

ICSE Paper 2009

MATHEMATICS

SECTION A [40 Marks]

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

Question 1.

- (a) Mr. Dubey borrows ₹ 1,00,000 from State Bank of India at 11% per annum compound interest. He repays ₹ 41,000 at the end of the first year and ₹ 47,700 at the end of the second year. Find the amount outstanding at the beginning of the third year. [3]
- (b) A dice is thrown once. What is the probability that the
(i) number is even
(ii) number is greater than 2 ? [3]
- (c) Find the HCF and LCM of the following polynomials : **
 $3x^3 - 27x^2 + 60x$ and $x^2 - 16$ [4]

Solution :

- (a) Given : P = ₹ 1,00,000, R = 11%

$$\text{Interest for first year} = \frac{PRT}{100} = \frac{1,00,000 \times 11 \times 1}{100} = ₹ 11,000$$

$$\text{Amount after first year} = 1,00,000 + 11,000 = ₹ 1,11,000$$

$$\begin{aligned}\text{Principal for second year} &= ₹ 1,11,000 - ₹ 41,000 \\ &= ₹ 70,000\end{aligned}$$

$$\text{Interest for second year} = \frac{70,000 \times 11 \times 1}{100} = ₹ 7,700$$

$$\text{Amount after second year} = ₹ 70,000 + 7,700 = ₹ 77,700$$

$$\begin{aligned}\text{Amount outstanding for beginning of third year} \\ &= ₹ 77,700 - ₹ 47,700 \\ &= ₹ 30,000.\end{aligned}$$

Ans.

- (b) Dice is thrown once.

$$\text{Sample space} = \{1, 2, 3, 4, 5, 6\}$$

$$\therefore n(S) = 6$$

(i) Number is even = {2, 4, 6}

$$\therefore n(E) = 3$$

$$P(\text{Even number}) = \frac{n(E)}{n(S)} = \frac{3}{6} = 1/2$$

Ans.

(ii) Number is greater than 2 = {3, 4, 5, 6}

$$n(E) = 4$$

$$P(> 2) = \frac{n(E)}{n(S)} = \frac{4}{6} = \frac{2}{3}$$

Ans.

Question 2.

(a) Find x and y , if $\begin{bmatrix} 2x & x \\ y & 3y \end{bmatrix} \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 16 \\ 9 \end{bmatrix}$ [3]

(b) What least number must be added to each of the numbers 5, 11, 19 and 37 so that they are in proportion? [3]

(c) Given that $x + 2$ and $x + 3$ are factors of $2x^3 + ax^2 + 7x - b$. Determine the values of a and b . [4]

Solution :

(a) Given : $\begin{bmatrix} 2x & x \\ y & 3y \end{bmatrix} \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 16 \\ 9 \end{bmatrix}$

$$\Rightarrow \begin{bmatrix} 6x + 2x \\ 3y + 6y \end{bmatrix} = \begin{bmatrix} 16 \\ 9 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 8x \\ 9y \end{bmatrix} = \begin{bmatrix} 16 \\ 9 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 8x = 16 \Rightarrow x = 2 \\ 9y = 9 \Rightarrow y = 1 \end{bmatrix}$$

Ans.

(b) Let the number x be added to each number.

$$5 + x : 11 + x = 19 + x : 37 + x$$

$$\frac{5 + x}{11 + x} = \frac{19 + x}{37 + x}$$

By componendo and dividendo,

$$\Rightarrow \frac{5 + x + 11 + x}{5 + x - 11 - x} = \frac{19 + x + 37 + x}{19 + x - 37 - x}$$

$$\Rightarrow \frac{16 + 2x}{-6} = \frac{56 + 2x}{-18}$$

$$\Rightarrow 3(16 + 2x) = 56 + 2x$$

$$\Rightarrow 48 + 6x = 56 + 2x$$

$$\Rightarrow 4x = 8$$

$$\Rightarrow x = 2$$

Ans.

(c) Given : $(x + 2)$ and $(x + 3)$ are the factors of $2x^3 + 9x^2 + 7x - b$.

$\therefore f(-2)$ and $f(-3)$ will be zero.

$$f(x) = 2x^3 + 9x^2 + 7x - b$$

$$f(-2) = 2(-2)^3 + 9(-2)^2 + 7(-2) - b = 0$$

$$-16 + 4a - 14 - b = 0$$

$$4a - b = 30 \quad \dots(1)$$

$$f(-3) = 2(-3)^3 + 9(-3)^2 + 7(-3) - b = 0$$

$$-54 + 9a - 21 - b = 0$$

$$9a - b = 75 \quad \dots(2)$$

Solving (1) and (2), we get

$$a = 9, b = 6$$

Ans.

Question 3.

