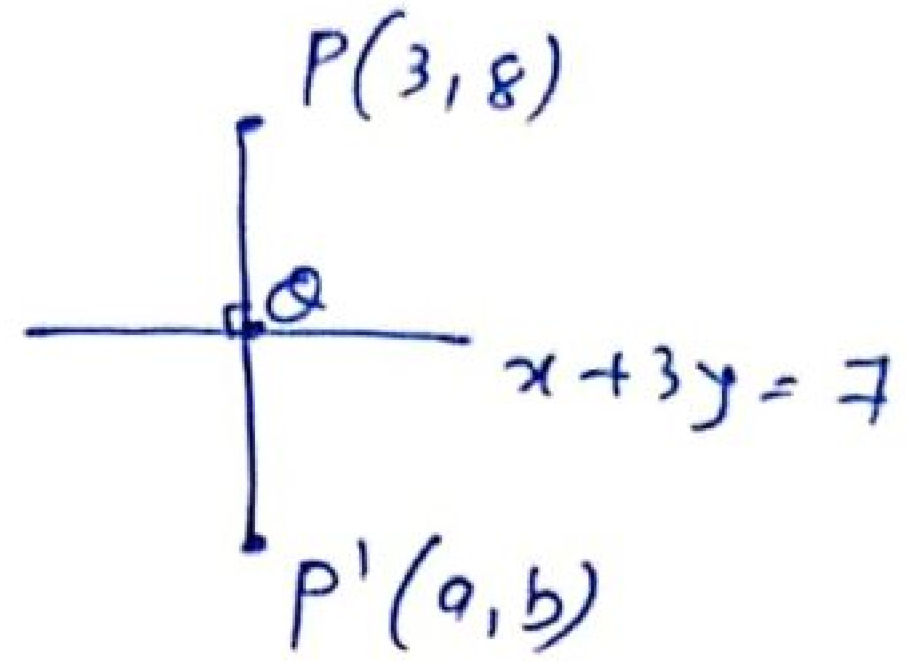
SOLUTIONS: STRAIGHT LINES

WORKSHEET No: 2 (Class No: 3)

Ans: 1



(·) Slope of given line $(x+3y=7) = \frac{-1}{3}$

(·) Since $PQ \perp$ given line

(·) $\therefore$ slope of $PQ = 3$ (-ve reciprocal)

(·) equation of PQ (point slope form)

$$y-8 = 3(x-3)$$

$$\Rightarrow y-8 = 3x-9$$

$$\Rightarrow 3x-y = 1$$

(·) Solving equation of given line & equation of PQ we get $x=1$ & $y=2$

$\therefore Q(1,2)$

(·) let $P'(a,b)$ is the image of point P

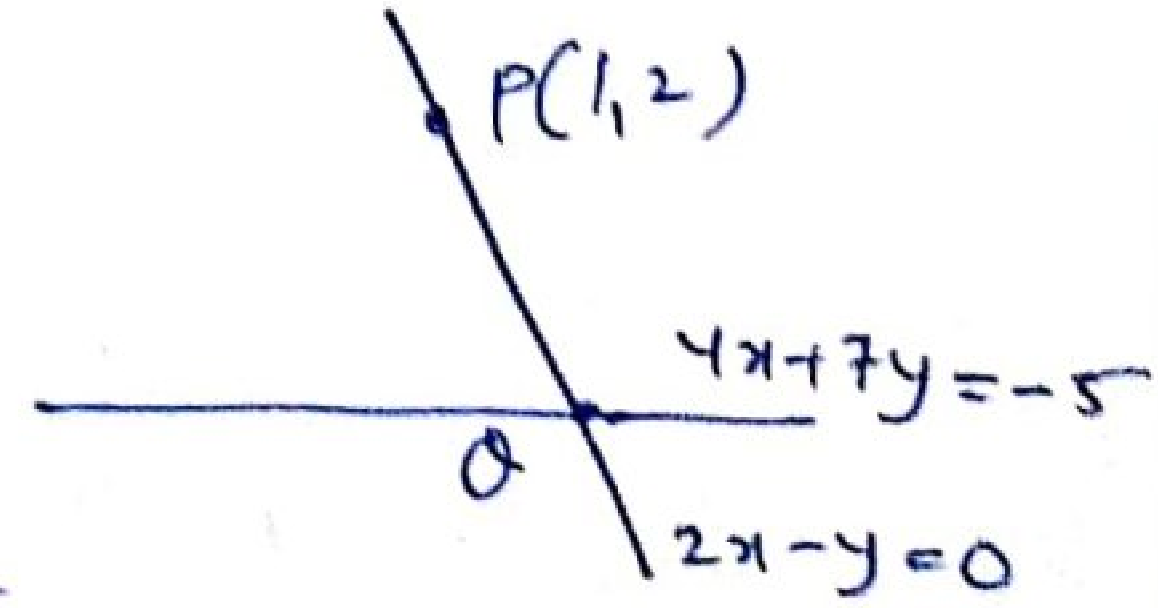
(·) Q is the mid point of PP'

