

TENTH PUBLIC EXAM-2023

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) ∞
10. a) $\frac{3}{2}$
11. a) 12 cm
12. d) 3:1:2
13. a) 37
14. c) $\frac{23}{26}$

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

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

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

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

$$k = 2.$$

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

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

$$3x = -54$$

$$x = -18$$

$$18. \quad \frac{x+2}{4y} \times \frac{12y^2}{(x-3)(x+2)} \quad \begin{array}{c} (-6) \\ \swarrow \quad \searrow \\ -3 \quad +2 \end{array}$$

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

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

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

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

\therefore Roots are real and unequal.

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

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

$$12x = 30$$

$$x = 2.5$$

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

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

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

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

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

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

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

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

$$P = -7 - 3 = -10. \quad \boxed{P = -10}$$

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

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

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

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

$$25. \frac{r_1}{r_2} = \frac{4}{7} \quad \frac{V_1}{V_2} = \frac{\frac{4}{3} \pi r_1^3}{\frac{4}{3} \pi r_2^3} = \frac{r_1^3}{r_2^3} = \frac{64}{343}$$

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

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

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

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

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

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

29

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

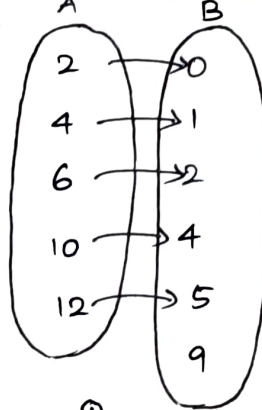
$$f(2) = \frac{2}{2} - 1 = 1 - 1 = 0$$

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

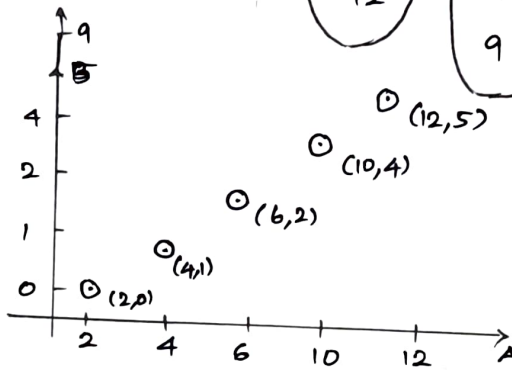
(ii) table

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

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

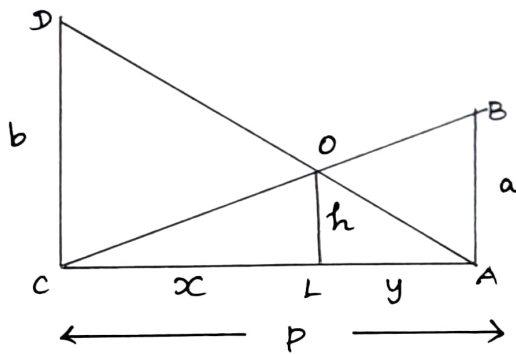
$$(AB)^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix}$$

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

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

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

34



$$x + y = p$$

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

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

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

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

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

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

①+② we get

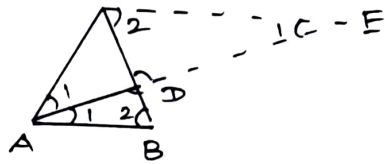
$$1 = h \left(\frac{a+b}{ab} \right)$$

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

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.

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

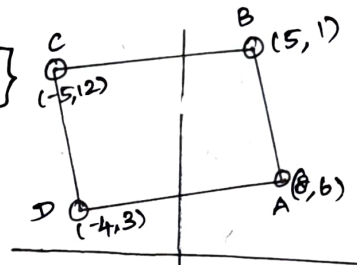


36. Area of quadrilateral = $\frac{1}{2} \begin{vmatrix} x_1 & x_2 & x_3 & x_4 \\ y_1 & y_2 & y_3 & y_4 \end{vmatrix}$

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

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

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



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

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

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

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

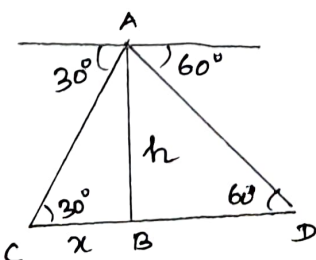
$$x = \frac{+18 - 33}{11} \Rightarrow x = \frac{-15}{11}$$