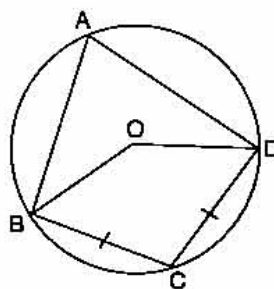
(a) Solve the inequation and represent the solution set on the number line.

$$-3 + x \leq \frac{8x}{3} + 2 \leq \frac{14}{3} + 2x, \text{ where } x \in I \quad [3]$$

(b) Find the value of p for which the lines

$$2x + 3y - 7 = 0 \text{ and } 4y - px - 12 = 0 \text{ are perpendicular to each other.} \quad [3]$$

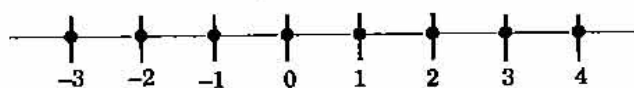
(c) In the given figure O is the centre of the circle, $\angle BAD = 75^\circ$ and chord $BC =$ chord CD . Find : (i) $\angle BOC$ (ii) $\angle OBD$ (iii) $\angle BCD$. [4]



Solution :

$$\begin{array}{lcl} \text{(a)} & -3 + x \leq \frac{8x}{3} + 2 \leq \frac{14}{3} + 2x, x \in I & \\ & \begin{array}{l} -3 + x \leq \frac{8x}{3} + 2 \\ \frac{8x}{3} - \frac{x}{1} \geq -3 - 2 \\ \frac{8x - 3x}{3} \geq -5 \\ 5x \geq -15 \\ x \geq -3 \end{array} & \begin{array}{l} \frac{8x}{3} + 2 \leq \frac{14}{3} + 2x \\ \frac{8x}{3} - 2x \leq \frac{14}{3} - \frac{2}{1} \\ \frac{8x - 6x}{3} \leq \frac{14 - 6}{3} \\ \frac{2x}{3} \leq \frac{8}{3} \\ x \leq 4 \end{array} \end{array}$$

Solution set : $\{-3 \leq x \leq 4\}$



(b) Given equation is $2x + 3y - 7 = 0$

$$\Rightarrow 3y = -2x + 7$$

$$\Rightarrow y = -\frac{2}{3}x + \frac{7}{3}$$

$$\text{Slope of the line } (m_1) = -\frac{2}{3}$$

Another equation is $4y - px - 12 = 0$

$$\Rightarrow 4y = px + 12$$

$$\Rightarrow y = \frac{p}{4}x + 3$$

$$\text{Slope of the line } (m_2) = \frac{p}{4}$$

As per the question, lines are perpendicular.

$$m_1 \times m_2 = -1$$

$$-\frac{2}{3} \times \frac{p}{4} = -1$$

$$\Rightarrow -2p = -12$$

$$\Rightarrow p = 6$$

Ans.

(c) Given : $\angle BAD = 75^\circ$, chord $BC =$ chord CD

$$\angle BOD = 2 \times \angle BAD = 2 \times 75^\circ = 150^\circ$$

$$(i) \quad \angle BOC = \frac{1}{2} \angle BOD$$

$$= \frac{1}{2} \times 150^\circ = 75^\circ$$

Ans.

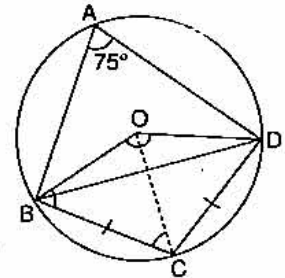
$$(ii) \quad \angle OBD = \frac{1}{2} (180^\circ - 150^\circ)$$

$$= 15^\circ$$

Ans.

$$(iii) \quad \angle BCD = 180^\circ - 75^\circ = 105^\circ$$

Ans.



Question 4.

(a) Find the mean, median and mode of the following distribution :

8, 10, 7, 6, 10, 11, 6, 13, 10

[3]

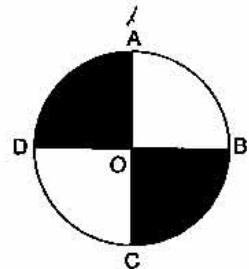
(b) Without using trigonometric tables evaluate the following :

$$\frac{\sec 17^\circ}{\operatorname{cosec} 73^\circ} + \frac{\tan 68^\circ}{\cot 22^\circ} + \cos^2 44^\circ + \cos^2 46^\circ$$

[3]

(c) AC and BD are two perpendicular diameters of a circle with centre O . If $AC = 16$ cm, calculate the area and perimeter of the shaded part. (Take $\pi = 3.14$)

[4]



Ans.