$\therefore$

$1 = \frac{3+a}{2}$	$2 = \frac{8+b}{2}$
$\Rightarrow 2 = 3+a$	$4 = 8+b$
$a = -1$	$b = -4$

$\therefore$ $\boxed{P'(-1,-4) \text{ is the Image}}$ Ans

Ans: 2



(·) given equation of PQ : $2x-y=0$

(·) equation of given line: $4x+7y=-5$

(·) Solving these equations, we get

$x = \frac{-5}{18}$ & $y = \frac{-10}{18}$

(·) $\therefore$ $Q\left(\frac{-5}{18}, \frac{-10}{18}\right)$

(·) Required distance $PQ = \sqrt{\left(\frac{-5}{18}-1\right)^2 + \left(\frac{-10}{18}-2\right)^2}$

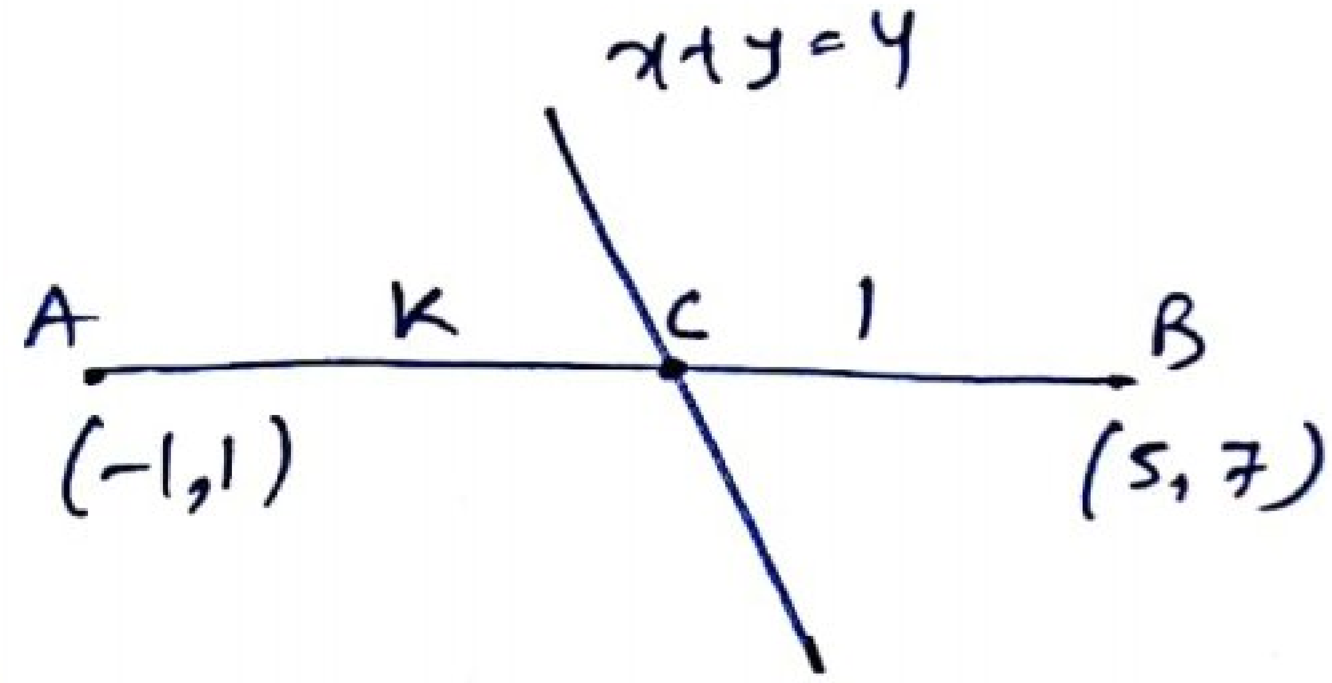
$$= \sqrt{\frac{(23)^2}{(18)^2} + \frac{(46)^2}{(18)^2}}$$

