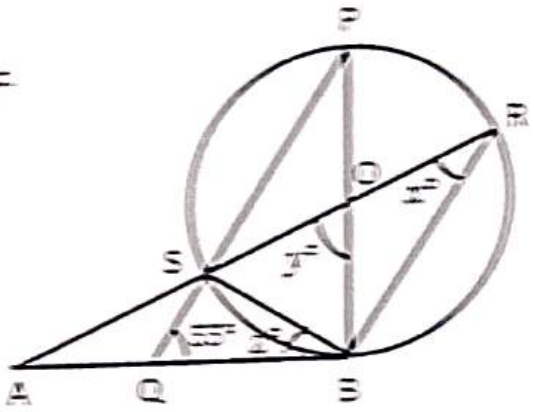
Find the total amount to be paid (including GST) for the above bill.

(iii) In the given figure, O is the centre of the circle and AB is a tangent to the circle at B. [4]

If $\angle PQB = 55°$.

(a) find the value of the angles x, y and z.

(b) prove that RB is parallel to PQ.



Question 6

(i) There are three positive numbers in a Geometric Progression (G.P.) such that: [5]

(a) their product is 3375

(b) the result of the product of first and second number added to the product of second and third number is 750.

Find the numbers.

(ii) The table given below shows the ages of members of a society. [5]

Age (in years)	Number of Members of the Society
25 – 35	15
35 – 45	32
45 – 55	69
55 - 65	80
65 – 75	61
75 - 85	43

Use graph sheet for this question.

Take 2cm = 10 years along one axis and 2cm=10 members along the other axis.

(a) Draw a histogram representing the above distribution.

(b) Hence find the modal age of the members.

(iii) A tent is in the shape of a cylinder surmounted by a conical top. If the height and radius of the cylindrical part are 7 m each and the total height of the tent is 14 m. Find the: [4]

(a) quantity of air contained inside the tent.

(b) radius of a sphere whose volume is equal to the quantity of air inside the tent.

Use $\pi = \frac{22}{7}$

Question 7

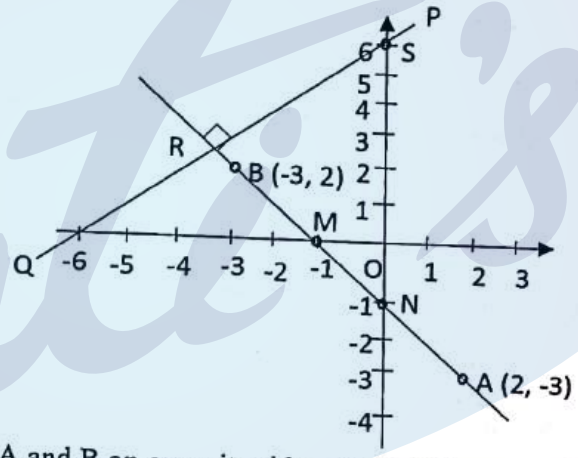
(i) The line segment joining A(2,-3) and B(-3, 2) is intercepted by the x-axis at the point M and the y axis at the point N. PQ is perpendicular to AB produced at R and meets the y- axis at a distance of 6 units from the origin O, as shown in the diagram, at S. Find the: [5]

(a) coordinates of M and N

(b) coordinates of S

(c) slope of AB.

(d) equation of line PQ.

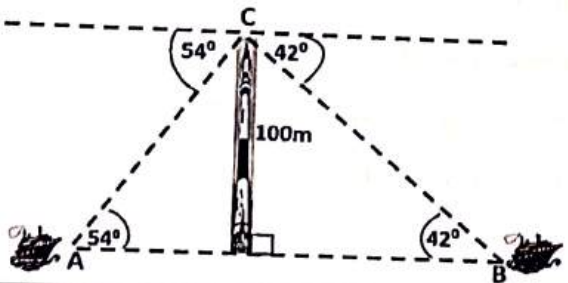


(ii) The angle of depression of two ships A and B on opposite sides of a light house of height 100m are respectively 42° and 54°. The line joining the two ships passes through the foot of the lighthouse. [5]

(a) Find the distance between the two ships A and B.

