ICSE 2025 EXAMINATION

SPECIMEN QUESTION PAPER

MATHEMATICS

Maximum Marks: 80

Time allowed: Three hours

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

You will not be allowed to write during 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.

CISCE

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.

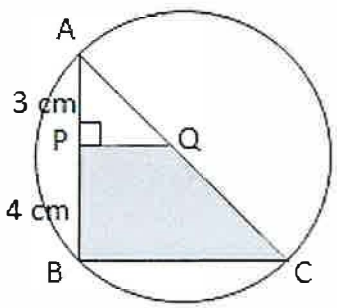
If the area of ΔAPQ is18 cm^2 , then the area of shaded portion QPBC is:

(a) 32 cm^2

(b) 49 cm^2

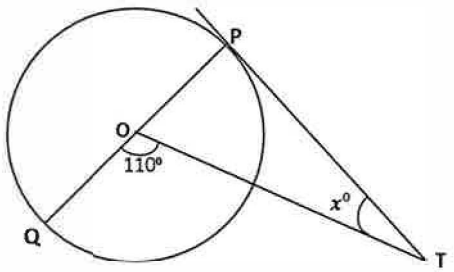
(c) 80 cm^2

(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:



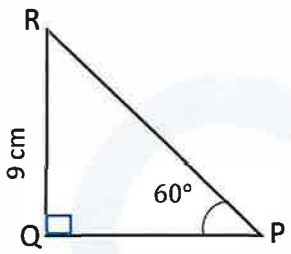
(a) 20°

(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, 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) 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]**

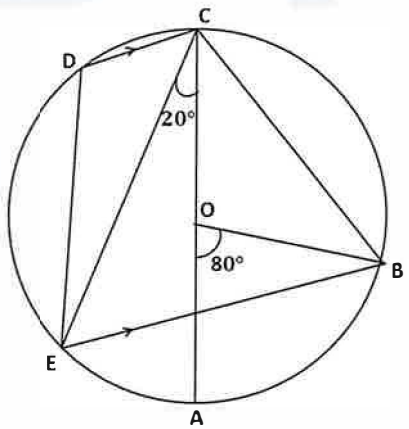
(iii) In the given figure AC is the diameter of the circle with centre O. CD is parallel to BE. [4]

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

(a) $\angle$ BEC

(b) $\angle$ BCD

(c) $\angle$CED

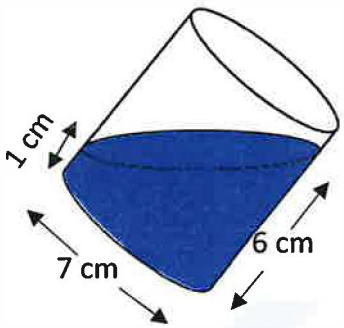


[Analysis & Evaluation]

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 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. (Use $\pi = \frac{22}{7}$). [4]



[Application & Evaluation]

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

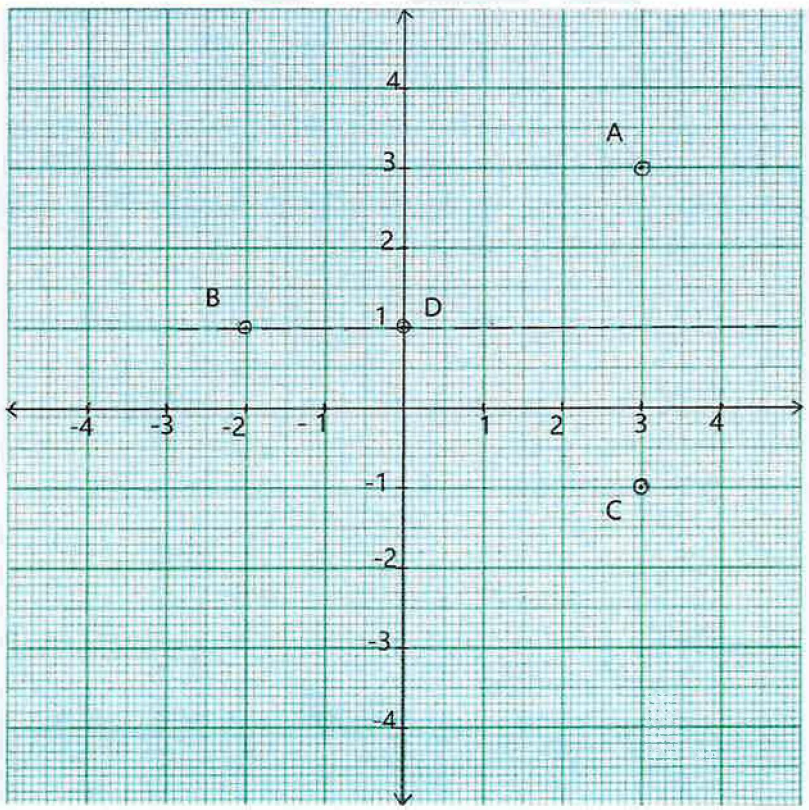
(a) Write the coordinates of points A, B, C & D.