$$= \frac{(23)\sqrt{1+(2)^2}}{18}$$

$$\boxed{\text{distance } PQ = \frac{23\sqrt{5}}{18} \text{ units}}$$ Ans.

Qn. 3 →

(·) let point C divides AB in ratio $k:1$



(·) By section formula

$x = \frac{5k-1}{k+1}$ & $y = \frac{7k+1}{k+1}$

(·) $\therefore C\left(\frac{5k-1}{k+1}, \frac{7k+1}{k+1}\right)$

(·) Now point C lies on the line $x+y=4$
$\therefore$ it must satisfy equation of line

(·) $\therefore$ $\frac{5k-1}{k+1} + \frac{7k+1}{k+1} = 4$

$\Rightarrow 5k - \cancel{1} + 7k + \cancel{1} = 4k + 4$

$\Rightarrow 8k = 4$

$\Rightarrow k = 1/2$

$\therefore$ $\boxed{\text{Required ratio } 1:2}$ Ans

Ons: 5 → let the intercepts are a & b

Given that $a+b=14$

let equation of line is $\frac{x}{a}+\frac{y}{b}=1$

$$\Rightarrow \frac{x}{a}+\frac{y}{14-a}=1$$

this line passes through the point $(3,4)$

$$\therefore \frac{3}{a}+\frac{4}{14-a}=1$$

$$\Rightarrow 42-3a+4a=14a-a^2$$

$$\Rightarrow a^2-13a+42=0$$

$$\Rightarrow (a-7)(a-6)=0$$

$$a=7 \quad ; \quad a=6$$

$$\Rightarrow b=7 \quad ; \quad b=8$$

$\therefore$ equation of lines $\frac{x}{7}+\frac{y}{7}=1 \Rightarrow x+y=7$

and $\frac{x}{6}+\frac{y}{8}=1 \Rightarrow 4x+3y=24$

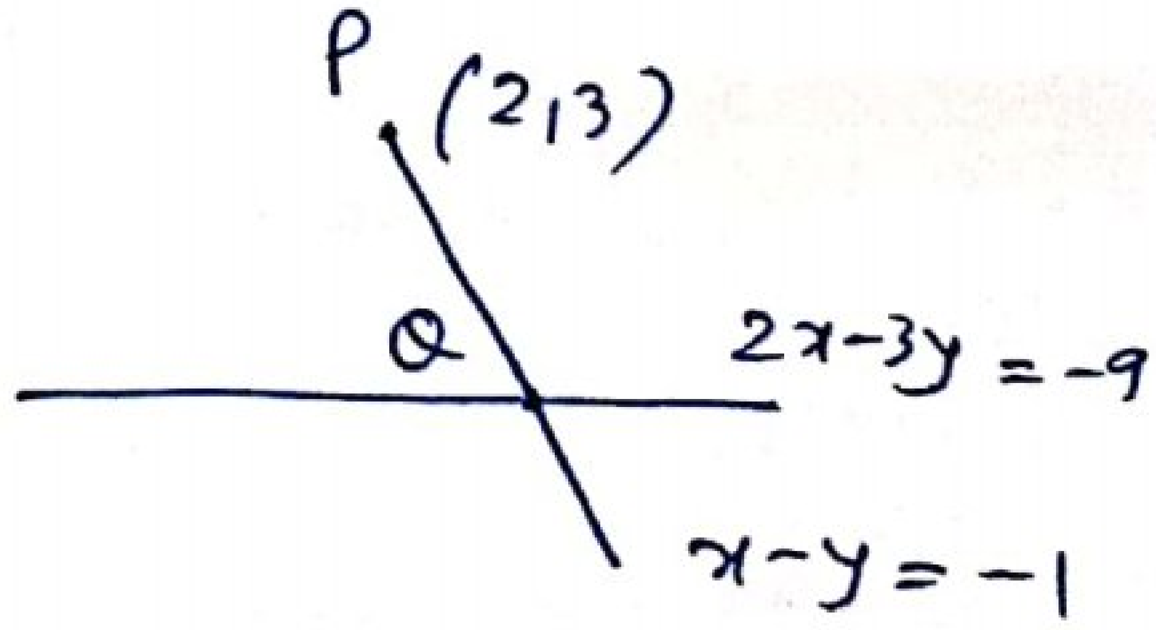
$\therefore \boxed{4x+3y=24 \quad \& \quad x+y=7}$ Ans

