

PART-III - MATHEMATICS

ANSWER KEY.

PART-I

1. c) 12
2. d)  $2^{pq}$
3. d) 11
4. b) an Arithmetic progression.
5. a)  $\frac{9y}{7}$
6. c) Parabola.
7. c)  $LB = LD$
8. b) Point of contact.
9. c)  $\infty$
10. a)  $\frac{3}{2}$
11. a) 12 cm
12. d) 3:1:2
13. a) 37
14. c)  $\frac{23}{26}$

PART-II

15.  $A = \{3, 4\}$        $B = \{-2, 0, 3\}$

16.  $f(2k-1) = 5$

$$2(2k-1) - 1 = 5$$

$$4k - 2 - 1 = 5$$

$$k = 2.$$

17.  $\frac{x+12}{x+6} = \frac{x+15}{x+12}$

$$(x+12)^2 = (x+15)(x+6)$$

$$3x = -54$$

$$x = -18$$

18.  $\frac{x+2}{4y} \times \frac{12y^2}{(x-3)(x+2)}$        $\begin{array}{c} \textcircled{-b} \\ \swarrow \quad \searrow \\ -3 \quad +2 \end{array}$

$$= \frac{3y}{x-3}$$

19.  $2x^2 - x - 1 = 0$        $a = 2, b = -1, c = -1$

$$\Delta = b^2 - 4ac$$

$$\Delta = (-1)^2 - 4(2)(-1) = 1 + 8 = 9 > 0$$

$\therefore$  Roots are real and unequal.

20.  $\frac{AB}{AC} = \frac{BD}{DC}$

$$\frac{10}{14} = \frac{x}{6-x}$$

$$12x = 30$$

$$x = 2.5$$

$$BD = 2.5 \text{ cm}, \quad DC = 6 - 2.5 = 3.5 \text{ cm}.$$

$$21. \frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$$

$$\frac{y-(-4)}{11-(-4)} = \frac{x-(-6)}{5-(-6)}$$

$$\Rightarrow 15x - 11y + 46 = 0$$

$$22. (P+3)x + 12y - 12 = 0 \quad ; \quad 12x - 7y - 16 = 0$$

$$m_1 = -\frac{(P+3)}{12}$$

$$m_2 = \frac{-12}{-7}$$

$$\frac{-(P+3)}{12} \times \frac{12}{7} = -1$$

$$P = -7 - 3 = -10.$$

$$\boxed{P = -10}$$

$$23. \frac{\cos \theta \times \sec \theta - \sin^2 \theta}{\sin \theta \cos \theta} = \frac{1 - \sin^2 \theta}{\sin \theta \cos \theta} = \frac{\cos^2 \theta}{\sin \theta \cos \theta} = \cot \theta.$$

$$24. r = 7 \text{ m} \quad h = 24 \text{ m} \quad d = \sqrt{r^2 + h^2} = 25$$

$$\text{CSA} = \pi r l \text{ sq. units} = 550 \text{ m}^2.$$

$$\text{length of canvas} = \frac{550}{4} = 137.5 \text{ m}^2.$$

$$25. \frac{r_1}{r_2} = \frac{4}{7} \quad \frac{v_1}{v_2} = \frac{\frac{4}{3} \pi r_1^3}{\frac{4}{3} \pi r_2^3} = \frac{r_1^3}{r_2^3} = \frac{64}{343}$$

$$26. \text{Range } R = L - S = 62$$

$$\text{Co-efficient of range} = \frac{L-S}{L+S} = \frac{62}{188} = 0.33$$

$$27. P(A) = 0.5, \quad P(A \cap B) = 0.3 \quad P(A \cup B) \leq 1 \quad P(A) + P(B) - P(A \cap B) \leq 1$$

$$\Rightarrow 0.5 + P(B) - 0.3 \leq 1 \Rightarrow P(B) \leq 1 - 0.2 \Rightarrow P(B) \leq 0.8$$

