

**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 [3]  
 (ii) number is greater than 2 ?
- (c) Find the HCF and LCM of the following polynomials : \*\* [4]  
 $3x^3 - 27x^2 + 60x$  and  $x^2 - 16$

**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.**

\*\* Solution has not given due to out of present syllabus.

**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.

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

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

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

$4a - b = 30$  ... (1)

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

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

$9a - b = 75$  ... (2)

Solving (1) and (2), we get

$a = 9, b = 6$  **Ans.**

**Question 3.**

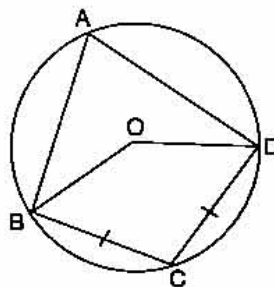
(a) Solve the inequation and represent the solution set on the number line.

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

(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 :**

(a) 
$$-3 + x \leq \frac{8x}{3} + 2 \leq \frac{14}{3} + 2x, x \in I$$

$$-3 + x \leq \frac{8x}{3} + 2$$

$$\frac{8x}{3} - x \geq -3 - 2$$

$$\frac{8x - 3x}{3} \geq -5$$

$$5x \geq -15$$

$$x \geq -3$$

$$\frac{8x}{3} + 2 \leq \frac{14}{3} + 2x$$

$$\frac{8x}{3} - 2x \leq \frac{14}{3} - \frac{2}{1}$$

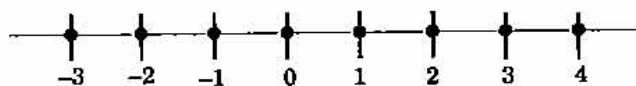
$$\frac{8x - 6x}{3} \leq \frac{14 - 6}{3}$$

$$\frac{2x}{3} \leq \frac{8}{3}$$

$$x \leq 4$$

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  $4y - px - 12 = 0$

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

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

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

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

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

Ans.

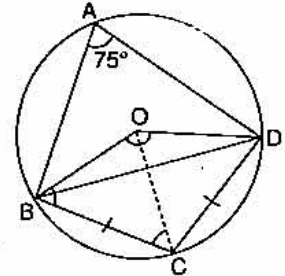
(ii)  $\angle OBD = \frac{1}{2} (180^\circ - 150^\circ)$

$$= 15^\circ$$

Ans.

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

Ans.



**Question 4.**

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

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

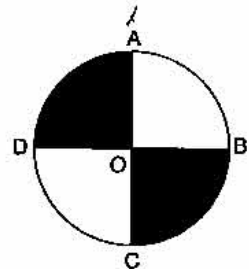
[3]

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

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

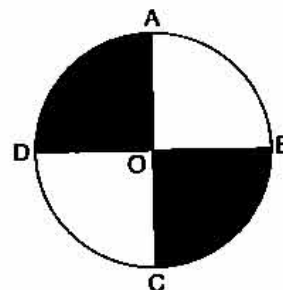
Ans.

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

Area of shaded portion = 2 quadrant

$$\begin{aligned}
 &= \frac{1}{2} \times \pi r^2 \\
 &= \frac{1}{2} \times 3.14 \times (8)^2
 \end{aligned}$$

$$= 100.48 \text{ cm}^2 \quad \text{Ans.}$$



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

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.

$$4x^2 - 7x + 2 = 0$$

[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 :**

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

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

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

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

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

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

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

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

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

Ans.

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

Ans.

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

Taking +ve sign

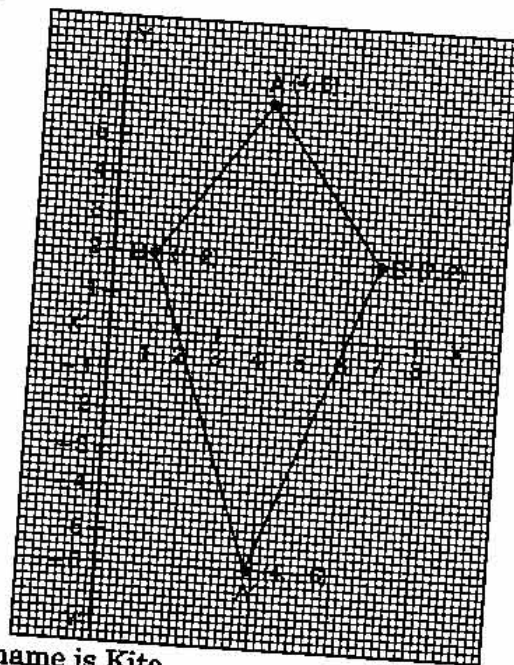
$$x = \frac{7 + 4.123}{8} = \frac{11.123}{8} = 13.9$$

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.**

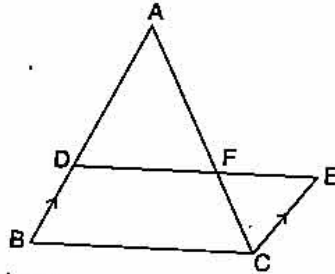
(a) In the given figure, ABC and CEF are two triangles where BA is parallel to CE and AF : AC = 5 : 8.