Ons: 4 →

(.) Given equation of line PQ
$x-y=-1$

(.) given: equation of line
$2x-3y=-9$

(.) solving these equations
we get $x=6$, $y=+7$



$\therefore$ point Q is $(6, +7)$

(ii) Required distance $PQ = \sqrt{(6-2)^2 + (+7-3)^2}$

$= \sqrt{16 + 16}$

$= \sqrt{32}$

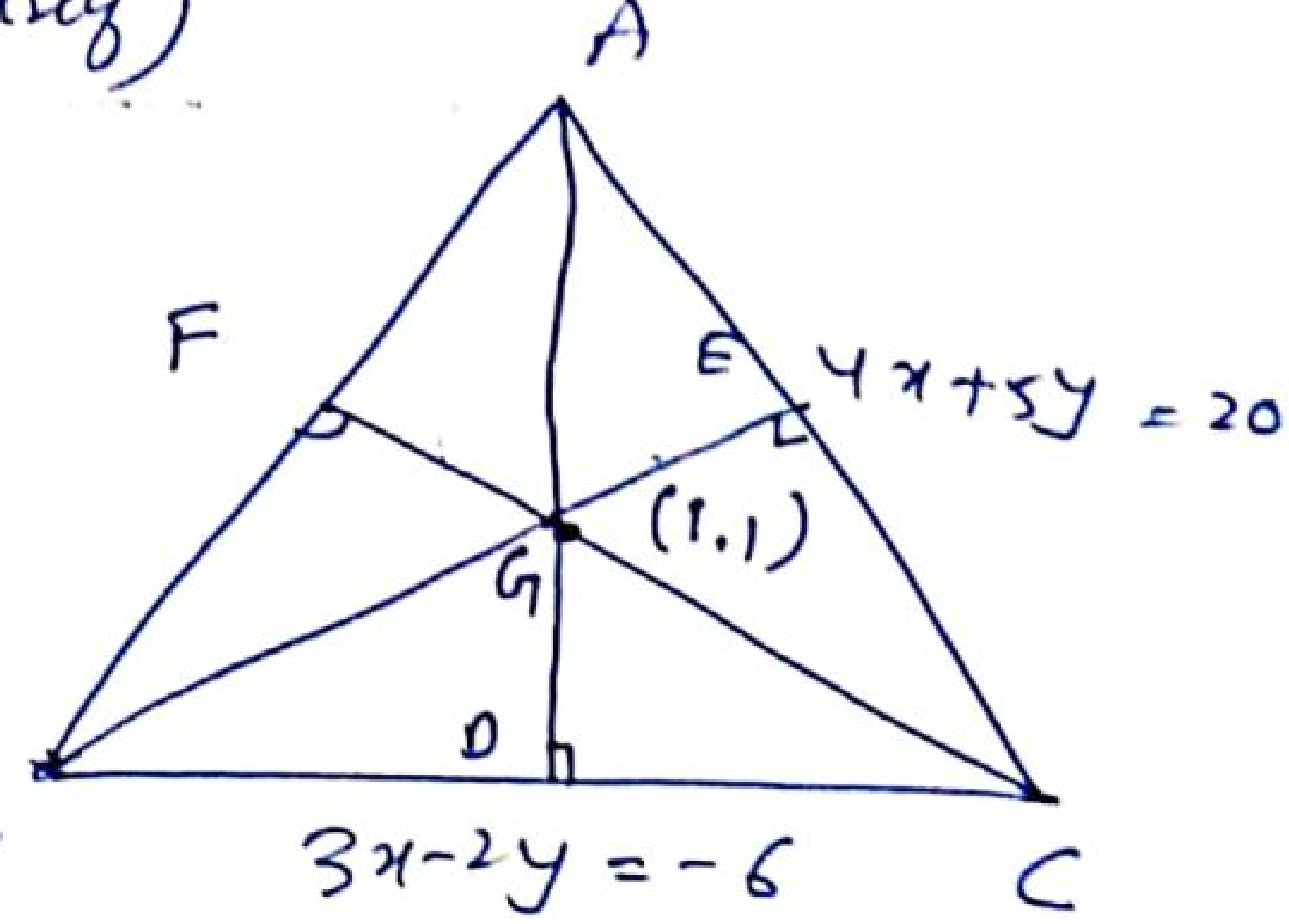
$= \boxed{4\sqrt{2} \text{ units}}$ Ans

Qn. 6 → (only steps: calculation (Do yourself))

Let equation of

AC: $4x + 5y = 20$