$$28. 315000 = 3^2 \times 7^1 \times 5^4 \times 2^3$$

$$P = 3, \quad q = 7, \quad r = 5, \quad s = 2.$$

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$$f(x) = \frac{x}{2} - 1$$

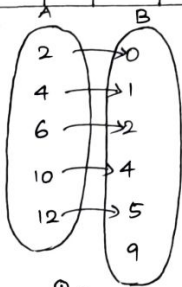
$$f(2) = \frac{2}{2} - 1 = 1 - 1 = 0$$

(i) set of ordered pairs  $\{(2,0), (4,1), (6,2), (10,4), (12,5)\}$

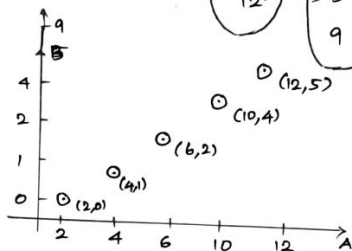
(ii) table

x	2	4	6	10	12
y	0	1	2	4	5

(iii) Arrow diagram



(iv)



30. Let Senthil's house number be  $x$

$$1+2+3+\dots+(x-1) = (x+1)(x+2)+\dots+49$$

$$\frac{x(x-1)}{2} = (1+2+\dots+49) - (1+2+3+\dots+x)$$

$$\frac{x(x-1)}{2} = \frac{49 \times 50}{2} - \frac{x(x+1)}{2}$$

$$x^2 - x = 2450$$

$$\boxed{x = 35}$$

31.

$$5+55+555+\dots$$

$$= \frac{5}{9} [9+99+999+\dots]$$

$$= \frac{5}{9} \left[ \frac{10(10^n-1)}{10-1} - n \right]$$

$$= \frac{50}{81} [10^n - 1] - \frac{5n}{9}$$

32

$$2x - 3y = -20 \quad \text{---(1)}$$

$$x - 2z = -15 \quad \text{---(2)}$$

$$x + y + z = 90 \quad \text{---(3)}$$

$$3x + 2y = 165 \quad \text{---(4)}$$

$$x = 35 ; y = 30 ; z = 25.$$

33

$$AB = \begin{pmatrix} 52 & 30 \\ 43 & 3 \end{pmatrix}$$

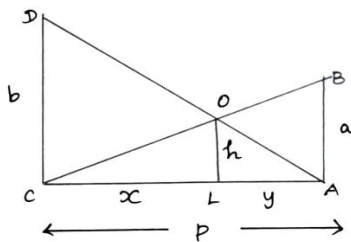
$$(AB)^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix}$$

$$B^T = \begin{pmatrix} 1 & 1 & 5 \\ 7 & 2 & -1 \end{pmatrix}$$

$$A^T = \begin{pmatrix} 5 & 1 \\ 2 & 2 \\ 9 & 8 \end{pmatrix}$$

$$B^T A^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix}$$

34



$$x + y = p$$

$$\triangle CAB \sim \triangle CLO$$

$$\frac{CA}{CL} = \frac{AB}{LO} ; \frac{p}{x} = \frac{a}{h}$$

$$\Rightarrow x = \frac{ph}{a} \dots (1)$$

$$\triangle ALO \sim \triangle ACD$$

$$\frac{AL}{AC} = \frac{LO}{DC} \Rightarrow \frac{y}{p} = \frac{h}{b}$$

$$\Rightarrow y = \frac{ph}{b} \dots (2)$$

①+② we get

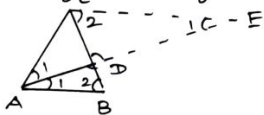
$$p = h \left( \frac{a+b}{ab} \right)$$

$$\therefore h = \frac{ab}{a+b}$$

35. Angle Bisector Theorem.

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing the angle.

$$\frac{AB}{AC} = \frac{BD}{CD}$$

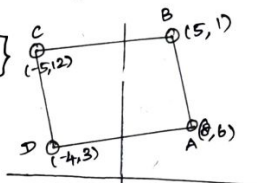


36. Area of quadrilateral =  $\frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 & x_4 \\ y_1 & y_2 & y_3 & y_4 \end{vmatrix}$

$$= \frac{1}{2} \left\{ (88 + 60 - 15 - 24) - (30 - 55 - 48 + 24) \right\}$$

$$= \frac{1}{2} \{ 109 + 49 \}$$

$$= 79 \text{ sq. units.}$$



37.  $x - 2y + 3 = 0 \dots (1)$

$7x - 3y + 12 = 0 \dots (2)$

solving (1) and (2)  $y = \frac{+9}{11}$

$$x = \frac{+18}{11} - 3$$

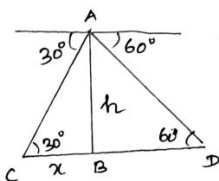
$$x = \frac{+18 - 33}{11} \Rightarrow x = \frac{-15}{11}$$

straight line parallel to x-axis

$$y = c$$

$$y = \frac{9}{11}$$

38.