(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]

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

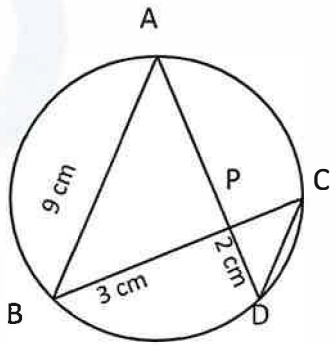
[Application & Analysis]

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]

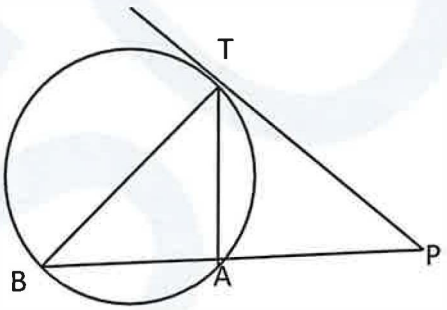
(ii) In the given figure PT is a tangent to the circle. [3]

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]

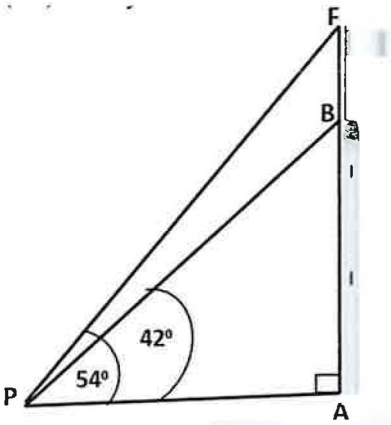
Rajdhani Departmental Store				
S. No.	Item	Marked Price	Discount	Rate of GST
(a)	Dry fruits (1 kg)	₹ 1200	₹100	12%
(b)	Packed Wheat flour (5kg)	₹ 286	Nil	5%
(c)	Bakery products	₹ 500	10%	12%

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

[Application & Evaluation]

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° and 42° 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 a distance 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 2025 SPECIMEN

DRAFT MARKING SCHEME – MATHEMATICS

Question 1		
(i)	(b) 0	[15]
(ii)	(c) ₹ 68,400	
(iii)	(c) 80 cm^2	
(iv)	(a) 20°	
(v)	(b) $6\sqrt{3}$ cm	
(vi)	(c) Statement 1 is true, and Statement 2 is false.	
(vii)	(a) 20	
(viii)	(a) 0	
(ix)	(c) Both A and R are true, and R is the correct reason for A.	
(x)	(d) a = 10, b = 5, c = 15	
(xi)	(d) ₹ 86.40	
(xii)	(c) ₹1925	
(xiii)	(d) ±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) *Slope of* $PQ=-1$ *Equation of* PQ: $x+y+1=0$ *(b) Slope of* $AB=1$ $\therefore$ *Eq of line* $AB, x-y+6=0$ (c) $R(-1,0)$ $S\left(-\frac{7}{2},\frac{5}{2}\right)$	[4]
(iii)	(a) $\angle BOC=180°-80°=100° \rightarrow \angle BEC=\frac{1}{2}\times 100°=50°$ ($\angle$ *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)	$a=24$ *and* $T_5=8 \rightarrow ar^4=8 \rightarrow r^4=\frac{1}{3}, \therefore T_9=ar^8 \rightarrow 24\times\left(\frac{1}{3}\right)^2=\frac{8}{3}$	[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) $A(3,3), B(-2,1), C(3,-1)$ *and* $D(0,1)$ (b) BD *and* $y=1$ *is the line of reflection.* (c) $D(0,1)$ (d) *Invariant point.* (e) *Concave Quadrilateral or Arrowhead.*	[5]

SECTION – B

Question 4

(i) [3]

(a) $Annual\ Dividend = 250 \times 10 \times \frac{7}{100} = ₹175$

(b) $Return\ \% = \frac{7 \times 10}{12.50} = 5.6\ \%$

(ii) [3]