& BC = $3x - 2y = -6$



✓ Solve them we get point C (   )

✓ then slope of CF (by $\frac{y_2-y_1}{x_2-x_1}$)

✓ $AB \perp CF$

Slope of AB (-ve reciprocal)

✓ Now slope of AC $= \frac{-4}{5}$

✓ Slope of BE $= \frac{5}{4}$ (-ve reciprocal)

✓ Find equation of BE (point slope form)

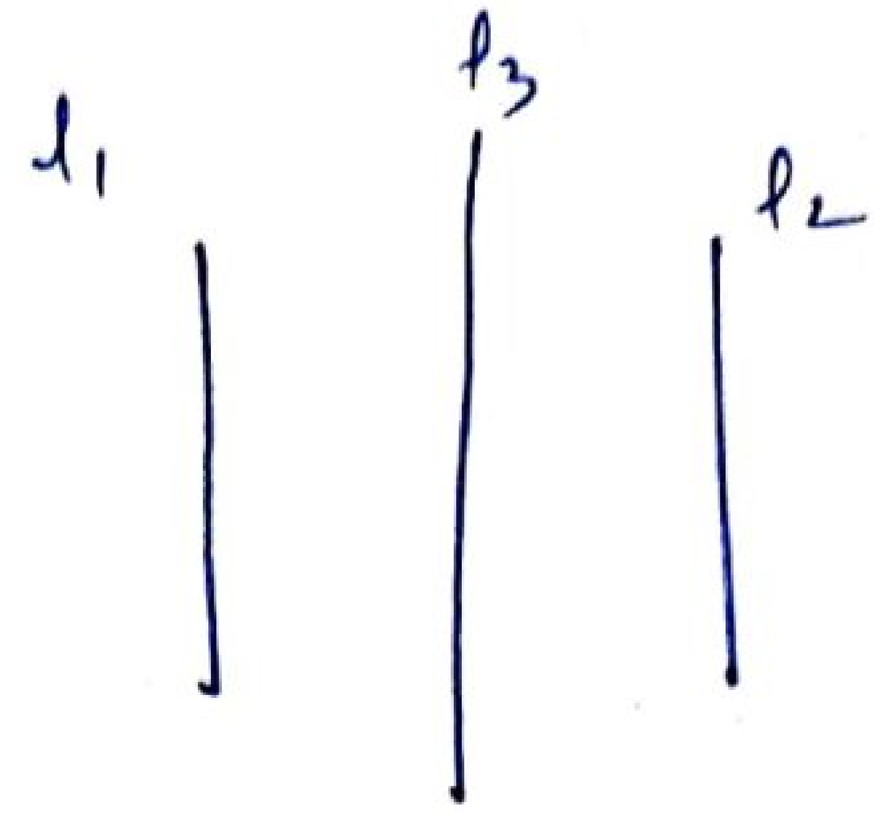
✓ then solve equation of BE & equation of BC

✓ we get point B (   )

✓ then finally equation of AB (point slope form)