(b) Give your final answer correct to the nearest whole number.

(Use mathematical tables for this question)



Question 8

(i) Solve the following inequation write the solution set and represent it on the real number line. [3]

$$3 - 2x \geq x + \frac{1-x}{3} > \frac{2x}{5}, x \in R$$

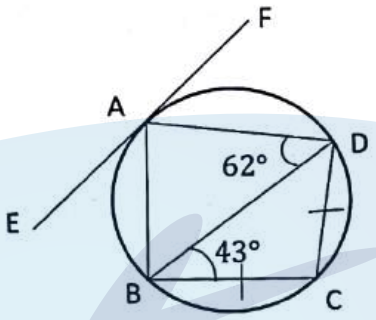
(ii) ABCD is a cyclic quadrilateral in which BC = CD and EF is a tangent at A. [3]

$\angle CBD = 43°$ and $\angle ADB = 62°$. Find:

(a) $\angle ADC$

(b) $\angle ABD$

(c) $\angle FAD$



(iii) A (a, b), B(-4, 3) and C(8,-6)are the vertices of a ΔABC. Point D is on BC such that BD : DC is 2 : 1 and M (6, 0) is mid point of AD. Find: [4]

(a) coordinates of point D.

(b) coordinates of point A.

(c) equation of a line passing through M and parallel to line BC.

Question 9

(i) Using componendo and dividend, find the value of x, when: [3]

$$\frac{x^3 + 3x}{3x^2 + 1} = \frac{14}{13}$$

(ii) The total expense of a trip for certain number of people is ₹18000. If three more people join them, then the share of each reduces by ₹3000. Taking x to be the original number of people, form a quadratic equation in x and solve it to find the value of x. [3]

(iii) Using ruler and compass only construct $\angle ABC = 60°$, AB = 6 cm and BC = 5 cm. [4]

(a) construct the locus of points equidistant from AB and BC.

(b) construct the locus of points equidistant from A and B.

(c) Mark the point which satisfies both the conditions (a) and (b) as P.

Hence, construct a circle with centre P and passing through A and B.

Question 10

(i) Using remainder and factor theorem, factorize completely, the given polynomial: [3]

$2x^3 - 9x^2 + 7x + 6$

(ii) Each of the letter of the word "HOUSEWARMING"" is written on cards and put in a bag. [3]
If a card is drawn at random from the bag after shuffling, what is the probability that the letter on the card is:

(a) a vowel

(b) one of the letters of the word SEWING.

(c) not a letter from the word WEAR.

(iii) Use graph sheet for this question. Take 2 cm = 1 unit along the axes. [4]

(a) Plot A (1, 2), B(1, 1)and C (2, 1)

(b) Reflect A, B and C about y-axis and name them as A', B' and C'.

(c) Reflect A, B, C, A', B' and C' about x-axis and name them as A", B", C", A"', B"' and C"" respectively.

(d) Join A, B, C, C", B", A", A"', B"', C"", C', B', A' and A to form a closed figure.

ICSE SEMESTER 2 EXAMINATION

SPECIMEN QUESTION PAPER

MATHEMATICS

Maximum Marks: 40

Time allowed: One and a half hours

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

You will not be allowed to write during the first 10 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 three** questions from **Section B.***

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

SECTION A

*(Attempt **all** questions from this Section.)*

Question 1

Choose the correct answers to the questions from the given options. (Do not copy the question, Write the correct answer only.) [10]

(i) The point (3,0) is invariant under reflection in:

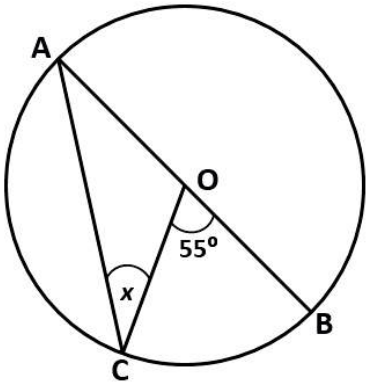
(a) The origin

(b) x-axis

(c) y-axis

(d) both x and y axes

(ii) In the given figure, AB is a diameter of the circle with centre 'O'. If $\angle COB = 55^0$ then the value of x is:



(a) 27.5^0

(b) 55^0

(c) 110^0

(d) 125^0

(iii) If a rectangular sheet having dimensions 22 cm x 11 cm is rolled along its shorter side to form a cylinder. Then the curved surface area of the cylinder so formed is:

(a) 968 cm^2

(b) 424 cm^2

(c) 121 cm^2

(d) 242 cm^2

(iv) If the vertices of a triangle are (1,3), (2,- 4) and (-3, 1). Then the co-ordinate of its centroid is:

(a) (0, 0)

(b) (0, 1)

(c) (1, 0)

(d) (1, 1)

(v) $\tan\theta \times \sqrt{1 - \sin^2\theta}$ is equal to:

(a) $\cos\theta$

(b) $\sin\theta$

(c) $\tan\theta$

(d) $\cot\theta$

(vi) The median class for the given distribution is:

Class Interval	1 – 5	6 – 10	11–15	16 –20
Cumulative Frequency	2	6	11	18

(a) 1 – 5

(b) 6 – 10

(c) 11 – 15

(d) 11 – 20

(vii) If the lines $7y = ax + 4$ *and* $2y = 3 - x$, are parallel to each other, then the value of 'a' is:

(a) - 1

(b) $\frac{-7}{2}$

(c) $\frac{-2}{7}$

(d) 14

(viii) Volume of a cylinder is 330 cm^3. The volume of the cone having same radius and height as that of the given cylinder is:

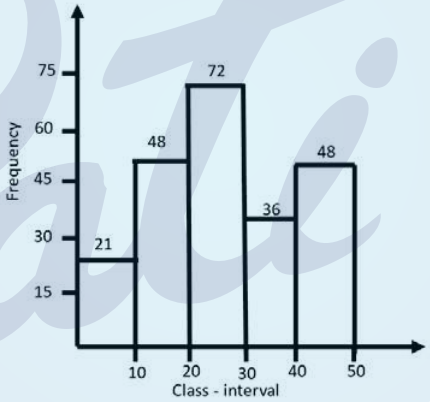
(a) 330 cm^3

(b) 165 cm^3

(c) 110 cm^3

(d) 220 cm^3

(ix) In the given graph, the modal class is the class with frequency:



(a) 72

(b) 21

(c) 48

(d) 36

(x) If the probability of a player winning a game is 0.56. The probability of his losing this game is:

(a) 0.56

(b) 1

(c) 0.44

(d) 0

SECTION B

*(Attempt **any three** questions from this Section.)*

Question 2

(i) Find the ratio in which the x- axis divides internally the line joining points A (6,- 4) and B (-3, 8). [2]

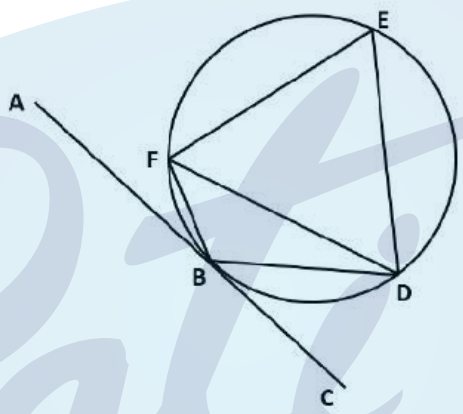
(ii) Three rotten apples are accidently mixed with twelve good ones. One apple is picked at random. What is the probability that it is a good one? [2]

(iii) In the given figure , AC is a tangent to circle at point B. ΔEFD is an equilateral triangle and $\angle CBD = 40°$. Find: [3]

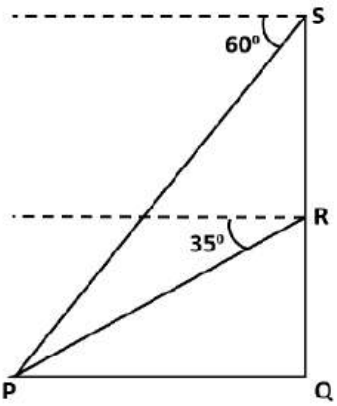
(a) $\angle BFD$

(b) $\angle FBD$

(c) $\angle ABF$



(iv) A drone camera is used to shoot an object P from two different positions R and S along the same vertical line QRS. The angle of depression of the object P from these two positions are 35° and $60°$ respectively as shown in the diagram. If the distance of the object P from point Q is 50 metres, then find the distance between R and S correct to the nearest meter. [3]