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 $\triangle ABD$

$$\tan 60^\circ = \frac{AB}{BD}$$

$$y = \frac{h}{\sqrt{3}}$$

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

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

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

$$\text{Total base area} = 150 \times 4 = 600$$

$$\pi r^2 = 600$$

Volume of air required for 1 person = 40 m^3

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

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

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

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

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

41.

$$S = \left\{ \begin{array}{l} (1, 1), (1, 2) \dots (1, b) \\ (2, 1), (2, 2) \dots (2, b) \\ \vdots \\ (b, 1) \dots (b, b) \end{array} \right\}$$

$$n(S) = 36$$

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

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

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

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

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

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

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

$$P(D) = 0$$

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

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

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

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

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

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

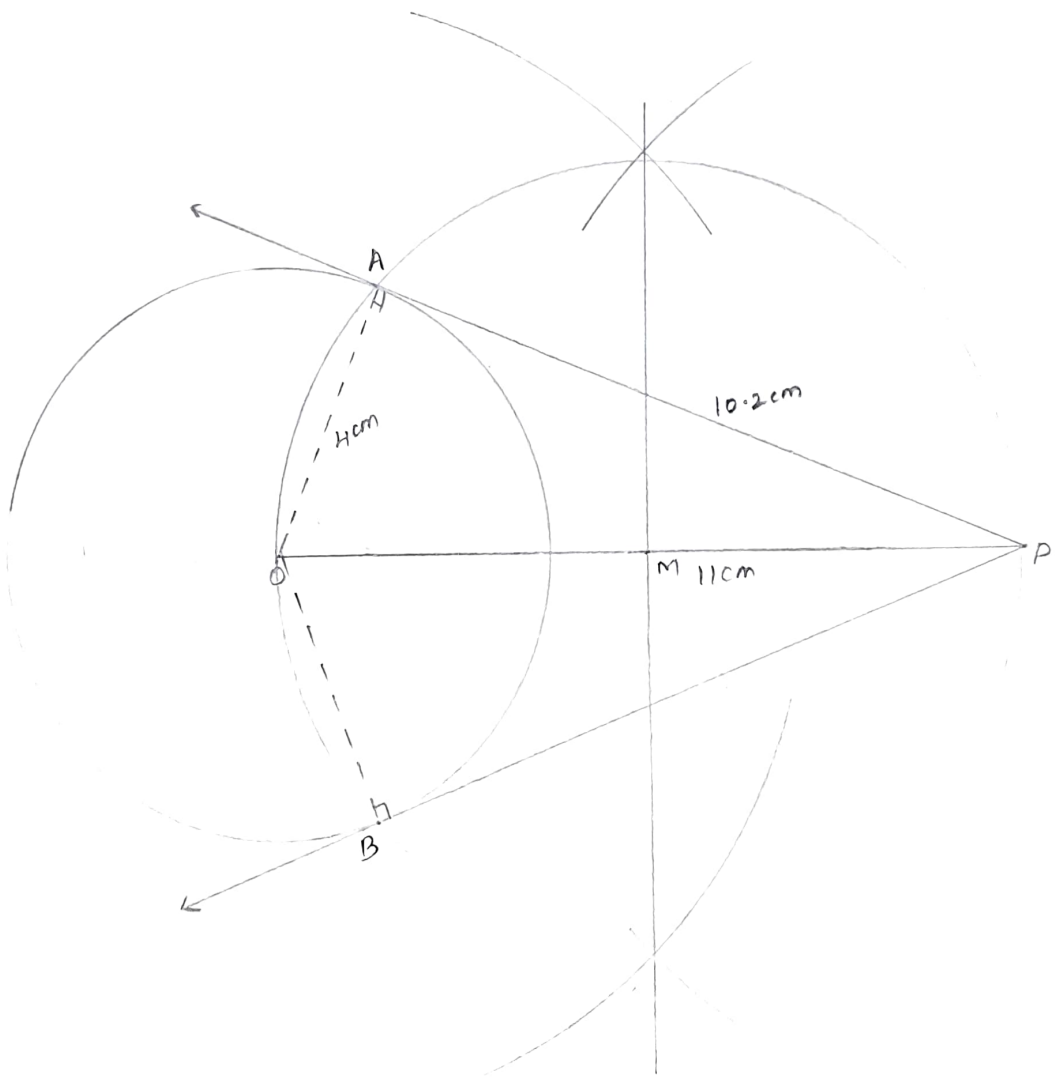
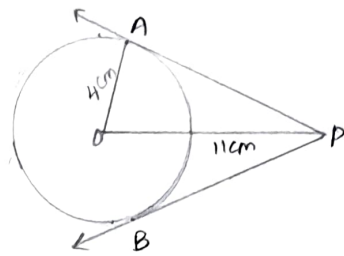
$$A \times C = \{ (0, 3), (0, 5), (0, 7), (1, 3), (1, 5), (1, 7), (2, 3) \\ (2, 5), (2, 7) \}$$