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

(ii) Find AD if CE = 6 cm.

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

[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  $\Delta ABC$  and  $\Delta CEF$ ,

BA  $\parallel$  CE (given)

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

and

$\Rightarrow$

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

$\Rightarrow$

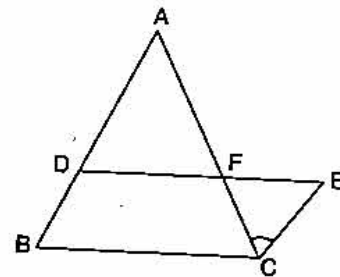
$$\frac{AF}{FC} = \frac{5}{3}$$

(i)

$\angle DAF = \angle FCE$

$\angle AFD = \angle CFE$

$\Delta ADF \sim \Delta CEF$



(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

$\Delta ADF \sim \Delta ABC$

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

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

**Ans.**

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

Proved

(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,  $A = 62.5$

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

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	—	1000.00	1000.00
Jan. 11, 2007	By Cheque	—	3000.00	4000.00
Feb. 3, 2007	By Cash	—	2500.00	6500.00
Feb. 7, 2007	To Cheque	2000.00	—	4500.00
March 3, 2007	By Cash	—	5000.00	9500.00
March 25, 2007	By Cash	—	2000.00	11,500.00
June 7, 2007	By Cash	—	3500.00	15000.00
Aug. 29, 2007	To Cheque	1000.00	—	14000.00

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



**Solution :**

(a) MV of 1 share = ₹ (100 + 20) = ₹ 120

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

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

Ans.

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

Dividend on 300 shares =  $15 \times 300$   
 $= ₹ 4,500$

Ans.

(iii) Rate of interest =  $\frac{4,500}{36,000} \times 100$   
 $= 12.5\%$

Ans.

(b) Given A = ₹ 9,261, T = 3 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
	<hr/>
	₹ 92,000

$$P = ₹ 92,000$$

$$T = 1 \text{ month}$$

$$R = 4.5\%$$

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

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

$$= ₹ 345$$

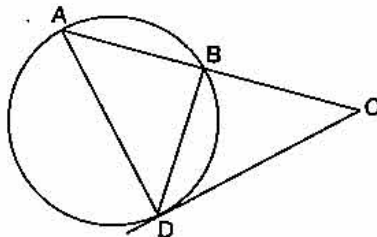
Ans.

**Question 8.**

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

Using Componendo and Dividendo find  $a : b$ .

[3]



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

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

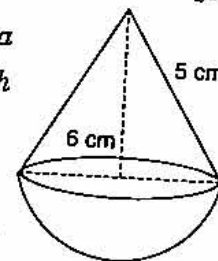
(ii) Find the length of  $CD$ .

[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.

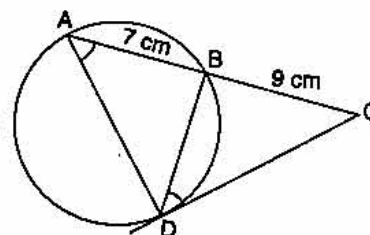
(i) In  $\Delta ACD$  and  $\Delta DCB$ ,

$$\angle C = \angle C$$

(common)

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

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



Ans.

Proved

(ii)  $AC \times BC = CD^2$  ( $\because \Delta ACD \sim \Delta DCB$ )

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

$CD = 12 \text{ cm.}$

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

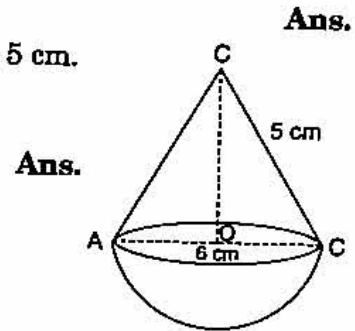
(i)  $OD^2 = DB^2 - OB^2$   
 $= 25 - 9 = 16$