In  $\triangle ABC$   
 $\tan 30^\circ = \frac{AB}{BC}$   
 $x = \sqrt{3}h$

In  $\triangle ABD$   
 $\tan 60^\circ = \frac{AB}{BD}$   
 $y = \frac{h}{\sqrt{3}}$

$$CD = CB + BD = x + y = \sqrt{3}h + \frac{h}{\sqrt{3}}$$

$$\boxed{CD = \frac{4h}{\sqrt{3}}}$$

39.

$$r : h = 5 : 7$$

$$r = 5x$$

$$h = 7x$$

$$CSA = 2\pi rh$$

$$5500 = 2 \times \frac{22}{7} \times 5x \times 7x$$

$$\Rightarrow x = 5$$

$$r = 5x = 5 \times 5 = 25 \text{ cm.}$$

$$h = 7x = 7 \times 5 = 35 \text{ cm}$$

40.

Area for one person = 150

Total base area =  $150 \times 4 = 600$

$$\pi r^2 = 600$$

Volume of air required for 1 person =  $40 \text{ m}^3$

Total Volume of air required for 150 person =  $150 \times 40 = 6000 \text{ m}^3$ .

$$\pi r^2 h_1 + \frac{1}{3} \pi r^2 h_2 = 6000$$

$$\pi r^2 \left[ h_1 + \frac{1}{3} h_2 \right] = 6000$$

$$600 \left[ 8 + \frac{1}{3} h_2 \right] = 6000$$

$$\boxed{h_2 = 6 \text{ m}}$$

41.

$$S = \left\{ (1, 1), (1, 2) \dots (1, b) \right. \\ \left. (2, 1), (2, 2) \dots (2, b) \right. \\ \vdots \\ \left. (b, 1) \dots (b, b) \right\}$$

$$n(S) = 36$$

$$(i) n(A) = b$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{b}{36} = \frac{1}{6}$$

$$(ii) n(B) = b$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{b}{36} = \frac{1}{6}$$

$$(iii) n(C) = 15$$

$$P(C) = \frac{n(C)}{n(S)} = \frac{15}{36}$$

$$(iv) n(D) = \{3\}$$

$$P(D) = 0$$

$$42. A = \{0, 1, 2\}$$

$$B = \{2, 3, 4, 5\}$$

$$C = \{3, 5, 7\}$$

$$B \cup C = \{2, 3, 4, 5, 7\}$$

$$A \times (B \cup C) = \{ (0, 2), (0, 3), (0, 4), (0, 5), (0, 7), \\ (1, 2), (1, 3), (1, 4), (1, 5), (1, 7), \\ (2, 2), (2, 3), (2, 4), (2, 5), (2, 7) \}$$

$$A \times B = \{ (0, 2), (0, 3), (0, 4), (0, 5), (1, 2), (1, 3), (1, 4), (1, 5), \\ (2, 2), (2, 3), (2, 4), (2, 5) \}$$