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

43

(a)

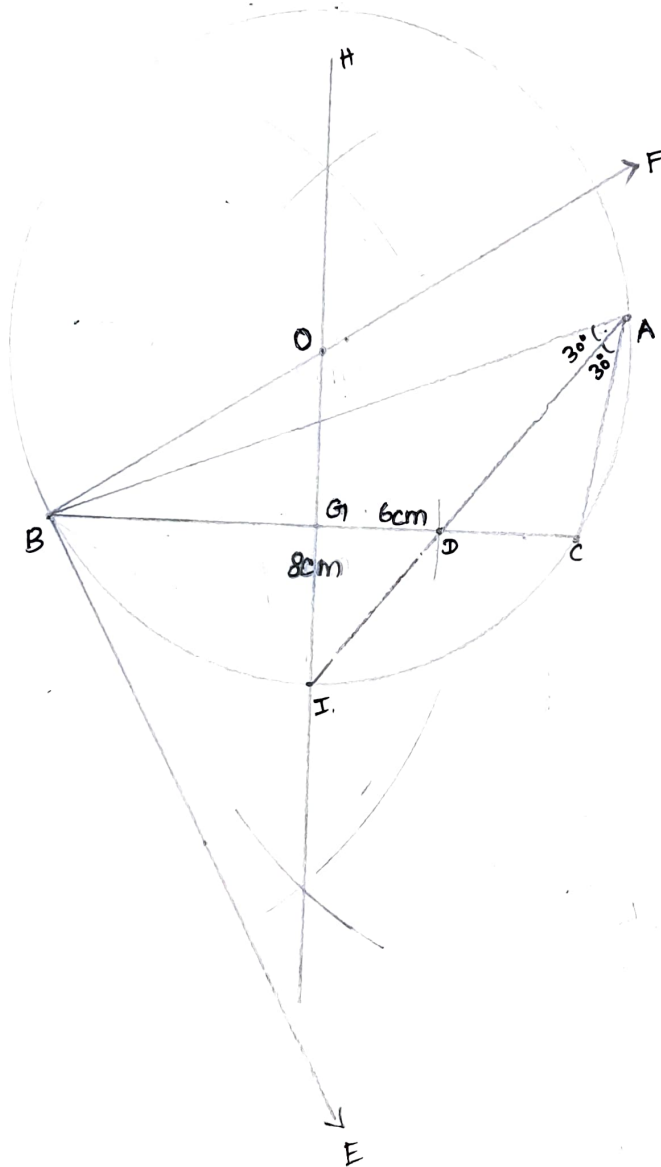
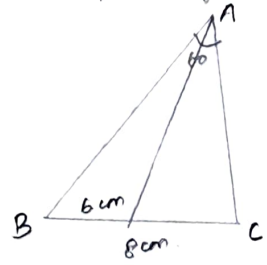
Rough diagram



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

43
(b)

Rough diagram



x increases y also increases.

