Weekly Test - 09/12/2025

CLASS-XI

1. Given $L_1: ax+by=c$ and $L_2: a'x+b'y=c'$ are perpendicular.

Slope of $L_1 = m_1 = -\frac{a}{b}$

Slope of $L_2 = m_2 = -\frac{a'}{b'}$

Since $L_1 \perp L_2 \Rightarrow m_1 m_2 = -1$

$\Rightarrow -\frac{a}{b} \times -\frac{a'}{b'} = -1$

$\Rightarrow \boxed{aa'+bb'=0}$

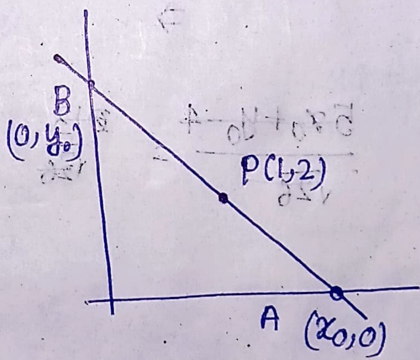
$\therefore$ option (a)

2. Distance of the point $P(1,-3)$ from the line $2y-3x=4$

is $d = \frac{|2(-3)-3(1)-4|}{\sqrt{2^2+(-3)^2}} = \frac{13}{\sqrt{13}} = \sqrt{13}$

$\therefore$ option (c)

3. Let AB straight line intercept at $A=(x_0,0)$ and $B=(0,y_0)$ and $P(1,2)$ bisect the line segment AB.



Then by mid-point formula

$\frac{x_0+0}{2} = 1$ and $\frac{0+y_0}{2} = 2$

$\Rightarrow \boxed{x_0=2}$ and $\boxed{y_0=4}$

Then by intercept form equation of the line is

$\frac{x}{2} + \frac{y}{4} = 1. \Rightarrow \boxed{2x+y=4}$ $\therefore$ option (d)

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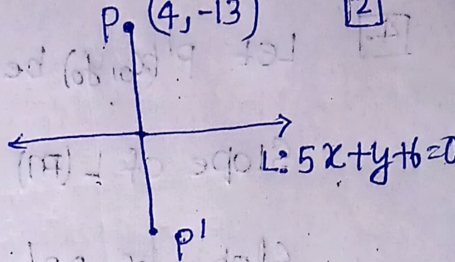
4. $P = (4,-13)$ and $L: 5x+y+6=0$



Slope of L : -5

$\therefore$ Slope of $PP' = \frac{-1}{\text{slope of } L} = \frac{1}{5}$

Slope of $(4,-13)$ and $(-1,-14)$ is $\frac{-14-(-13)}{-1-4} = \frac{1}{5}$

Slope of $(4,-13)$ and $(3,4)$ is $\frac{4-(-13)}{3-4} = -17$

Slope of $(4,-13)$ and $(0,0)$ is $\frac{0-(-13)}{0-4} = \frac{-13}{4}$

Slope of $(4,-13)$ and $(1,2)$ is $\frac{2-(-13)}{1-4} = \frac{-15}{3} = -5$

Hence reflection point is $(-1,-14)$

$\therefore$ option (a)

5. option (d)

Section-B

6. Slope of the line passing through $(3,-2)$ and $(-1,4)$ is

$\frac{4-(-2)}{-1-3} = \frac{-6}{4} = \frac{-3}{2}$

7. Slope of $x+y+7=0$ is $m_1 = -1$

Slope of $\perp^r$ line to it is $m_2 = \frac{-1}{m_1} = 1$

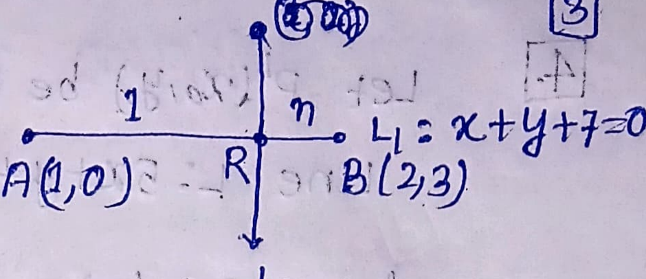
Eq^n of line passing through $(1,2)$ and having slope m_2 is