Solution :

$$(a) \quad \text{Mean} = \frac{\Sigma x}{n} = \frac{8 + 10 + 7 + 6 + 10 + 11 + 6 + 13 + 10}{9}$$

$$= \frac{81}{9} = 9$$

For the median, we arrange the data in ascending order

6, 6, 7, 8, 10, 10, 10, 11, 13

$$\text{Median} = \left(\frac{n+1}{2} \right)^{\text{th}} \text{ term} = \left(\frac{9+1}{2} \right)^{\text{th}} \text{ term}$$

$$= 5^{\text{th}} \text{ term} = 10$$

In the given data, 10 occurs maximum number of times, therefore

$$\text{Mode} = 10$$

Ans.

$$(b) \text{ Given : } \frac{\sec 17^\circ}{\operatorname{cosec} 73^\circ} + \frac{\tan 68^\circ}{\cot 22^\circ} + \cos^2 44^\circ + \cos^2 46^\circ$$

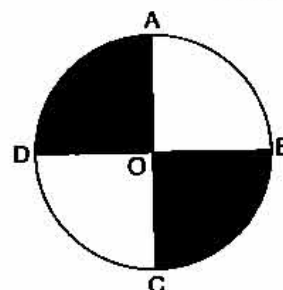
$$\begin{aligned}
 &= \frac{\sec(90^\circ - 73^\circ)}{\operatorname{cosec} 73^\circ} + \frac{\tan(90^\circ - 22^\circ)}{\cot 22^\circ} + \cos^2(90^\circ - 46^\circ) + \cos^2 46^\circ \\
 &= \frac{\operatorname{cosec} 73^\circ}{\operatorname{cosec} 73^\circ} + \frac{\cot 22^\circ}{\cot 22^\circ} + \sin^2 46^\circ + \cos^2 46^\circ \\
 &= 1 + 1 + 1 = 3
 \end{aligned}$$

Ans.

(c) Given : AC = 16 cm = diameter of the circle, $\pi = 3.14$.

Area of shaded portion = 2 quadrant

$$\begin{aligned}
 &= \frac{1}{2} \times \pi r^2 \\
 &= \frac{1}{2} \times 3.14 \times (8)^2 \\
 &= 100.48 \text{ cm}^2 \quad \text{Ans.}
 \end{aligned}$$



$$\begin{aligned}
 \text{Perimeter of the shaded portion} &= \pi r + DB + AC \\
 &= 3.14 \times 8 + 16 + 16 \\
 &= 57.12 \text{ cm.}
 \end{aligned}$$

Ans.

SECTION B [40 Marks]

Answer any four Questions in this Section.

Question 5.

(a) A shopkeeper bought a TV at a discount of 30% of the listed price of ₹ 24,000. The shopkeeper offers a discount of 10% of the listed price to his customer. If the VAT (Value Added Tax) is 10%.

Find : (i) the amount paid by the customer.

(ii) the VAT to be paid by the shopkeeper. [3]

(b) Solve the following quadratic equation and give the answer correct to two significant figures.

$$4x^2 - 7x + 2 = 0 \quad [3]$$

(c) Use graph paper to answer this question.

(i) Plot the points A (4, 6) and B (1, 2)

(ii) A' is the image of A when reflected in X-axis.

(iii) B' is the image of B when B is reflected in the line AA'.

(iv) Give the geometrical name for the figure AB A'B'. [4]

Solution :

$$\begin{aligned}
 \text{(a) (i)} \quad \text{Discount} &= 30\% \text{ on } 24,000 \\
 &= \frac{30}{100} \times 24,000 = ₹ 7,200
 \end{aligned}$$

$$\begin{aligned}
 \text{Cost price of shopkeeper} &= 24,000 - 7,200 \\
 &= ₹ 16,800
 \end{aligned}$$

$$\text{Tax @ 10\%} = \frac{10 \times 16800}{100} = ₹ 1680$$

$$\text{Amount paid by shopkeeper} = 16,800 + 1,680 = ₹ 18,480$$

$$\begin{aligned}\text{Discount on customer} &= 10\% \text{ on } 24,000 = \frac{10}{100} \times 24,000 \\ &= ₹ 2,400\end{aligned}$$

$$\text{Selling price of shopkeeper} = 24,000 - 2,400 = ₹ 21,600$$

$$\text{Tax @ } 10\% = \frac{10 \times 21,600}{100} = ₹ 2,160$$

$$\text{The amount paid by customer} = 21,600 + 2,160 = ₹ 23,760$$

Ans.

$$\begin{aligned}\text{(ii) VAT to be paid by shopkeeper} &= ₹ 2,160 - ₹ 1,680 \\ &= ₹ 480\end{aligned}$$

Ans.

$$\text{(b) Given equation } 4x^2 - 7x + 2 = 0 \text{ comparing with } ax^2 + bx + c = 0, \text{ we have } a = 4,$$

$$b = -7, c = 2$$

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{+7 \pm \sqrt{(-7)^2 - 4 \times 4 \times 2}}{2 \times 4} = \frac{+7 \pm \sqrt{49 - 32}}{8} \\ &= \frac{7 \pm 4.123}{8}\end{aligned}$$