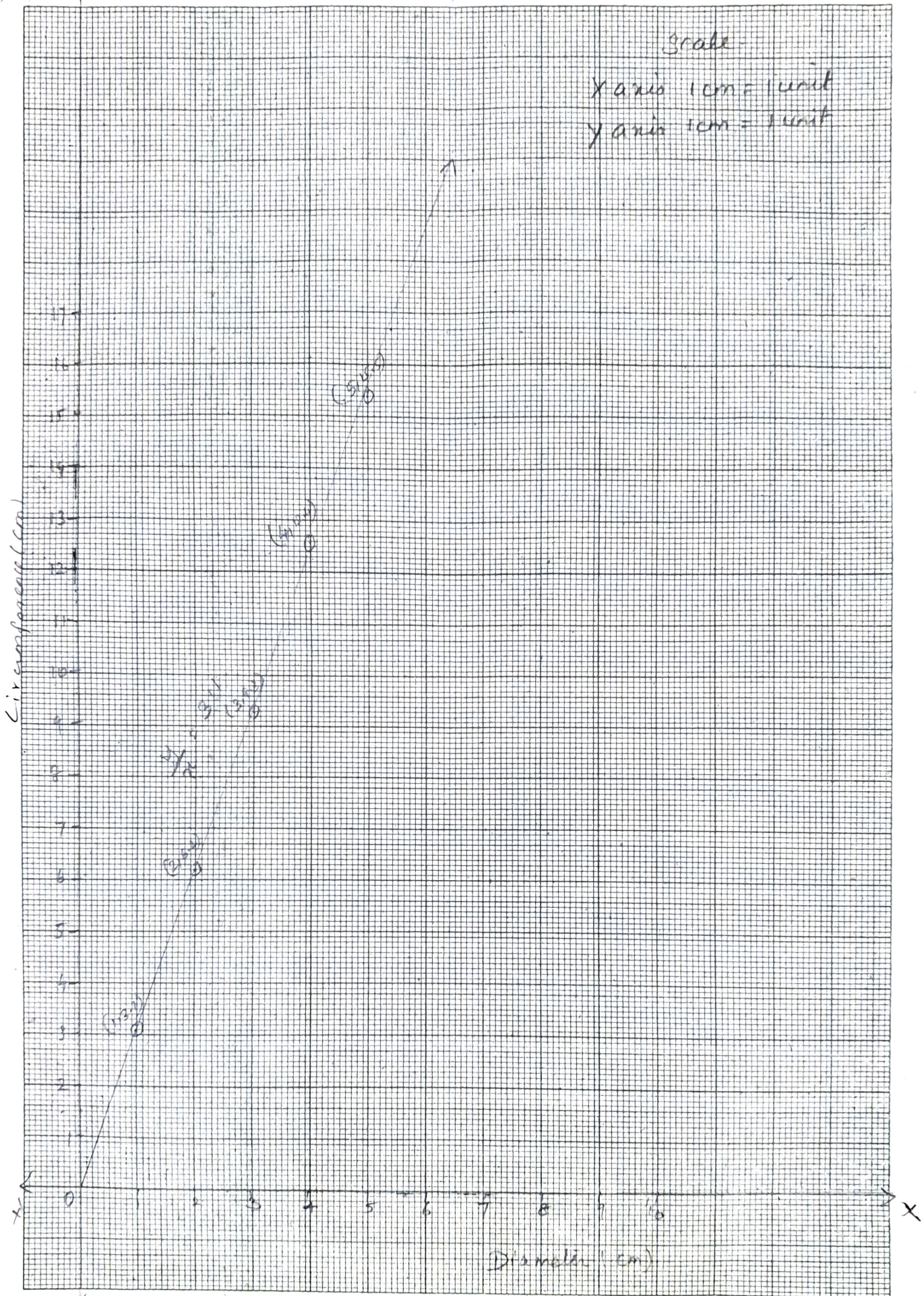
∴ direct variation.

$$y = kx.$$

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

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

44) a)