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

$$5x - 21 < \frac{5x}{7} - 6 \qquad \frac{5x}{7} - 6 \leq -3\frac{3}{7} + x$$

$$5x - \frac{5x}{7} < -6 + 21 \qquad \frac{5x}{7} - x \leq -\frac{24}{7} + 6$$

$$\frac{35x - 5x}{7} < 15 \qquad \frac{5x - 7x}{7} \leq \frac{-24 + 42}{7}$$

$$30x < 105 \qquad -2x \leq 18$$

$$x < 3.5 \qquad x \geq -9$$

$$\left\{x: -9 \leq x < \frac{7}{2}, x \in R\right\}$$



(iii) [4]

$$L\ H\ S = (sin\theta + cos\theta)(cosec\theta - sec\theta)$$

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

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

$$= cosec\theta.sec\theta - 2tan\theta = RHS$$

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]

$$Qualifying\ Sum = \frac{600 \times 24 \times 25}{2} = 1{,}80{,}000$$

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

$$Maturity\ Value = ₹15600$$

$$600 \times 24 + 150r = ₹15600$$

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

(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) $In\ \Delta PTB\ and\ \Delta PAT, \angle PTA = \angle PBT \quad (alt.segment\ th.)$

$$\angle TPA = \angle BPT \quad (common\ \angle)$$

$$\therefore \Delta PTB \sim \Delta PAT \quad (AA\ axiom)$$

(b) $PA \times PB = PT^2 \rightarrow 16(16 + AB) = 400 \rightarrow 16 + AB = 25$

$$\rightarrow AB = 9\,cm$$

(iii) [4]

Rajdhani Departmental Store

S. No.	*Item*	*Marked Price*	*Discounte 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) [4]

(a) $In\ \Delta PAB,\ \frac{AB}{PA} = \tan 42°$

$\frac{AB}{100} = 0.9004 \rightarrow AB = 90.04\ m$

$In\ \Delta PAF,\ \frac{AF}{PA} = \tan 54°$

$\frac{AF}{100} = 1.3764 \rightarrow AF = 137.64\ m$

$FB = 137.64\ m - 90.04\ m = 47.60\ m = 48\ m$

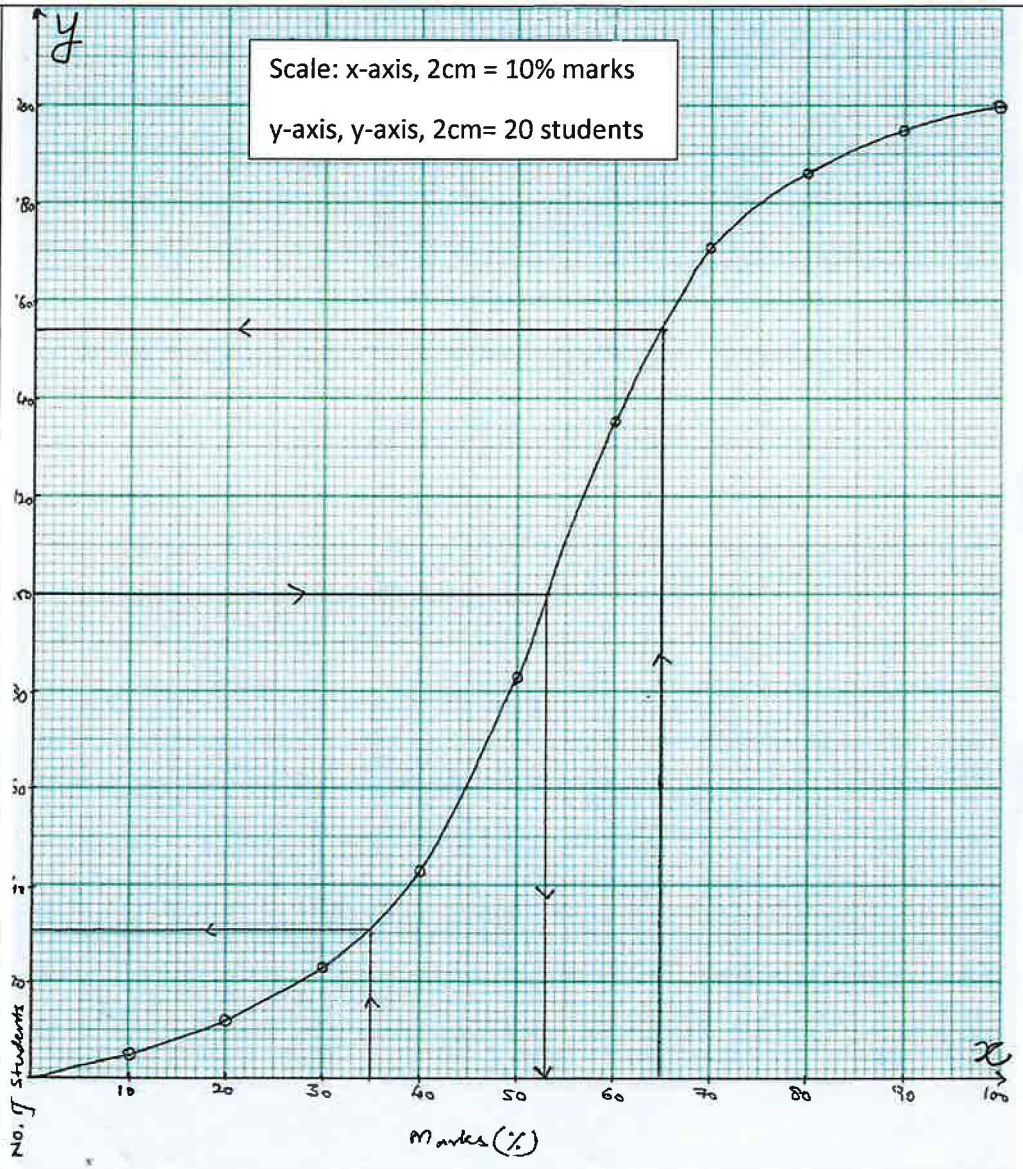
(ii) [6]