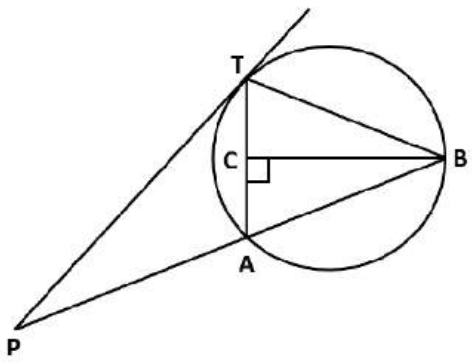


Question 3

(i) In the given figure, PT is a tangent to the circle at T, chord BA is produced to meet the tangent at P. Perpendicular BC bisects the chord TA at C. If PA = 9cm and TB = 7cm, find the lengths of: [2]

(a) AB

(b) PT



(ii) How many solid right circular cylinders of radius 2 cm and height 3 cm can be made by melting a solid right circular cylinder of diameter 12 cm and height 15 cm? [2]

(iii) Prove that: [3]

$$\frac{\cos^2 A}{\cos A - \sin A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$$

(iv) Use graph paper for this question, take 2 cm = 10 marks along one axis and 2 cm = 10 students along the other axis.

The following table shows the distribution of marks in a 50 marks test in Mathematics:

Marks	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$
No. of Students	6	10	13	7	4

Draw the ogive for the above distribution and hence estimate the median marks. [3]

Question 4

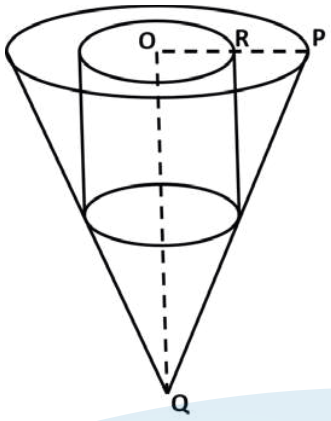
(i) Find the equation of the perpendicular dropped from the point P (-1,2) onto the line joining A (1,4) and B (2,3). [2]

(ii) Find the mean for the following distribution: [2]

Class Interval	20 – 40	40 – 60	60–80	80 –100
Frequency	4	7	6	3

(iii) A solid piece of wooden cone is of radius OP = 7 cm and height OQ = 12 cm. A cylinder whose radius and height equal to half of that of the cone is drilled out from this piece of wooden cone. Find the volume of the remaining piece of wood.

(Use, $\pi = \frac{22}{7}$) [3]



(iv) Use a graph sheet for this question, take 2cm = 1 unit along both x and y axis: [3]

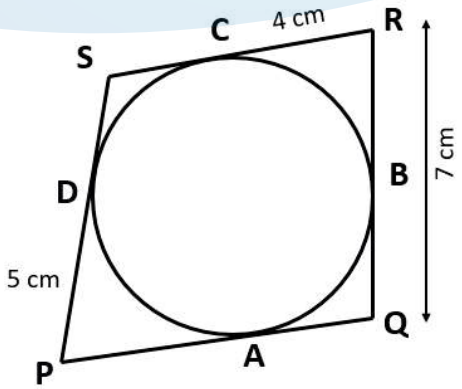
(a) Plot the points A (3,2) and B (5,0). Reflect point A on the y-axis to A′. Write co-ordinates of A′.

(b) Reflect point B on the line AA′ to B′. Write the co-ordinates of B′.

(c) Name the closed figure A'B'AB.