41

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

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

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

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

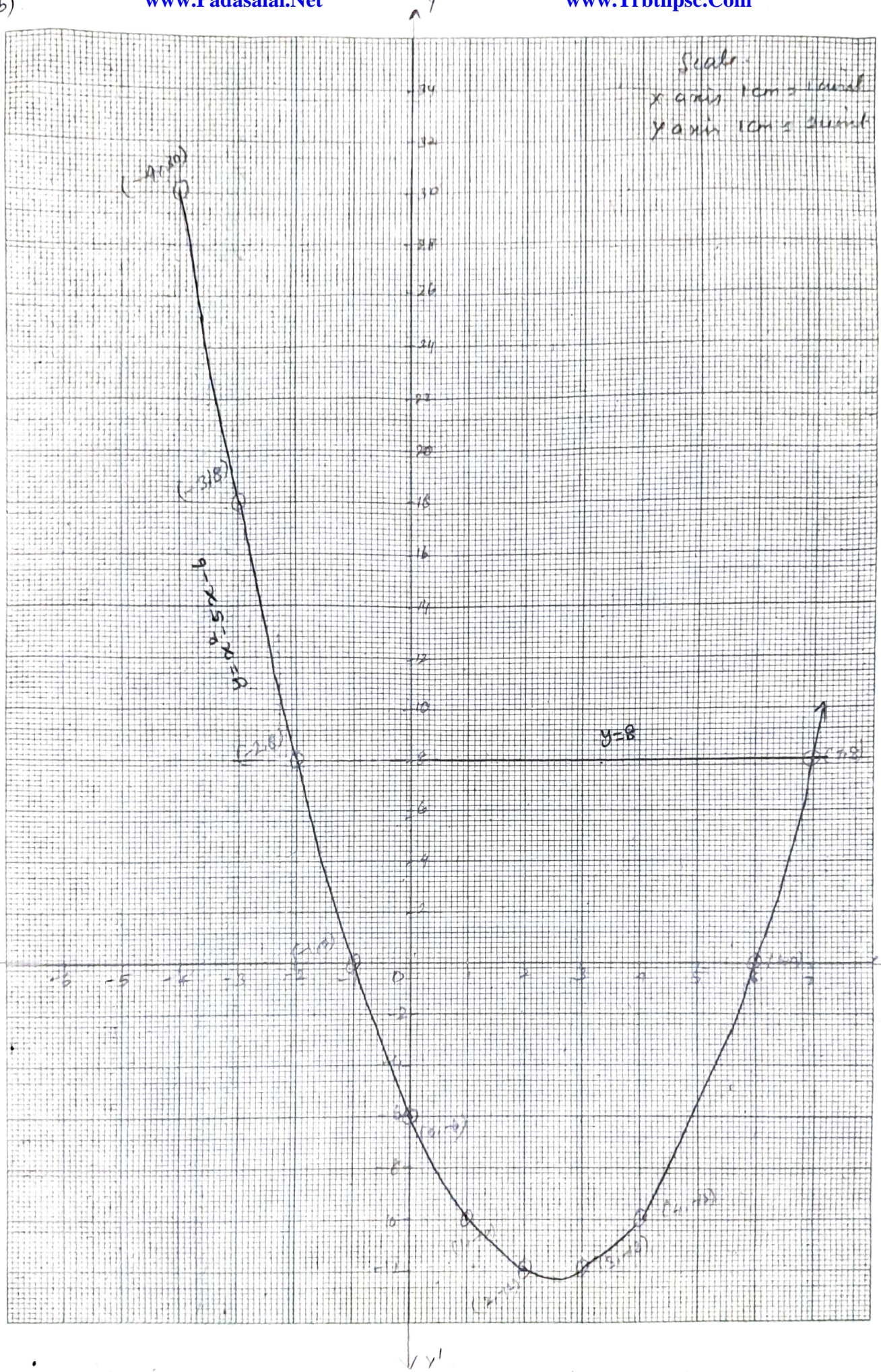
$$0 = x^2 - 5x - 14$$

$$y = \quad \quad \quad 8$$

is straight line parallel to
x axis.

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

4a b)

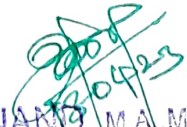


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