Solutions WORKSHEET No: 1 (Class No: 2)

STRAIGHT LINES

Ans: 1 Let the vertices are $A(4,4)$ $B(3,5)$, $C(-1,-1)$

Slope of $AB = \frac{5-4}{3-4} = -1$

Slope of $BC = \frac{-1-5}{-1-3} = \frac{-6}{-4} = \frac{3}{2}$

Slope of $AC = \frac{-1-4}{-1-4} = 1$

Clearly Slope of $AB \times$ Slope of $AC = -1$

$\therefore$ $AB \perp AC$

$\therefore$ A, B, C are the vertices of a right angled Triangle **Ans**

Ans: 2 → Let the points are $A(x,-1)$ $B(2,1)$ $C(4,5)$

Given: points A, B, C are collinear

$\therefore$ Slope of $AB =$ Slope of BC

$$\Rightarrow \frac{1-(-1)}{2-x} = \frac{5-1}{4-2}$$

$$\Rightarrow \frac{2}{2-x} = 2$$

$$\Rightarrow 2 = 4-2x$$

$$\Rightarrow 2x = 2$$

$$\Rightarrow \boxed{x=1}$$ **Ans**

Ans 3 → Let Slope of I^{st} line $= m$

$\therefore$ Slope of 2^{nd} line $= 2m$

given $\tan\theta = 1/3$

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$$

$$\Rightarrow \frac{1}{3} = \left|\frac{m - 2m}{1 + 2m^2}\right|$$

$$\Rightarrow \frac{1}{3} = \left|\frac{-m}{1+2m^2}\right|$$

$$\Rightarrow \frac{1}{3} = \frac{-m}{1+2m^2} \quad (\text{or}) \quad \cancel{-}\frac{1}{3} = \cancel{-}\frac{m}{1+2m^2}$$

$\Rightarrow 1 + 2m^2 = -3m$	$1 + 2m^2 = 3m$
$\Rightarrow 2m^2 + 3m + 1 = 0$	$2m^2 - 3m + 1 = 0$
$\Rightarrow 2m^2 + 2m + m + 1 = 0$	$2m^2 - 2m - m + 1 = 0$
$\Rightarrow 2m(m+1) + 1(m+1) = 0$	$2m(m-1) - 1(m-1) = 0$
$\Rightarrow m = -1 \;;\; m = -1/2$	$m = 1 \;;\; m = 1/2$
$2m = -2 \;;\; 2m = -1$	$2m = 2 \;;\; 2m = 1$

$\therefore$ Slope of lines are -1 & -2 (or) $-1/2$ & -1 (or) 1 & 2 (or) $1/2$ & 1 Ans