Taking +ve sign

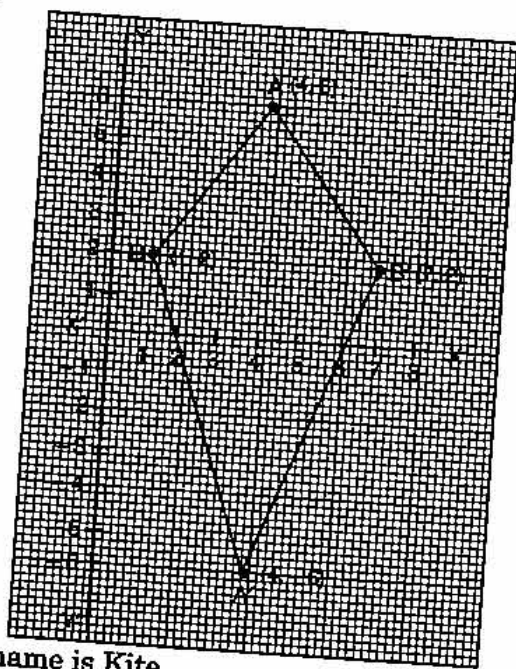
$$x = \frac{7 + 4.123}{8} = \frac{11.123}{8} = 13.9$$

Taking -ve sign

$$\begin{aligned}x &= \frac{7 - 4.123}{8} = \frac{2.877}{8} = 0.36 \\ &= 1.390 \text{ and } 0.3596 \\ &= 1.4 \text{ and } 0.36\end{aligned}$$

Ans.

- ⇒
(c) (i) See figure.
(ii) See figure.
(iii) See figure.



- (iv) Geometrical name is Kite.

Question 6.

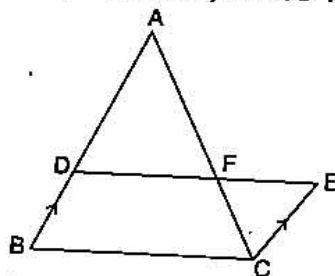
- (a) In the given figure, ABC and CEF are two triangles where BA is parallel to CE and $AF : AC = 5 : 8$.

(i) Prove that $\triangle ADF \sim \triangle CEF$.

(ii) Find AD if $CE = 6$ cm.

(iii) If DF is parallel to BC find area of $\triangle ADF$: area of $\triangle ABC$.

[3]



- (b) Prove the following identity :

$$\frac{\sin A}{1 + \cos A} + \frac{1 + \cos A}{\sin A} = 2 \operatorname{cosec} A$$

[3]

- (c) The following table gives the wages of workers in a factory :

Wages in ₹	45-50	50-55	55-60	60-65	65-70	70-75	75-80
No. of workers	5	8	30	25	14	12	6

Calculate the mean by the short cut method.

[4]

Solution :

- (a) In $\triangle ABC$ and $\triangle CEF$,

and

$$BA \parallel CE \text{ (given)}$$

$$\frac{AF}{AC} = \frac{5}{8} \text{ (given)}$$

$\Rightarrow$

$$\frac{AF}{AF + FC} = \frac{5}{5 + 3}$$

$\Rightarrow$

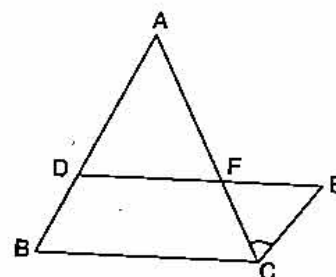
$$\frac{AF}{FC} = \frac{5}{3}$$

(i)

$$\angle DAF = \angle FCE$$

$$\angle AFD = \angle CFE$$

$$\triangle ADF \sim \triangle CEF$$



(Int. $\angle$)

(Vert.)

(AA similarity)

Proved

(ii)

$$\frac{AD}{CE} = \frac{AF}{FC} \Rightarrow \frac{AD}{6} = \frac{5}{3}$$

$$\Rightarrow AD = \frac{5}{3} \times 6 = 10 \text{ cm} \quad \text{Ans.}$$

- (iii) Given : $DF \parallel BC$

$$\triangle ADF \sim \triangle ABC$$

$$\frac{AF}{AC} = \frac{AD}{AB} = \frac{5}{8}$$

$$\frac{\text{Area of } \triangle ADF}{\text{Area of } \triangle ABC} = \frac{AD^2}{AB^2} = \frac{(5)^2}{(8)^2} = \frac{25}{64}$$

Ans.

(b)

$$\begin{aligned}
 \text{L.H.S.} &= \frac{\sin A}{1 + \cos A} + \frac{1 + \cos A}{\sin A} \\
 &= \frac{\sin^2 A + 1 + \cos^2 A + 2 \cos A}{\sin A (1 + \cos A)} \\
 &= \frac{2 + 2 \cos A}{\sin A (1 + \cos A)} = \frac{2(1 + \cos A)}{\sin A (1 + \cos A)} \\
 &= 2 \operatorname{cosec} A = \text{R.H.S.}
 \end{aligned}$$

(c)

Class interval	Class Marks x_i	$d_i = x_i - A$	Frequency f_i	$f_i d_i$
45-50	47.5	-15	5	-75
50-55	52.5	-10	8	-80
55-60	57.5	-5	30	-150
60-65	62.5 (A)	0	25	0
65-70	67.5	5	14	70
70-75	72.5	10	12	120
75-80	77.5	15	6	90
			$\Sigma f_i = 100$	$\Sigma f_i d_i = -25$

Here, $A = 62.5$

Proved

$$\begin{aligned}
 \text{Mean} &= A + \frac{\Sigma f_i d_i}{\Sigma f_i} = 62.5 + \left(\frac{-25}{100} \right) \\
 &= 62.5 - 0.25 = 62.25
 \end{aligned}$$

Ans.