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) $Didn't\ pass = 31 \pm 2$



Question 8

(i). [3]

(a) $P(Akbar) = \frac{1}{3}$

(b) $P(not\ correct\ answer) = 1 - \frac{1}{4} = \frac{3}{4}$

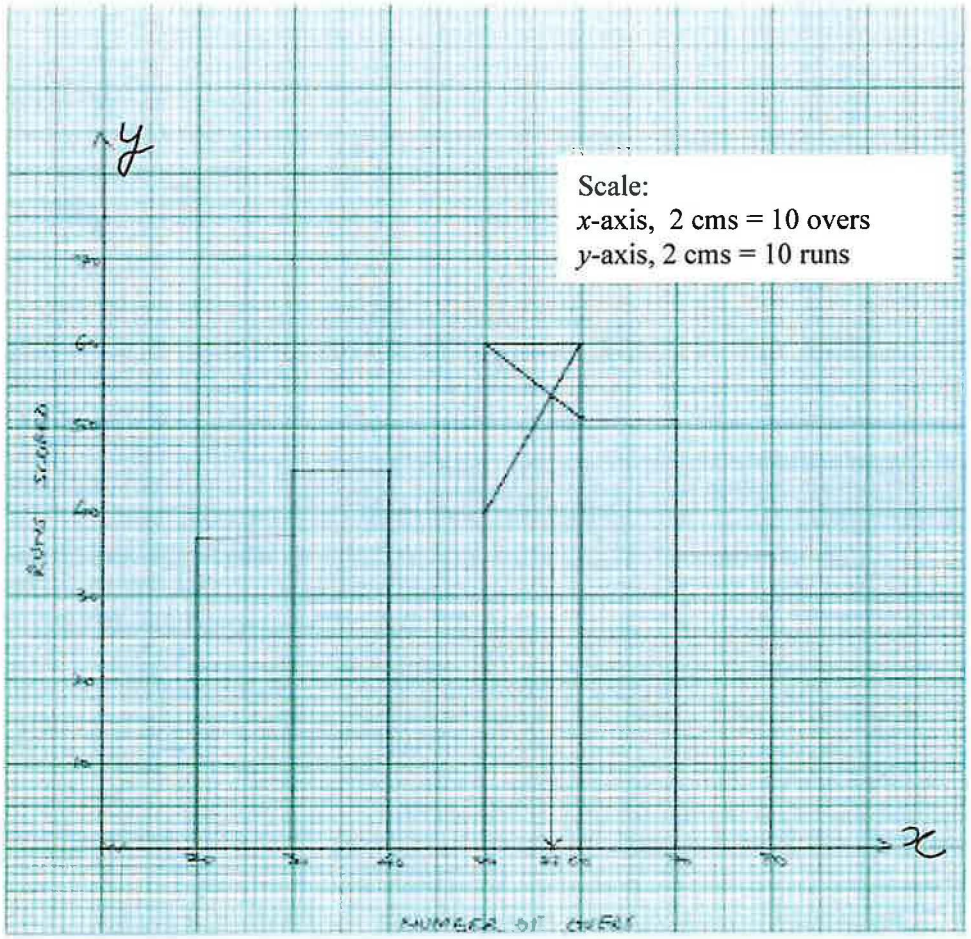
(ii) [3]