Ans 4 $\Rightarrow$ Given $a = b$

by Intercept form

$$\frac{x}{a} + \frac{y}{b} = 1$$

$$\Rightarrow \frac{x}{a} + \frac{y}{a} = 1$$

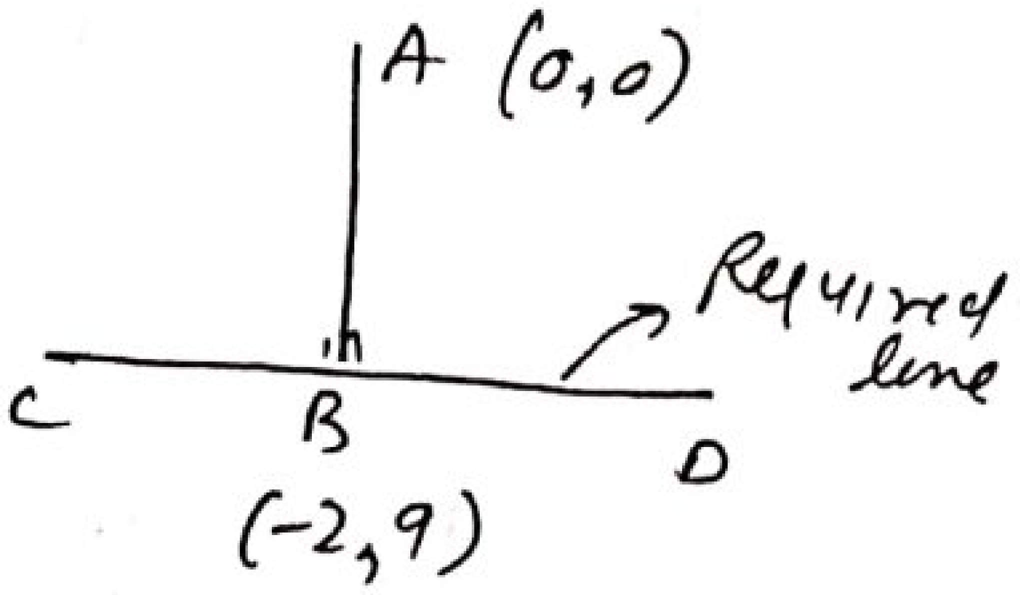
$$\Rightarrow x + y = a$$

this line passes through $(2,3)$

$$\therefore 2 + 3 = a \Rightarrow \boxed{a = 5}$$

$\therefore$ equation of line is $x+y=5$ Ans

Ques 5 →



Slope of $AB = \dfrac{0-9}{0+2} = \dfrac{-9}{2}$

Since $CD \perp AB$

$\therefore$ slope of $CD = \dfrac{2}{9}$ (-ve reciprocal)

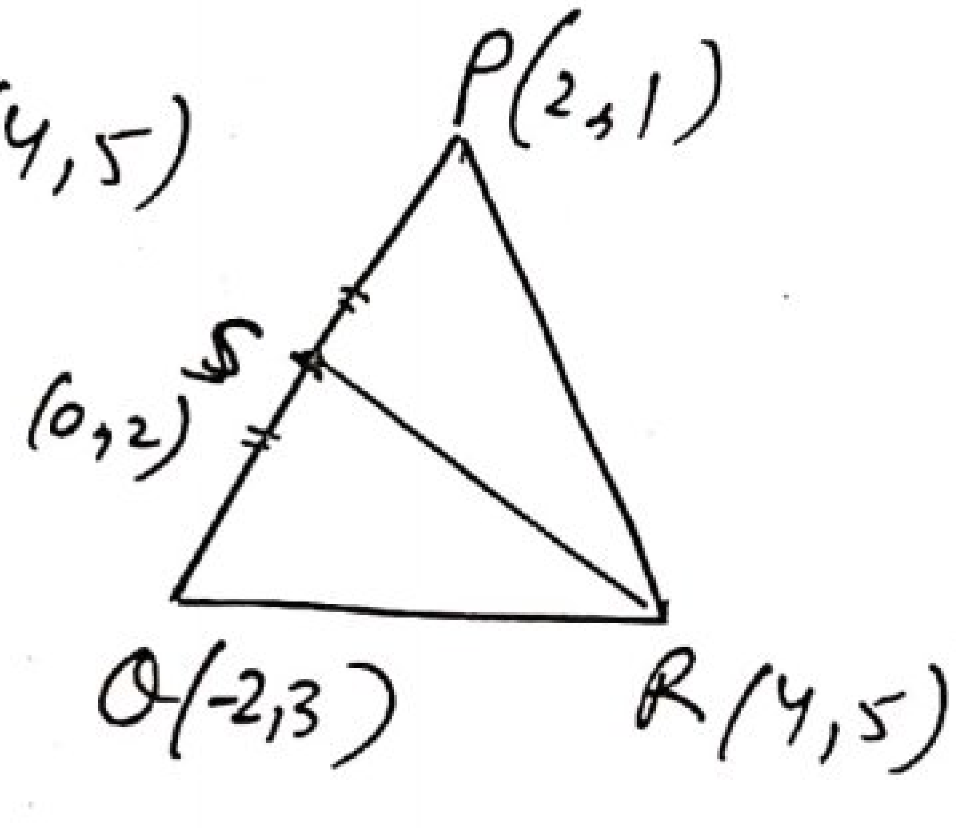
equation of CD (point slope form)

$y-9 = \dfrac{2}{9}(x+2)$

$\Rightarrow 9y - 81 = 2x+4$

$\Rightarrow 2x - 9y + 85 = 0$ Ans

Qn 6 → given vertices $P(2,1)$, $Q(-2,3)$ $R(4,5)$



S is the mid point of P & Q

$\therefore$ Coordinate of $S(0,2)$

equation of RS (two point form)