Question 7.

- (a) Amit Kumar invests ₹ 36,000 in buying ₹ 100 shares at ₹ 20 premium. The dividend is 15% per annum. Find :
- The number of shares he buys
 - His yearly dividend
 - The percentage return on his investment.
- Give your answer correct to the nearest whole number. [3]
- (b) What sum of money will amount to ₹ 9,261 in 3 years at 5% per annum compound interest? [3]
- (c) Mr. Mishra has a Savings Bank Account in Allahabad Bank. His pass book entries are as follows :

Date	Particulars	Withdrawals (in ₹)	Deposits (in ₹)	Balance (in ₹)
Jan. 4, 2007	By Cash	—	—	—
Jan. 11, 2007	By Cheque	—	1000.00	1000.00
Feb. 3, 2007	By Cash	—	3000.00	4000.00
Feb. 7, 2007	To Cheque	2000.00	2500.00	6500.00
March 3, 2007	By Cash	—	—	4500.00
March 25, 2007	By Cash	—	5000.00	9500.00
June 7, 2007	By Cash	—	2000.00	11,500.00
Aug. 29, 2007	To Cheque	1000.00	3500.00	15000.00
			—	14000.00

Rate of interest paid by the bank is 4.5% per annum. Mr. Mishra closes his account on 30th October, 2007. Find the interest he receives. [4]

Solution :

(a) $MV \text{ of 1 share} = ₹(100 + 20) = ₹120$

Given : Dividend = 15%, Investment = 36,000

(i) $\text{Number of shares buys} = \frac{\text{Investment}}{MV}$
 $= \frac{36,000}{120} = 300$

Ans.

(ii) $\text{Dividend on 1 share} = ₹ \frac{15}{100} \times 100 = ₹15$

$\text{Dividend on 300 shares} = 15 \times 300$

$= ₹4,500$

Ans.

(iii) $\text{Rate of interest} = \frac{4,500}{36,000} \times 100$

$= 12.5\%$

Ans.

(b) Given : $A = ₹9,261$, $T = 3 \text{ year}$, $R = 5\%$

$$A = P \left(1 + \frac{R}{100} \right)^T$$

$\Rightarrow 9,261 = P \left(1 + \frac{5}{100} \right)^3$

$\Rightarrow 9,261 = P \left(\frac{21}{20} \right)^3$

$\Rightarrow P = \frac{9,261 \times 20 \times 20 \times 20}{21 \times 21 \times 21}$

$= ₹8,000$

Ans.

(c) Qualifying amounts for interest for various months :

January	₹ 1,000
February	₹ 4,500
March	₹ 9,500
April	₹ 9,500
May	₹ 9,500
June	₹ 15,000
July	₹ 15,000
August	₹ 14,000
September	₹ 14,000
	<u>₹ 92,000</u>

$P = ₹92,000$

$T = 1 \text{ month}$

$R = 4.5\%$

$\text{Interest} = \frac{P \times R \times T}{100}$

$= \frac{92,000 \times 4.5 \times 1}{100 \times 12}$

$= ₹345$

Ans.

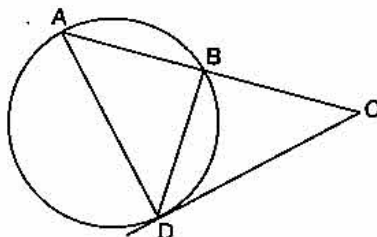
Question 8.

(a) Given that $\frac{a^3 + 3ab^2}{b^3 + 3a^2b} = \frac{63}{62}$.

Using Componendo and Dividendo find $a : b$.

(b)

[3]



In the above figure $AB = 7$ cm and $BC = 9$ cm.

(i) Prove $\triangle ACD \sim \triangle DCB$.

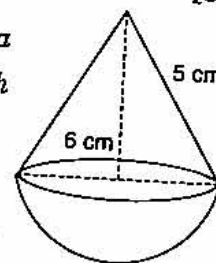
(ii) Find the length of CD .

[3]

(c) The given figure represents a hemisphere surmounted by a conical block of wood. The diameter of their bases is 6 cm each and the slant height of the cone is 5 cm. Calculate :

(i) the height of the cone.

(ii) the volume of the solid.