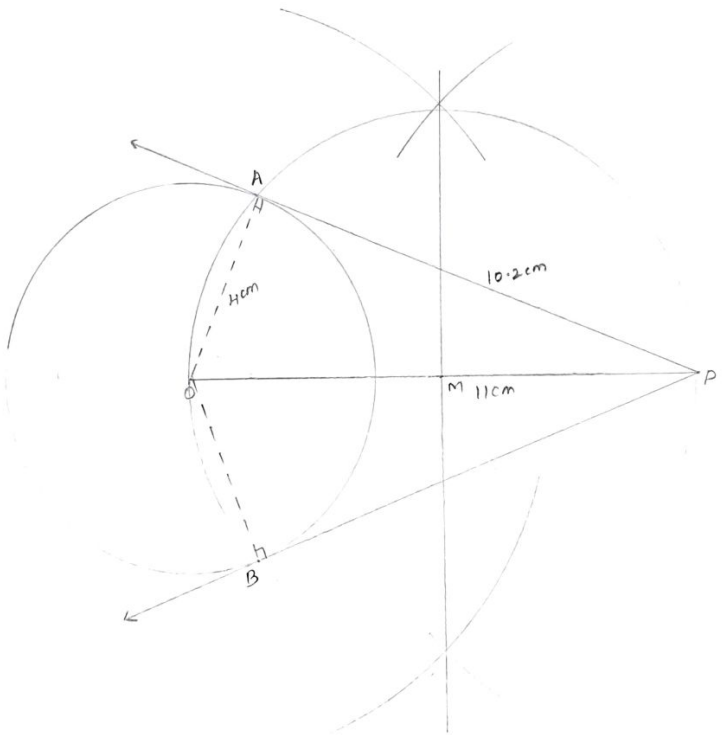
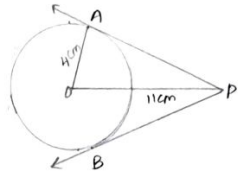
$$A \times C = \{ (0, 3), (0, 5), (0, 7), (1, 3), (1, 5), (1, 7), (2, 3), \\ (2, 5), (2, 7) \}$$

$$(A \times B) \cup (A \times C) = \{ (0, 2), (0, 3), (0, 4), (0, 5), (0, 7), \\ (1, 2), (1, 3), (1, 4), (1, 5), (1, 7), \\ (2, 2), (2, 3), (2, 4), (2, 5), (2, 7) \}$$



43  
(a)

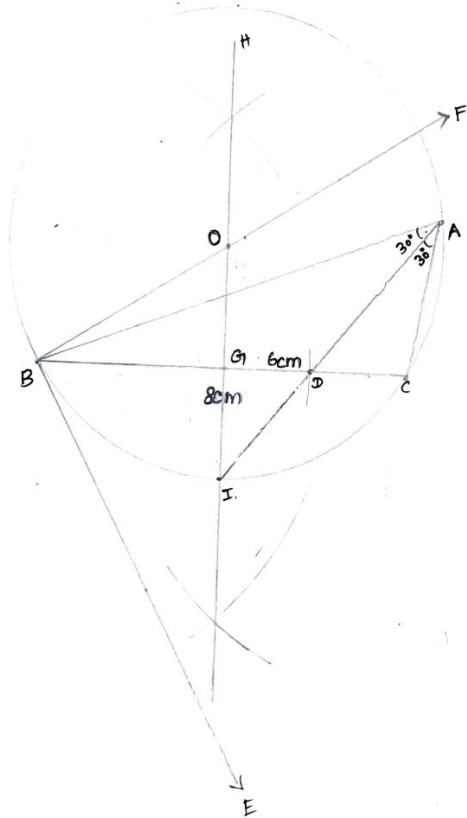
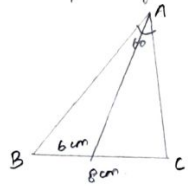
Rough diagram



$$\begin{aligned} PA &= \sqrt{OP^2 - OA^2} = \sqrt{11^2 - 4^2} \\ &= \sqrt{121 - 16} \\ &= \sqrt{105} \\ &\approx 10.2 \text{ cm.} \end{aligned}$$

43  
(b)

Rough diagram



$x$  increases  $y$  also increases.