Question 5

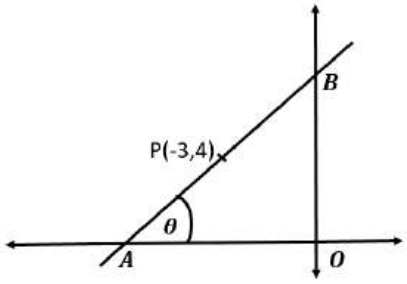
(i) In the given figure, the sides of the quadrilateral PQRS touches the circle at A,B,C and D. If RC = 4 cm, RQ = 7 cm and PD = 5cm. Find the length of PQ: [2]



(ii) Prove that: [2]

$$\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} = 1 - \sin\theta\cos\theta$$

(iii) In the given diagram, OA = OB, $\angle OAB = \theta$ *and* the line AB passes through point P (-3, 4). [3]



Find:

(a) Slope and inclination (θ) of the line AB

(b) Equation of the line AB

(iv) Use graph paper for this question. Estimate the mode of the given distribution by plotting a histogram. [Take 2 cm = 10 marks along one axis and 2 cm = 5 students along the other axis] [3]

Daily wages(in ₹)	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**	**70 – 80**
No. of Workers	6	12	20	15	9

Question 6

(i) A box contains tokens numbered 5 to 16. A token is drawn at random. Find the probability that the token drawn bears a number divisible by: [2]

(a) 5

(b) Neither by 2 nor by 3

(ii) Point M (2, b) is the mid point of the line segment joining points P (a, 7) and Q (6, 5). Find the values of 'a' and 'b'. [2]

(iii) An aeroplane is flying horizontally along a straight line at a height of 3000 m from the ground at a speed of 160 m/s. Find the time it would take for the angle of elevation of the plane as seen from a particular point on the ground to change from 60^0 to 45^0. Give your answer correct to the nearest second. [3]

(iv) Given that the mean of the following frequency distribution is 30, find the missing frequency 'f' [3]

Class Interval	0 – 10	10 – 20	20–30	30 –40	40 – 50	50 – 60
Frequency	4	6	10	f	6	4

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) Find the value of 'k' if $4x^3 - 2x^2 + kx + 5$ leaves remainder -10 when divided by $2x + 1$. [3]

(b) Amit deposits ₹ 1600 per month in a bank for 18 months in a recurring deposit account. If he gets ₹ 31,080 at the time of maturity, what is the rate of interest per annum? [3]

(c) A shopkeeper bought an article with market price ₹ 1200 from the wholesaler at a discount of 10%. The shopkeeper sells this article to the customer on the market price printed on it. If the rate of GST is 6%, then find:

(i) GST paid by the wholesaler.

(ii) Amount paid by the customer to buy the item. [4]

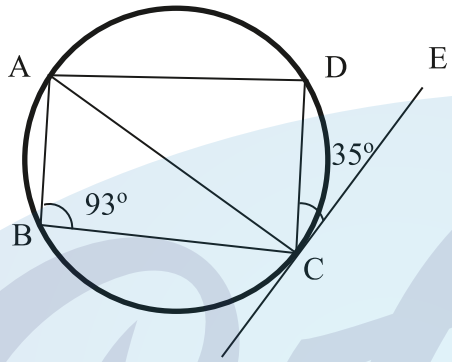
Question 2

(a) Solve the following inequation and represent your solution on the real number line:

$-5\frac{1}{2} - x \leq \frac{1}{2} - 3x \leq 3\frac{1}{2} - x,\ x \in R$ [3]

(b) Find the 16th term of the A.P. 7, 11, 15, 19…. Find the sum of the first 6 terms. [3]

(c) In the given figure CE is a tangent to the circle at point C. ABCD is a cyclic quadrilateral. If ∠ABC = 93° and ∠DCE = 35°.