[4]

Solution :

(a) Given :

$$\frac{a^3 + 3ab^2}{b^3 + 3a^2b} = \frac{63}{62}$$

By componendo and dividendo,

$$\frac{a^3 + 3ab^2 + b^3 + 3a^2b}{a^3 + 3ab^2 - b^3 - 3a^2b} = \frac{63 + 62}{63 - 62}$$

$$\Rightarrow \frac{(a+b)^3}{(a-b)^3} = \frac{125}{1} = \left(\frac{5}{1}\right)^3$$

$$\Rightarrow \frac{a+b}{a-b} = \frac{5}{1}$$

Again componendo and dividendo,

$$\Rightarrow \frac{a+b+a-b}{a+b-a+b} = \frac{5+1}{5-1} = \frac{6}{4}$$

$$\Rightarrow \frac{2a}{2b} = \frac{3}{2}$$

$$a : b = 3 : 2$$

(b) Given : $AB = 7$ cm, $BC = 9$ cm.

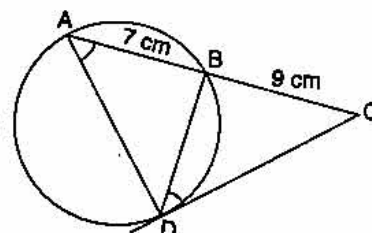
(i) In $\triangle ACD$ and $\triangle DCB$,

$$\angle C = \angle C$$

(common)

$$\angle CDB = \angle BAD \text{ (}\angle\text{'s alternate segment)}$$

$$\triangle ACD \sim \triangle DCB \text{ (By A.A similarity)}$$



Ans.

Proved

(ii)

$$AC \times BC = CD^2$$

$$(\because \triangle ACD \sim \triangle DCB)$$

$$CD^2 = 16 \times 9 = 144$$

$$CD = 12 \text{ cm.}$$

(c) Given : Diameter (AB) = 6 cm, r (OB) = 3 cm, l (DB) = 5 cm.

(i)

$$OD^2 = DB^2 - OB^2$$

$$= 25 - 9 = 16$$

$$OD = 4 \text{ cm}$$

Ans.

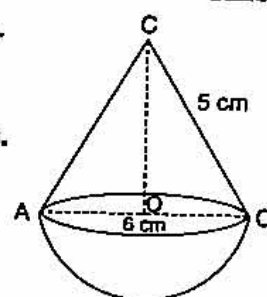
(ii)

$$\begin{aligned} \text{Volume of hemisphere} &= \frac{2}{3}\pi r^3 \\ &= \frac{2}{3} \times \frac{22}{7} \times (3)^3 \\ &= 56.57 \text{ cm}^3. \end{aligned}$$

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 9 \times 4 = 37.71 \text{ cm}^3$$

$$\begin{aligned} \text{Volume of the solid} &= 37.71 + 56.57 \\ &= 94.28 \text{ cm}^3. \end{aligned}$$

Ans.



Question 9.

(a) Attempt this question on graph paper.

Marks obtained by 200 students in examination are given below :

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	10	14	21	25	34	36	27	16	12

Draw an Ogive for the given distribution taking 2 cm = 10 marks on one axis and 2 cm = 20 students on the other axis.

From the graph find :

(i) the Median

(ii) the Upper Quartile

(iii) Number of students scoring above 65 marks.

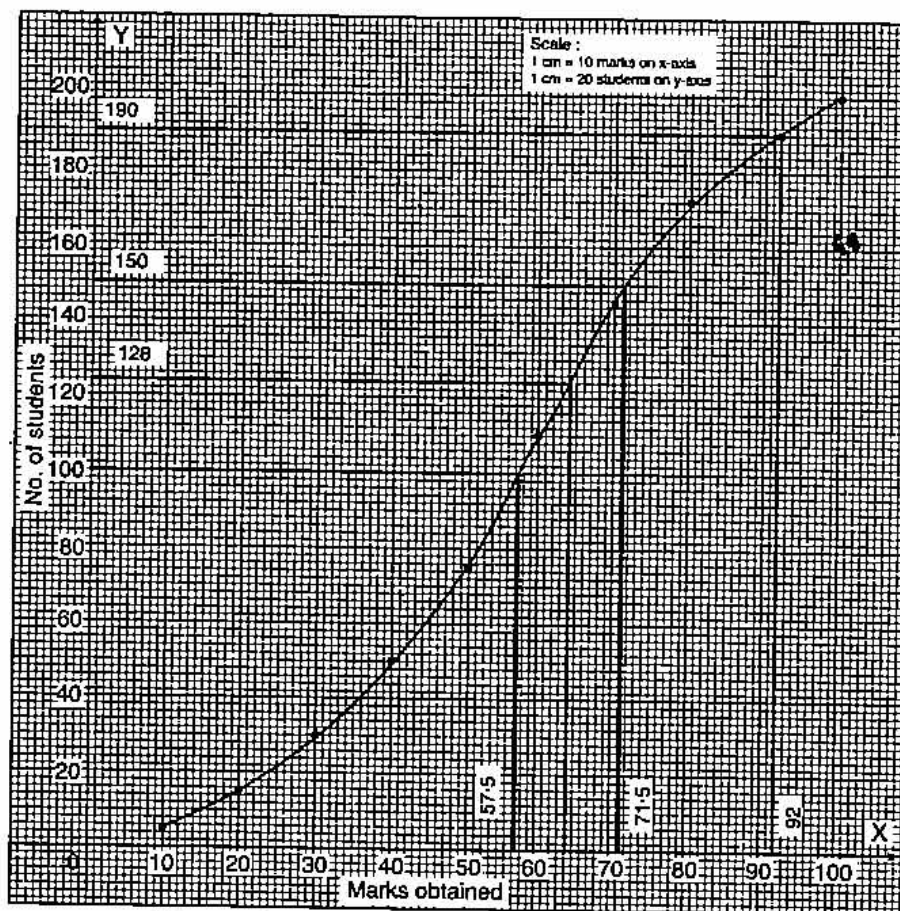
(iv) If 10 students qualify for merit scholarship, find the minimum marks required to qualify. [6]