= [   ] Ans

Qn. 7 →



(·) equation of l_1: $5x-2y+9=0$

(·) equation of l_2: $5x-2y+7=0$

(·) Since l_3 is parallel to them

(·) let equation of l_3: $5x-2y+\lambda=0$

(·) given that distance b/w l_1 & l_3 = distance b/w l_2 & l_3

$$\Rightarrow \frac{|-9-\lambda|}{\cancel{\sqrt{25+4}}} = \frac{|7-\lambda|}{\cancel{\sqrt{25+4}}}$$

$$\Rightarrow -9-\lambda = \pm(7-\lambda)$$

$$\Rightarrow -9-\cancel{\lambda} = 7-\cancel{\lambda}$$

$-9 = 7$ (not possible)

No value of λ

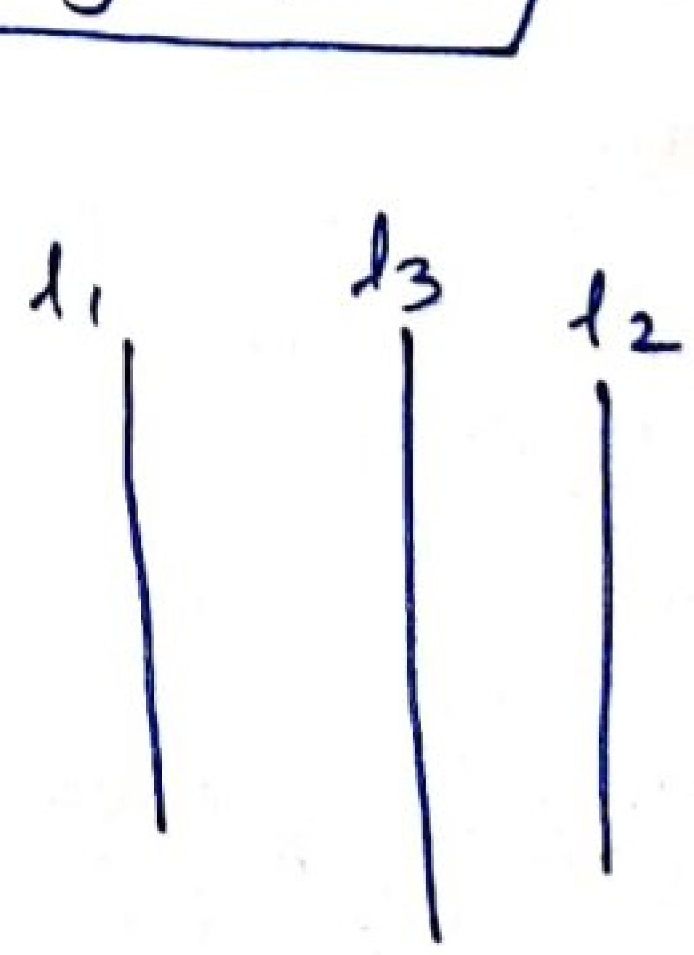
$$-9-\lambda = -7+\lambda$$

$$2\lambda = -2$$

$$\lambda = -1$$

∴ equation required line is $\boxed{5x-2y-1=0}$ Ans

Qn: 8 →



equation of l_1: $2x+3y-19=0$

equation of l_2: $2x+3y+7=0$

(·) Since l_3 is parallel to them

(·) let equation of l_3 is: $2x+3y+\lambda=0$

(·) Given that distance b/w l_1 & l_3 = distance b/w l_2 & l_3

$$\Rightarrow \frac{|-19-\lambda|}{\sqrt{4+9}} = \frac{|7-\lambda|}{\sqrt{4+9}}$$

$$\Rightarrow -19-\lambda = \pm(7-\lambda)$$

$\Rightarrow$ $-19-\cancel{\lambda} = 7-\cancel{\lambda}$ | $-19-\lambda = -7+\lambda$