$OD = 4 \text{ cm}$

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

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

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



**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 :

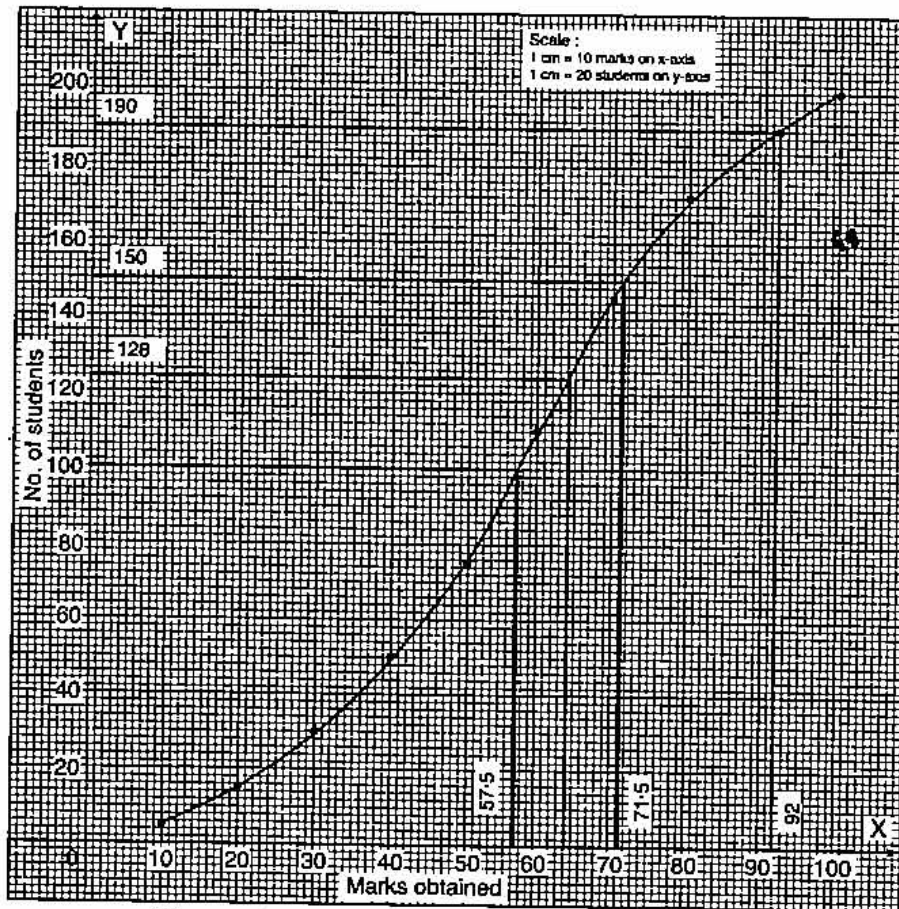
- (i) the Median
- (ii) the Upper Quartile
- (iii) Number of students scoring above 65 marks.
- (iv) If 10 students qualify for merit scholarship, find the minimum marks required to qualify. [6]

(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  $30^\circ$  and  $60^\circ$  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)

$$\therefore \text{Median} = \left(\frac{n}{2}\right)^{\text{th}} \text{ term} = 100^{\text{th}} \text{ term.}$$

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.

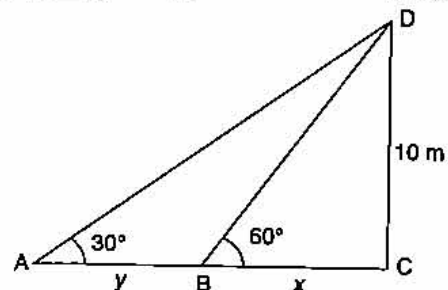
(b) In  $\Delta DBC$ ,

$$\tan 60^\circ = \frac{10}{x}$$

$$\Rightarrow \sqrt{3} = \frac{10}{x}$$

$$\Rightarrow x = \frac{10}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{10\sqrt{3}}{3} \text{ m}$$



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

**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

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

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

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

$$\begin{aligned} \text{Maturity value} &= ₹ 36,000 + 4,440 \\ &= ₹ 40,440 \end{aligned}$$

**Ans.**

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

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

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

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

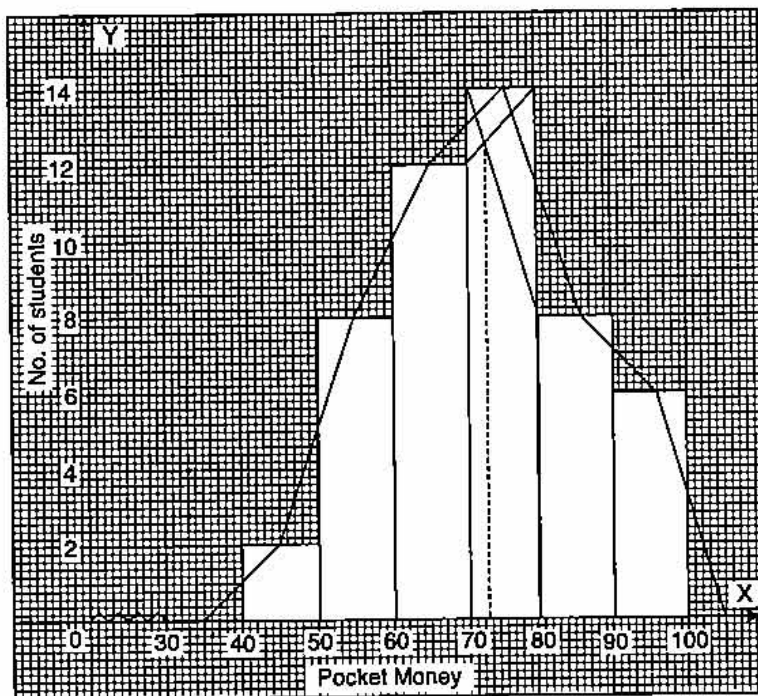
$$\Rightarrow y = 7(x - 5)$$

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

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

**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  $27\text{m}^3$ , 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,  $\frac{240}{x} = \frac{240}{x - 12} - 1$

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

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

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

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

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

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

either  $x - 60 = 0$  or  $x + 48 = 0$

$\Rightarrow x = 60$  or  $x = -48$

Ans.

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

(c) Steps of construction :

1. Draw  $\Delta ABC$  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.