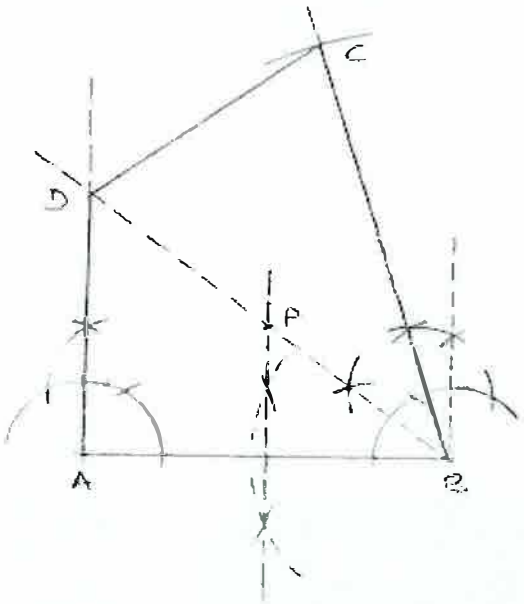
$$\frac{x}{y} = \frac{y}{z} \rightarrow y^2 = xz$$

$$L\,H\,S = \frac{x}{y^2.z^2} + \frac{y}{z^2.x^2} + \frac{z}{x^2.y^2} = \frac{x^3 + y^3 + z^3}{x^2.y^2z^2}$$

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

$$= \frac{1}{z^3} + \frac{y^3}{y^6} + \frac{1}{x^3} = \frac{1}{z^3} + \frac{1}{y^3} + \frac{1}{x^3} = R\,H\,S$$

(iii)	(a) $No.of\ ball\ bearings = \frac{2156}{\frac{4}{3}\times\pi\times r^3} = \frac{2156}{\frac{4}{3}\times\frac{22}{7}\times\left(\frac{7}{10}\right)^3}$ $= \frac{2156\times3\times7\times10\times10\times10}{4\times22\times7\times7\times7} = 1500$ (b) $Mass\ of\ each\ box = 4\ gm \times 1500 = 6\ kg$	[4]
Question 9		
(i)	$Modal\ Runs = 57 \pm 1$  	[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)	$a = q-r, b = r-p\ and\ c = p-q$ $for\ equal\ roots, b^2 = 4ac \rightarrow (r-p)^2 = 4(q-r)(p-q)$ $r^2+p^2-2pr = 4[pq-q^2-pr+qr)$ $r^2+p^2-2pr+4pr = 4[pq-q^2+qr]$ $(p+r)^2 = 4[q(p+r)-q^2]$	[4]

	$(p+r)^2 - 4q(p+r) + 4q^2 = 0$ $let\ (p+r) = y$ $y^2 - 4qy + 4q^2 = 0$ $(y-2q)^2 = 0$ $y - 2q = 0$ $or\ p + r = 2q \qquad proved$	
Question 10		
(i)	$\frac{72}{x} + \frac{81}{x+6} = 3 \rightarrow \frac{24}{x} + \frac{27}{x+6} = 1 \rightarrow \frac{24(x+6)+27x}{x(x+6)} = 1$ $x^2 - 45x - 144 = 0 \rightarrow (x-48)(x+3) \rightarrow x = 48\ {}^{km}/_{hr}$	[3]
(ii)	$X^2 = \begin{bmatrix}1 & 1\\ 8 & 3\end{bmatrix}\begin{bmatrix}1 & 1\\ 8 & 3\end{bmatrix}$ $= \begin{bmatrix}1\times1+(1)\times(8) & 1\times(1)+(1)\times3\\ (8)\times1+3\times(8) & (8)\times(1)+3\times3\end{bmatrix}$ $= \begin{bmatrix}1+8 & 1+3\\ 8+24 & 8+9\end{bmatrix}$ $\therefore X^2 = \begin{bmatrix}9 & 4\\ 32 & 17\end{bmatrix}$ $and\ 4X = 4\begin{bmatrix}1 & 1\\ 8 & 3\end{bmatrix} = \begin{bmatrix}4 & 4\\ 32 & 12\end{bmatrix}$ $4X + 5I = \begin{bmatrix}4 & 4\\ 32 & 12\end{bmatrix} + \begin{bmatrix}5 & 0\\ 0 & 5\end{bmatrix} = \begin{bmatrix}9 & 4\\ 32 & 17\end{bmatrix}$ $\therefore X^2 = 4X + 5I, \qquad proved$	[3]
(iii)		[4]