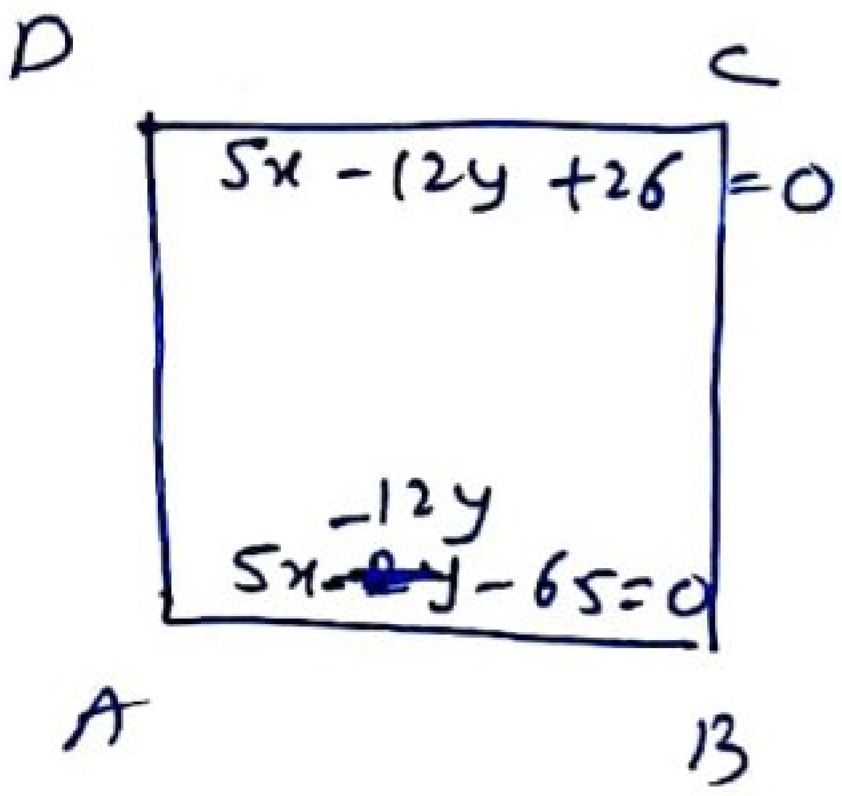
no value of λ | $2\lambda = -12$

$\lambda = -6$

$\therefore$ Equation of l_3 is $2x+3y-6=0$

$$\Rightarrow \boxed{2x+3y=6} \quad \text{Ans}$$

Qn. 9 $\rightarrow$



(∵) Equation of AB: $5x-12y-65=0$

(∵) Equation of DC: $5x-12y+26=0$

(∵) Clearly these lines are parallel

(∵) distance b/w them = Side of the square

(∵) Side of the square $= \dfrac{|-65-26|}{\sqrt{25+144}} = \dfrac{91}{\sqrt{169}} = \dfrac{91}{13}$

$= 7$

(∴) $\boxed{\text{Ar of Square} = (7)^2 = 49 \text{ square units}}$ Ans

Qn 10 $\rightarrow$ (∵) Equation of given line

$$x-\sqrt{3}y-2\sqrt{3}=0$$

(∵) Slope of this line: $m_1 = \dfrac{-1}{-\sqrt{3}} = \dfrac{1}{\sqrt{3}}$

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(Solution) WS-2

∴ let slope of required line: $m_2 = m$

∴ angle b/w them is $\theta = 60°$

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

$$\Rightarrow \tan 60° = \left|\frac{\frac{1}{\sqrt{3}} - m}{1 + \frac{m}{\sqrt{3}}}\right|$$

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

$$\Rightarrow \pm\sqrt{3} = \frac{1 - \sqrt{3}m}{\sqrt{3} + m}$$

$$\Rightarrow \sqrt{3} = \frac{1 - \sqrt{3}m}{\sqrt{3} + m}$$

$$\Rightarrow 3 + \sqrt{3}m = 1 - \sqrt{3}m$$

$$\Rightarrow -2 = 2\sqrt{3}m$$

$$\Rightarrow m = -\frac{1}{\sqrt{3}}$$

$$-\sqrt{3} = \frac{1 - \sqrt{3}m}{\sqrt{3} + m}$$

$$-3 - \sqrt{3}m = 1 - \sqrt{3}m$$

m = Not defined

or $m = \frac{1}{0}$

∴ Required line passes through $(7, 9)$

∴ Equation of required line (By point-slope form)

$$y - 9 = \frac{-1}{\sqrt{3}}(x - 7)$$

$$\sqrt{3}y - 9\sqrt{3} = -x + 7$$

$$\boxed{x + \sqrt{3}y = 7 + 9\sqrt{3}}$$

Ans

$$y - 9 = \frac{1}{0}(x - 7)$$

$$0 = x - 7$$

$$\Rightarrow \boxed{x = 7}$$ Ans

— x —