Find:

(i) ∠ADC

(ii) ∠CAD

(ii) ∠ACD [4]

Question 3

(a) Prove the following identity

$\frac{\sec A}{\sec A - 1} + \frac{\sec A}{\sec A + 1} = 2\text{cosec}^2 A$ [3]

(b) Find x and y if :

$3\begin{bmatrix} 5 & -6 \\ 4 & x \end{bmatrix} - \begin{bmatrix} 6 & y \\ 0 & 6 \end{bmatrix} = 3\begin{bmatrix} 3 & -2 \\ 4 & 0 \end{bmatrix}$ [3]

(c) For what value of 'k' will the following quadratic equation:

$(k+1)x^2 - 4kx + 9 = 0$ have real and equal roots? Solve the equations. [4]

Question 4

(a) A box consists of 4 red, 5 black and 6 white balls. One ball is drawn out at random. Find the probability that the ball drawn is:

(i) black

(ii) red or white [3]

(b) Calculate the median and mode for the following distribution:

Weight (in kg)	35	47	52	56	60
No. of students	4	3	5	3	2

[3]

(c) A solid cylinder of radius 7 cm and height 14 cm is melted and recast into solid spheres each of radius 3.5 cm. Find the number of spheres formed. [4]

SECTION B (40 Marks)

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

Question 5

(a) The 2nd and 45th term of an arithmetic progression are 10 and 96 respectively. Find the first term and the common difference and hence find the sum of the first 15 terms. [3]

(b) If $A = \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix}$, find matrix B such that $A^2 - 2B = 3A + 5I$ where I is a 2 x 2 identity matrix. [3]

(c) With the help of a graph paper, taking 1cm=1unit along both x and y axis:

(i) Plot points A (0, 3), B (2, 3), C (3, 0), D (2, -3), E (0, -3)

(ii) Reflect points B, C and D on the y axis and name them as B', C' and D' respectively.

(iii) Write the co-ordinates of B', C' and D'.

(iv) Write the equation of line B' D'.

(v) Name the figure BCDD'C'B'B [4]

Question 6

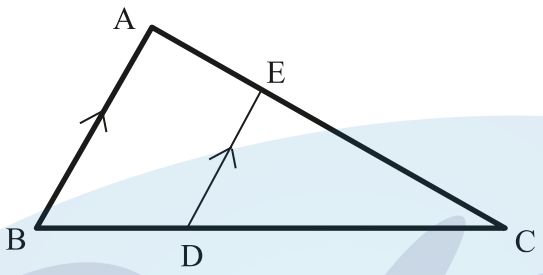
(a) In Δ ABC and ΔEDC, AB is parallel to ED. BD = $\frac{1}{3}$BC and AB = 12.3 cm.

(i) Prove that ΔABC ~ΔEDC.

(ii) Find DE

(iii) Find:

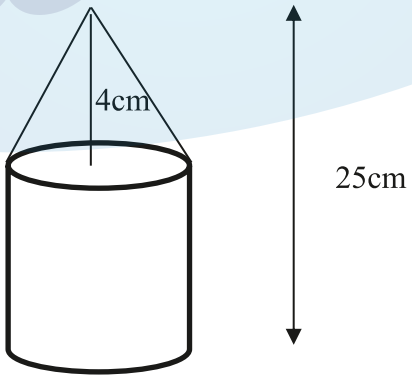
$$\frac{area\ of\ \Delta EDC}{area\ of\ \Delta ABC}$$



[3]

(b) Find the ratio in which the line joining (-2, 5) and (-5, -6) is divided by the line $y = -3$. Hence find the point of intersection. [3]

(c) The given solid figure is a cylinder surmounted by a cone. The diameter of the base of the cylinder is 6 cm. The height of the cone is 4 cm and the total height of the solid is 25 cm. Take $\pi = \frac{22}{7}$.



Find the:

(i) Volume of the solid

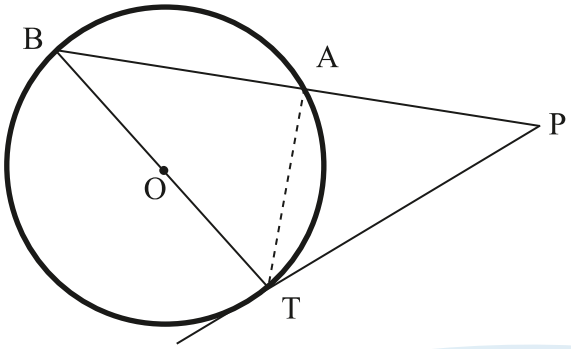
(ii) Curved surface area of the solid

Give your answers correct to the nearest whole number. [4]

Question 7

(a) In the given figure, PAB is a secant and PT a tangent to the circle with centre O.