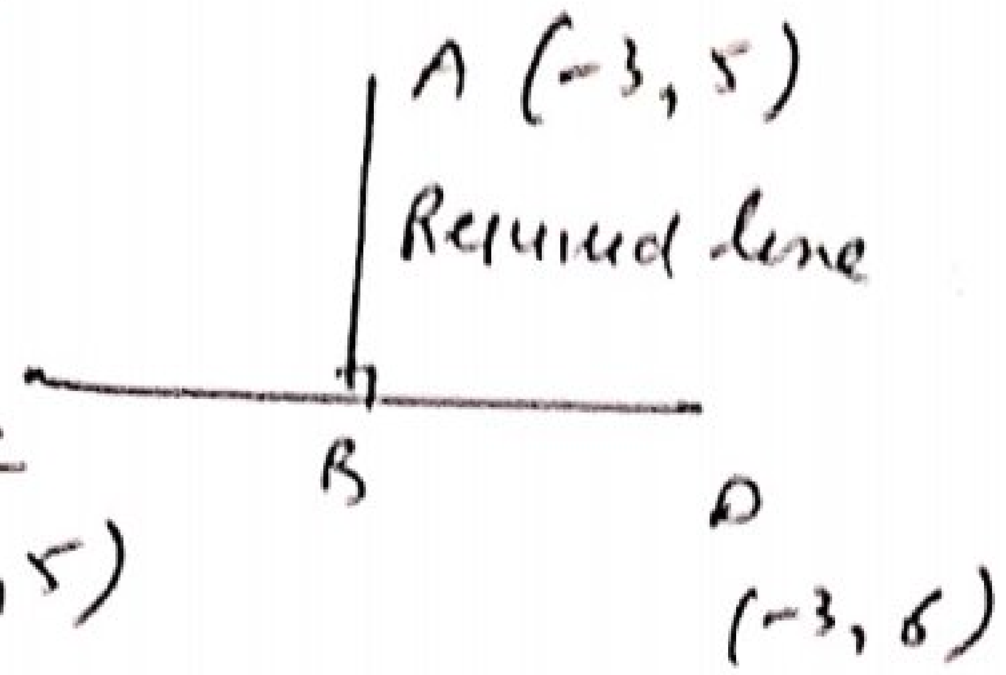
$y-5 = \dfrac{2-5}{0-4}(x-4)$

$y-5 = \dfrac{3}{4}(x-4)$

$\Rightarrow 4y - 20 = 3x - 12$

$\Rightarrow 3x - 4y + 8 = 0$ Ans

Ans = 7 →



Slope of CD = $\frac{6-5}{-3-2} = \frac{-1}{5}$

Since AB ⊥ CD

∴ slope of AB = 5 (-ve reciprocal)

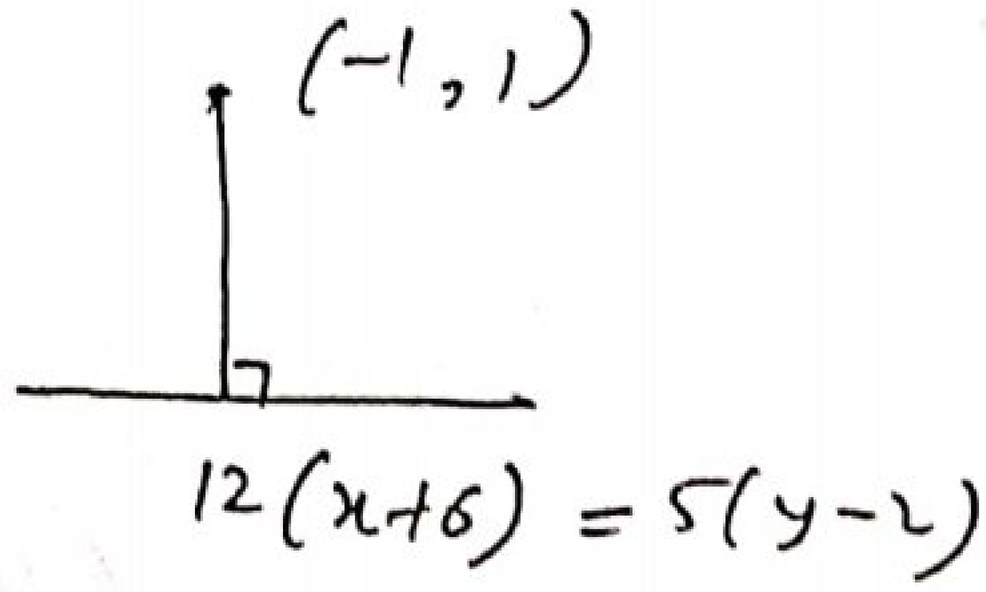
equation of AB (point slope form)