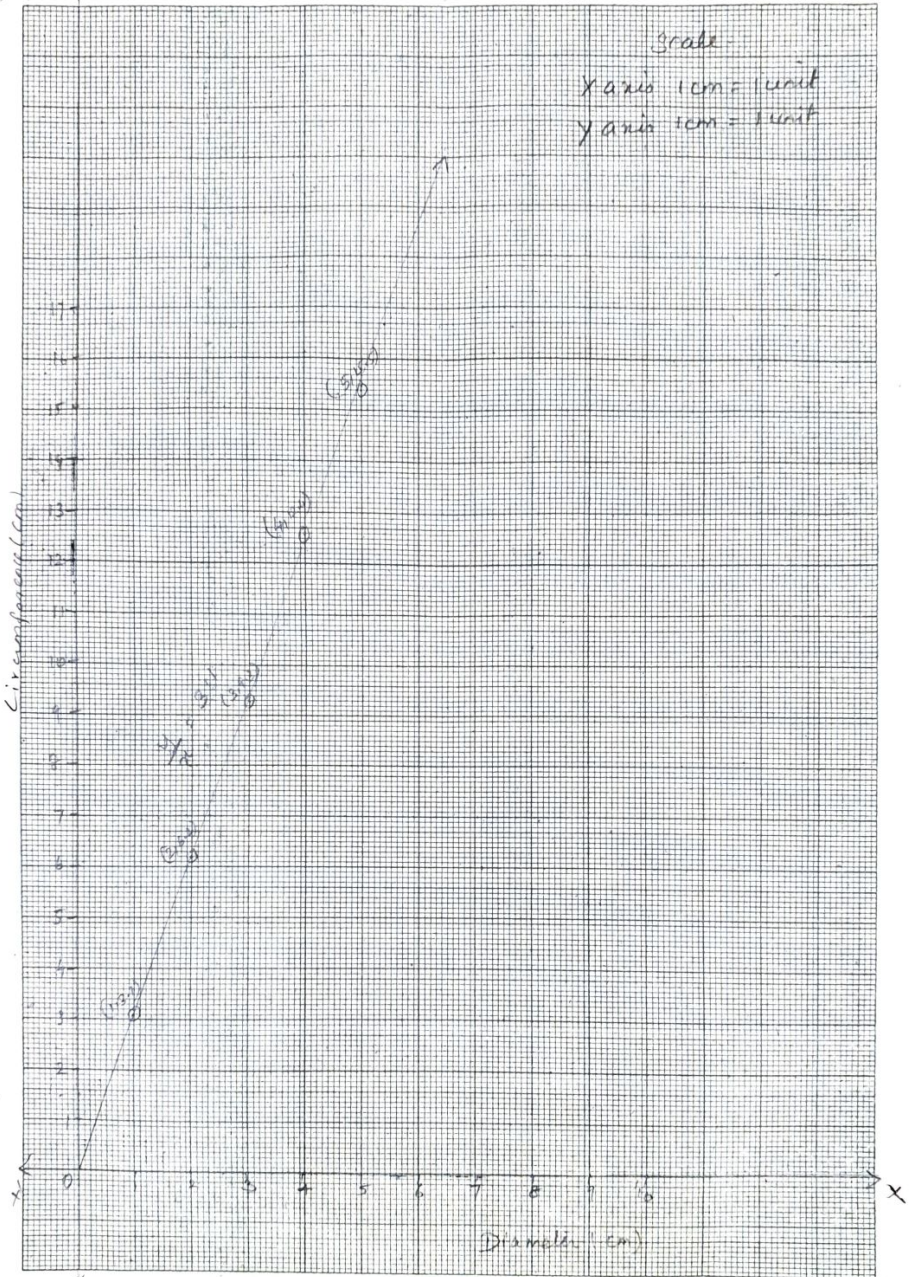
$\therefore$  direct variation.

$$y = kx.$$

$$k = \frac{3 \cdot 1}{1} = \frac{6 \cdot 2}{2} = \frac{9 \cdot 3}{3} = \frac{12 \cdot 4}{4} \dots = 3 \cdot 1$$

$$\therefore y = (3 \cdot 1)x.$$

44) a)  $\rightarrow$



$\rightarrow$

$$y = x^2 - 5x - 6$$

$x$	-5	-4	-3	-2	-1	0	1	2	3	4
$x^2$	25	16	9	4	1	0	1	4	9	16
$-5x$	25	20	15	10	5	0	-5	-10	-15	-20
$-6$	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6
$y = x^2 - 5x - 6$	44	30	18	8	0	-6	-10	-12	-12	-10

$(-5, 44)$   $(-4, 30)$   $(-3, 18)$   $(-2, 8)$   $(-1, 0)$   $(0, -6)$   
 $(1, -10)$   $(2, -12)$   $(3, -12)$   $(4, -10)$

$$y = x^2 - 5x - 6$$

$$0 = x^2 - 5x - 14$$

$$y = \frac{\quad}{8}$$

is straight line parallel to  $x$  axis.

Solution  $\{-2, 7\}$ .