If ∠ATP = 40°, PA = 9 cm and AB = 7 cm.



Find:

(i) ∠APT

(ii) length of PT [3]

(b) The 1st and the 8th term of a GP are 4 and 512 respectively. Find:

(i) the common ratio

(ii) the sum of its first 5 terms. [3]

(c) The mean of the following distribution is 49. Find the missing frequency *'a'*.

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	15	20	30	*a*	10

[4]

Question 8

(a) Prove the following identity

$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 5 + \sec^2 A \cdot \operatorname{cosec}^2 A$ [3]

(b) Find the equation of the perpendicular bisector of line segment joining A(4, 2) and B(-3, -5) [3]

(c) Using properties of proportion, find $x : y$ if

$$\frac{x^3 + 12x}{6x^2 + 8} = \frac{y^3 + 27y}{9y^2 + 27}$$

[4]

Question 9

(a) The difference of the squares of two natural numbers is 84. The square of the larger number is 25 times the smaller number. Find the numbers. [4]

(b) The following table shows the distribution of marks in Mathematics:

Marks (less than)	No. of students
10	7
20	28
30	54
40	71
50	84
60	105
70	147
80	180

With the help of a graph paper, taking 2 cm = 10 units along one axis and 2 cm = 20 units along the other axis, plot an ogive for the above distribution and use it to find the:

(i) median.

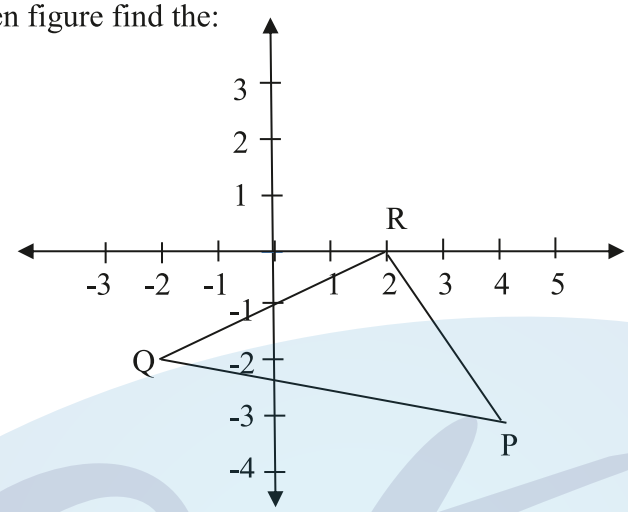
(ii) number of students who scored distinction marks (75% and above)

(iii) number of students, who passed the examination if pass marks is 35%. [6]

Question 10

(a) Prove that two tangents drawn from an external point to a circle are of equal length. [3]

(b) From the given figure find the:



(i) Coordinates of points P, Q, R.

(ii) Equation of the line through P and parallel to QR. [3]

(c) Ms. Roy went to a departmental store and bought the following items. The GST rates and the quantity of each items and market price of each are given below:

S.No.	Items	Price per item in ₹	Quantity	GST rate	Amount
1.	Walnut	650	1	5%	
2.	Potato Chips	50	2	0%	
3.	Coffee	80	2	18%	

Find the:

(i) The total amount of SGST paid.

(ii) The total amount of the bill. [4]

Question 11

(a) Mr. Sharma receives an annual income of ₹ 900 in buying ₹ 50 shares selling at ₹ 80. If the dividend declared is 20%, find the:

(i) Amount invested by Mr. Sharma.

(ii) Percentage return on his investment. [3]

(b) Two poles AB and PQ are standing opposite each other on either side of a road 200 m wide. From a point R between them on the road, the angles of elevation of the top of the poles AB and PQ are 45^o and 40^o respectively. If height of AB = 80 m, find the height of PQ correct to the nearest metre. [3]

(c) Construct a triangle PQR, given RQ = 10 cm, $\angle PRQ = 75^o$ and base RP = 8 cm. Find by construction:

(i) The locus of points which are equidistant from QR and QP.

(ii) The locus of points which are equidistant from P and Q.

(iii) Mark the point O which satisfies conditions (i) and (ii). [4]

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