$y - 5 = 5(x+3)$

$\Rightarrow y - 5 = 5x + 15$

$\Rightarrow 5x - y + 20 = 0$ Ans

Ans 8 →



given: equation of line

$12(x+6) = 5(y-2)$

$\Rightarrow 12x + 72 = 5y - 10$

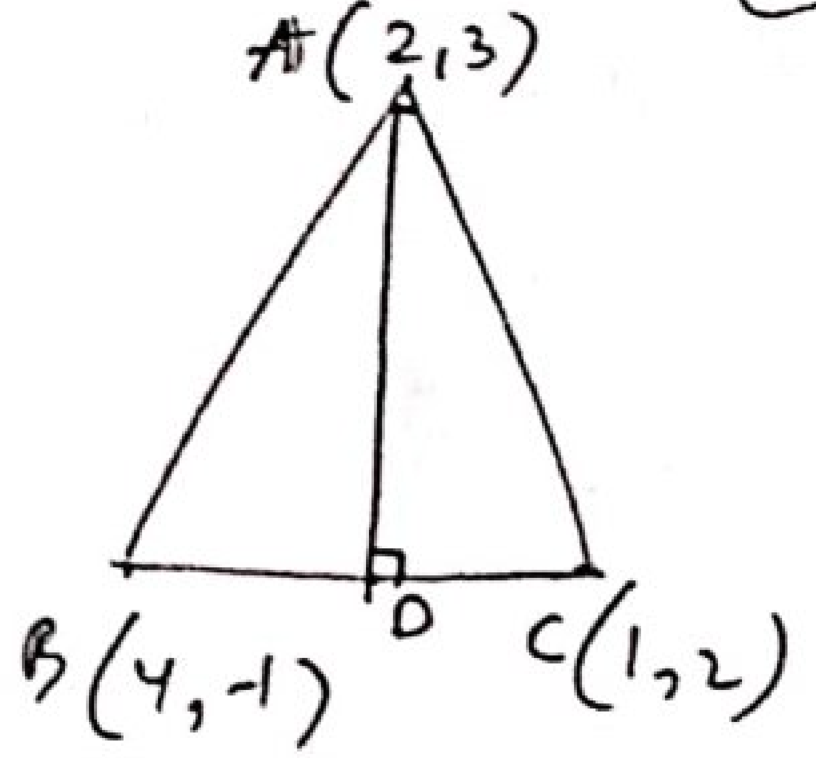
$\Rightarrow 12x - 5y + 82 = 0$

Distance $= \frac{|-12-5+82|}{\sqrt{144+25}}$

$= \frac{65}{13}$

= 5 units Ans

Ans 9 → given A (2,3) B(4,-1) C(1,2)



Slope of BC $= \frac{2-(-1)}{1-4} = \frac{3}{-3} = -1$

AD $\perp$ BC

$\therefore$ slope of AD $=$ 1 (-ve reciprocal)

Equation of AD (point slope form)

$y - 3 = 1(x-2)$

$\Rightarrow y - 3 = x - 2$

$\Rightarrow x - y + 1 = 0$ Ans

For length of AD : Find equation of BC

equation of BC (two point form)