4a b)

y'

Scale:  
x axis 1cm = 1 unit  
y axis 1cm = 2 units

(-4, 10)

(-3, 8)

$y - 10 = 5(x + 4) - 6$

(-2, 6)

y = 8

(2, 8)

(-1, 2)

(0, 0)

(1, -2)

(2, -3)

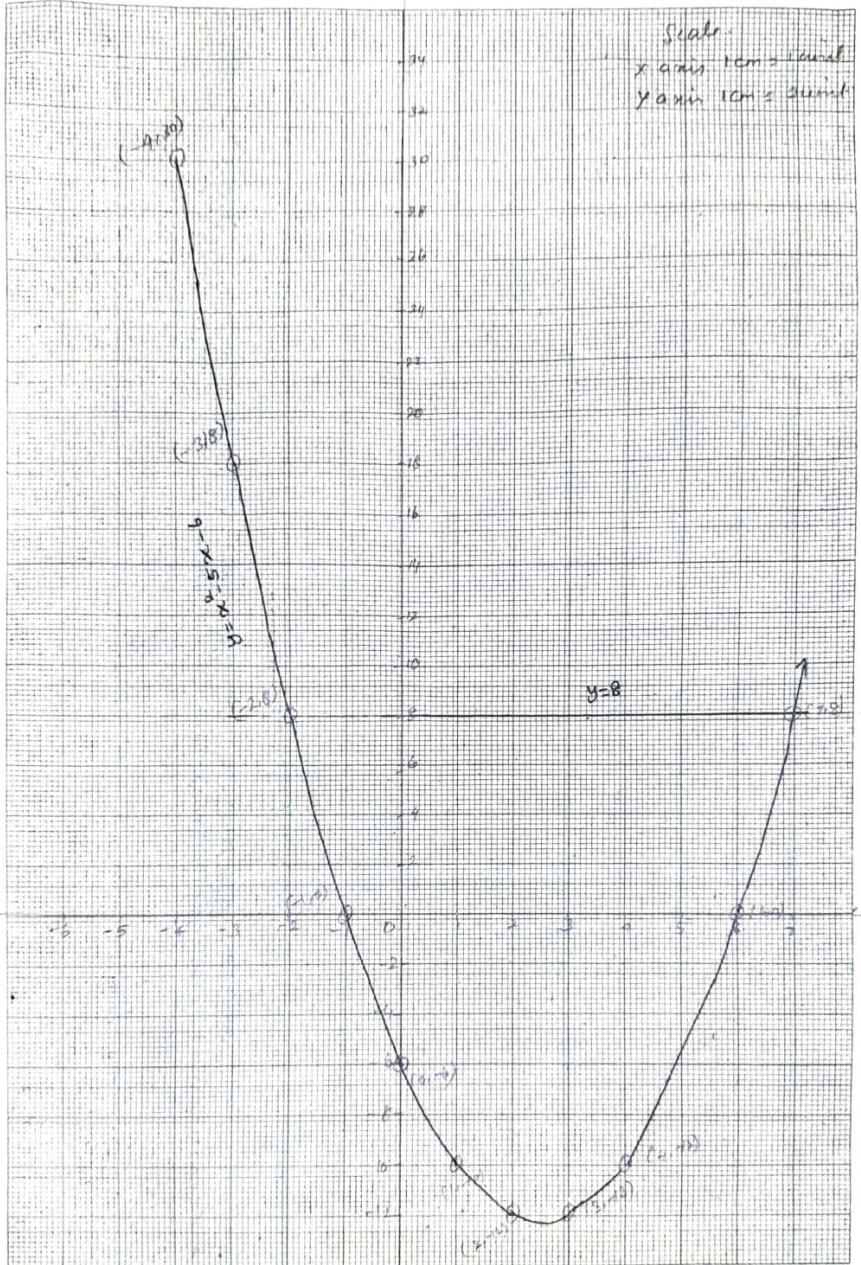
(3, -2)

(4, 0)

(5, 2)

x

y'




PREPARED BY:

1. KATHIRESAN.T (BT ASSISTANT)
2. MEHARAJ BEGAM.A (BT ASSISTANT)
3. SATHYAMEENAKSHI.M (BT ASSISTANT)
4. KRISHNAMOORTHY.S (BT ASSISTANT)

MUTHUTHEVAR MUKKULATHORE HR SEC SCHOOL.  
MADURAI



  
P. ANAND, M.A., M.Ed., DCA.,  
HEAD MASTER  
Muthuthevar Mukkulathore Hr. Sec. School  
Thirunagar, MADURAI - 625 006