(b) From two points A and B on the same side of a building, the angles of elevation of the top of the building are 30° and 60° respectively. If the height of the building is 10m, find the distance between A and B correct to two decimal places. [4]

Solution :

(a)

Marks	No. of students	cf
0-10	5	5
10-20	10	15
20-30	14	29
30-40	21	50
40-50	25	75
50-60	34	109
60-70	36	145
70-80	27	172
80-90	16	188
90-100	12	200



- (i) Here n (no. of students) = 200 (even)
 $\therefore$ Median = $\left(\frac{n}{2}\right)^{\text{th}}$ term = 100th term.

From the graph 100th term is 57.5.

$$\text{Median} = 57.5$$

Ans.

- (ii) Upper quartile (Q_3) = $\frac{3n}{4} = \frac{3 \times 200}{4}$ th term
 $= 3 \times 50 = 150$ term

From Graph 150th term = 71.5

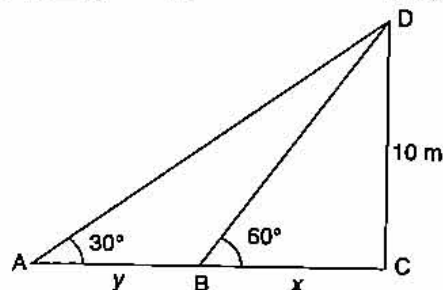
The upper quartile = 71.5

Ans.

- (iii) Number of students scoring above 65 marks = $200 - 128 = 72$ Ans.

- (iv) Minimum marks to qualify = 92 Ans.

(b) In $\triangle DBC$, $\tan 60^\circ = \frac{10}{x}$
 $\Rightarrow \sqrt{3} = \frac{10}{x}$
 $\Rightarrow x = \frac{10}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
 $= \frac{10\sqrt{3}}{3} \text{ m}$



$$\begin{aligned}
 \text{In } \triangle DAC, \quad \tan 30^\circ &= \frac{10}{x+y} = \frac{1}{\sqrt{3}} \\
 \Rightarrow x+y &= 10\sqrt{3} \\
 \Rightarrow y &= 10\sqrt{3} - \frac{10}{\sqrt{3}} \\
 &= \frac{30-10}{\sqrt{3}} = \frac{20}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\
 &= \frac{20}{3}\sqrt{3} \\
 &= 11.55 \text{ m}
 \end{aligned}$$

Ans.

Question 10.

- (a) Mrs. Goswami deposits ₹ 1000 every month in a recurring deposit account for 3 years at 8% interest per annum. Find the matured value. [3]
- (b) Find the equation of a line with x intercept = 5 and passing through the point (4, -7). [3]
- (c) In a school the weekly pocket money of 50 students is as follows :

Weekly pocket money in ₹	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	2	8	12	14	8	6

Draw a histogram and a frequency polygon on the same graph. Find the mode from the graph. [4]

Solution :

- (a) Total Principal (P) for 1 month

$$\begin{aligned}
 P &= x \times \frac{n(n+1)}{2} = 1000 \times \frac{36 \times 37}{2} \\
 &= ₹ 6,66,000
 \end{aligned}$$

$$\begin{aligned}
 \text{Interest for 1 month} &= \frac{PRT}{100} = \frac{6,66,000 \times 8 \times 1}{100 \times 12} \\
 &= ₹ 4,440
 \end{aligned}$$

$$\text{Total amount deposited by Mr. Goswami} = 36 \times 1000 = ₹ 36,000$$

$$\text{Maturity value} = ₹ 36,000 + 4,440$$

$$= ₹ 40,440$$

Ans.