$y + 1 = \frac{3}{-3}(x-4)$

$y + 1 = -x + 4$

$\Rightarrow x + y - 3 = 0$

Now AD is the $\perp^r$ distance b/w point A & line BC

$\therefore AD = \frac{|2+\cancel{3}-\cancel{3}|}{\sqrt{1+1}} = \frac{2}{\sqrt{2}} = \sqrt{2}$ units Ans

Ques 10 → Slope of line passing through the points (h,3) & (4,1) is $m_1 = \frac{1-3}{4-h} = \frac{-2}{4-h}$

Slope of line $7x - 9y - 19 = 0$ is $m_2 = -\frac{7}{-9} = \frac{7}{9}$

Since lines are perpendicular

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$\therefore m_1 m_2 = -1$

$$\left(\frac{-2}{4-h}\right)\left(\frac{7}{9}\right) = -1$$

$\Rightarrow$ $14 = 36 - 9h$

$\Rightarrow$ $9h = 22$

$\Rightarrow$ $\boxed{h = \frac{22}{9}}$ Ans

Ans 11 → let the point on y-axis as $(0, y)$

equation of given line: $\frac{x}{3} + \frac{y}{4} = 1$

$\Rightarrow 4x + 3y - 12 = 0$

distance = 4 units

$$\Rightarrow 4 = \frac{|0 + 3y - 12|}{\sqrt{16+9}}$$

$\Rightarrow$ $20 = |3y - 12|$

$\Rightarrow$ $20 = 3y - 12$ | $-20 = 3y - 12$

$\Rightarrow$ $3y = 32$ | $3y = -8$

$y = \frac{32}{3}$ | $y = \frac{-8}{3}$

$\therefore$ Required points on y-axis are $\left(0, \frac{32}{3}\right)$ & $\left(0, \frac{-8}{3}\right)$ Ans

Ans 12 → let the intercepts are a & b

given $a + b = 1$

$ab = -6$

$\Rightarrow a(1-a) = -6$

$\Rightarrow a - a^2 = -6$

$\Rightarrow a^2 - a - 6 = 0$

$\Rightarrow (a-3)(a+2) = 0$

$a = 3, \quad a = -2$

$\therefore b = -2, \quad b = 3$

$\therefore$ equations of lines are $\frac{x}{3} + \frac{y}{-2} = 1$ & $\frac{x}{-2} + \frac{y}{3} = 1$