- (b) Equation of the line passing through (5, 0) and (4, -7) :

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1} (x - x_1)$$

$$y - 0 = \frac{-7 - 0}{4 - 5} (x - 5)$$

$$y = \frac{-7}{-1} (x - 5)$$

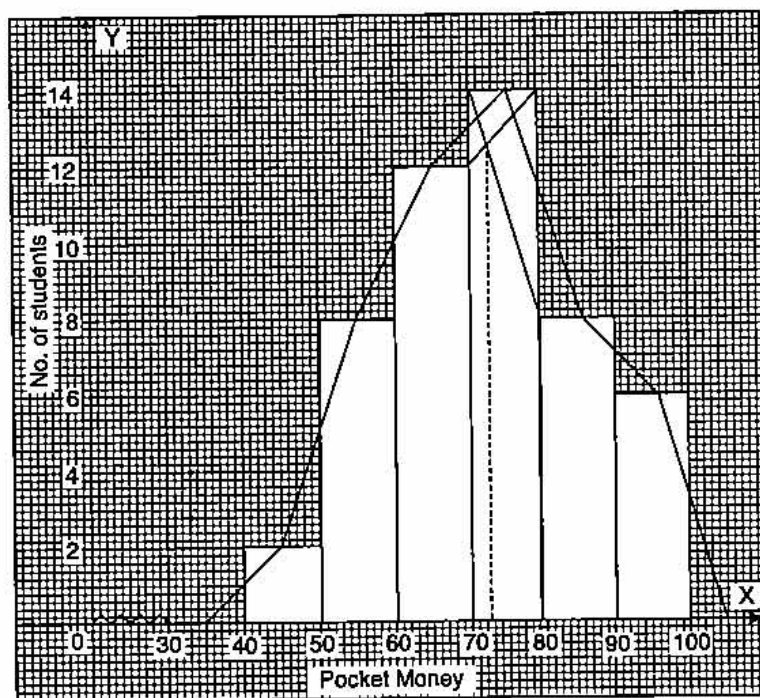
$$\Rightarrow y = 7(x - 5)$$

$$\Rightarrow y = 7x - 35$$

$$\Rightarrow 7x - y - 35 = 0$$

Ans.

(c)



So, from the graph,

Mode = 73

Ans.

Question 11.

(a) The model of a building is constructed with scale factor 1 : 30.

(i) If the height of the model is 80 cm, find the actual height of the building in metres.

(ii) If the actual volume of a tank at the top of the building is 27m^3 , find the volume of the tank on the top of the model. [2](b) The speed of an express train is x km/h and the speed of an ordinary train is 12 km/h less than that of the express train. If the ordinary train takes one hour longer than the express train to cover a distance of 240 km, find the speed of the express train. [4]

(c) Using ruler and compasses construct

(i) a triangle ABC in which $AB = 5.5$ cm, $BC = 3.4$ cm and $CA = 4.9$ cm.

(ii) the locus of points equidistant from A and C.

(iii) a circle touching AB at A and passing through C. [4]

Solution :(a) Scale factor $k = \frac{1}{30}$ (i) Height of the model = k (times the height of the building)

$$\begin{aligned}
 \Rightarrow \text{Height of building} &= 80 \times 30 \\
 &= 2400 \text{ cm} \\
 &= 24 \text{ m}
 \end{aligned}$$

Ans.

(ii) Volume of model = k^3 times volume of the building

$$= \frac{1}{30} \times \frac{1}{30} \times \frac{1}{30} \times 27 \text{ m}^3$$

$$= \frac{1}{1000} \text{ m}^3 = 0.001 \text{ m}^3$$

Ans.

(b) Time taken by express train = $\frac{240}{x}$ h

Speed of ordinary train = $(x - 12)$ km/h

Time taken by ordinary train = $\frac{240}{x - 12}$

According to the question, $\frac{240}{x} = \frac{240}{x - 12} - 1$

$$\Rightarrow 240(x - 12) = 240x - x(x - 12)$$

$$\Rightarrow 240x - 2880 = 240x - x^2 + 12x$$

$$\Rightarrow x^2 - 12x - 2880 = 0$$

$$\Rightarrow x^2 - 60x + 48x - 2880 = 0$$

$$\Rightarrow x(x - 60) + 48(x - 60) = 0$$

$$\Rightarrow (x - 60)(x + 48) = 0$$

$$\text{either } x - 60 = 0 \text{ or } x + 48 = 0$$

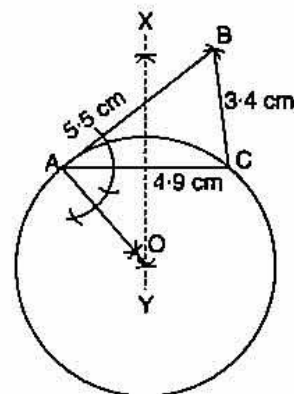
$$\Rightarrow x = 60 \text{ or } x = -48$$

Ans.

Hence, the speed of express train is 60 km/h.

(c) Steps of construction :

1. Draw $\triangle ABC$ with given values.
2. Draw XY perpendicular bisector of AC.
3. Draw perpendicular of AB at A which cuts perpendicular XY at O.
4. Draw a circle at centre O which touching AB at A and passing through C i.e., required circle.



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