$\Rightarrow -2x + 3y = -6$ & $3x - 2y = 6$

$\Rightarrow \boxed{2x - 3y = 6 \quad \& \quad 3x - 2y = 6}$ Ans

Ans 13 →

Given equation of line

$(k-3)x - (4-k^2)y + (k^2 - 7k + 6) = 0$

Slope of this line $= \frac{-(k-3)}{-(4-k^2)} = \frac{k-3}{4-k^2}$

(a) Slope of x-axis $= 0$

Since line $\parallel$ to x-axis

$\Rightarrow \frac{k-3}{4-k^2} = 0 \Rightarrow \boxed{k = 3}$

(b) Slope of y-axis $= \frac{1}{0}$

Since line $\parallel$ to y-axis

$\Rightarrow \frac{k-3}{4-k^2} = \frac{1}{0}$

$\Rightarrow 0 = 4 - k^2$

$\Rightarrow \boxed{k = \pm 2}$

(c) line passing through the origin

It satisfy equation of line

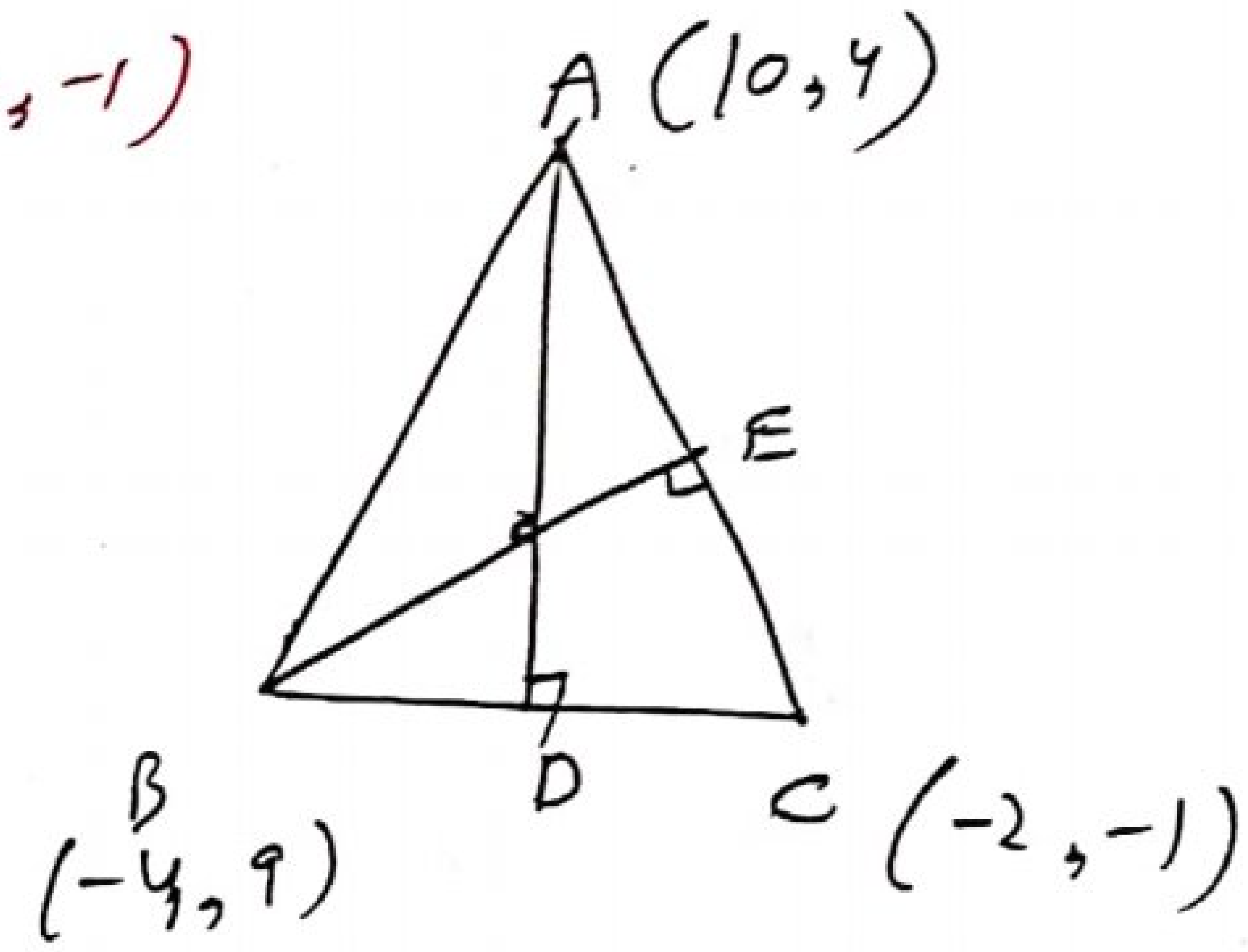
$\therefore \quad 0 - 0 + k^2 - 7k + 6 = 0$

$k^2 - 6k - k + 6 = 0$

$\Rightarrow (k-6)(k-1) = 0$

$k = 6 \quad ; \quad k = 1$ ANS

Qu. 14 → $A(10,4)$ $B(-4,9)$ $C(-2,-1)$



Slope of BC $= \frac{-10}{2} = -5$

$AD \perp BC$ $\therefore$ slope of $AD = \frac{1}{5}$

equation of AD (point slope form)

$y - 4 = \frac{1}{5}(x - 10)$

$\Rightarrow 5y - 20 = x - 10$

$\Rightarrow x - 5y = -10$ --- (1)

Slope of AC $= \frac{5}{12}$

$BE \perp AC$: slope of $BE = -\frac{12}{5}$

equation of BE (point slope form)

$y - 9 = \frac{-12}{5}(x + 4)$

$\Rightarrow 5y - 45 = -12x - 48$

$\Rightarrow 12x + 5y = -3$ --- (2)

Solving (1) & (2)

$x = -1$, & $y = \frac{9}{5}$ $\therefore$ orthocentre is $\left(-1, \frac{9}{5}\right)$ ANS

— x —