$y-2 = m_2(x-1)$

$\Rightarrow y-2 = 1(x-1)$

$\Rightarrow \boxed{y-x-1=0}$

8. Slope of the line $L_1: x+y+7=0$ is $m_1 = -1$



Slope of L_2 ($\perp$ to L_1) is $m_2 = \frac{-1}{m_1}$

$\Rightarrow \boxed{m_2 = 1}$

R divide ~~AB~~ AB, in $1:n$ ratio, where $A=(1,0)$ and $B=(2,3)$

$\therefore R = \left(\frac{2+n}{1+n}, \frac{3}{1+n}\right)$

By slope-point form eqn of the line passing through R and having slope m_2 is

$$y - \frac{3}{1+n} = m_2\left(x - \frac{2+n}{1+n}\right)$$

$$\Rightarrow (1+n)y - 3 = 1\left((1+n)x - (2+n)\right)$$

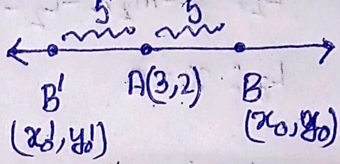
$$\Rightarrow \boxed{(1+n)y - (1+n)x - 1 + n = 0}$$

9. Eq^n of the line passing through the points $A(3,2)$ and having slope $\frac{3}{4}$ is

$$y-2=\frac{3}{4}(x-3)$$

$$\Rightarrow \boxed{4y-3x+1=0} \quad \text{——— (i)}$$

Let $B=(x_0,y_0)$ and $B'=(x_0',y_0')$ are two points on the Line L such that $AB=AB'$.



By mid-point formula $\frac{x_0+x_0'}{2}=3$ and $\frac{y_0+y_0'}{2}=2$

$$\Rightarrow \boxed{x_0+x_0'=6} \text{ and } \boxed{y_0+y_0'=4}$$

Since $AB=AB'=5$

$$\Rightarrow (x_0'-3)^2+(y_0'-2)^2=(x_0-3)^2+(y_0-2)^2=25$$

$\Rightarrow$ Consider $(x_0-3)^2+(y_0-2)^2=25$ ——— (ii)

At (x_0,y_0) $\quad 4y_0-3x_0+1=0$

$$\Rightarrow \boxed{y_0=\frac{3x_0-1}{4}}$$

From (ii)

$$(x_0-3)^2+\left(\frac{3x_0-1}{4}-2\right)^2=25$$

$$\Rightarrow 16(x_0^2+9-6x_0)+(9x_0^2+81-54x_0)=400$$

$$\Rightarrow 25x_0^2-150x_0-175=0$$

$$\Rightarrow x_0^2-6x_0-7=0$$

$$\Rightarrow (x_0-7)(x_0+1)=0$$

$$\Rightarrow \boxed{x_0=7} \text{ or } \boxed{x_0=-1}$$

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$\therefore$ At $x_0 = -1$; $y_0 = \frac{3(-1)-1}{4} = -1$

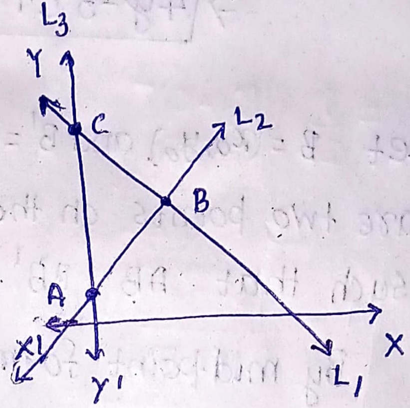
At $x_0 = 7$; $y_0 = \frac{3(7)-7}{4} = 5$

$\therefore$ points are $(-1,-1)$ and $(7,5)$

10. $L_1 : y - m_1 x - c_1 = 0$

$L_2 : y - m_2 x - c_2 = 0$

$L_3 : x = 0$



To find A

$L_3 : x = 0$

$L_2 : y - m_2 x - c_2 = 0$

$\therefore \boxed{y = c_2}$ and $\boxed{x = 0}$

$\therefore A(0, c_2)$

To find C

$L_3 : x = 0$

$L_1 : y - m_1 x - c_1 = 0$

$\therefore \boxed{y = c_1}$ and $\boxed{x = 0}$

$\therefore C = (0, c_1)$

To find B

$L_1 : y - m_1 x - c_1 = 0$

$L_2 : y - m_2 x - c_2 = 0$

$\therefore y = \frac{(-m_1)(-c_2) - (-m_2)(-c_1)}{(1)(-m_2) - (1)(-m_1)} = \frac{m_1 c_2 - m_2 c_1}{m_1 - m_2}$

$x = \frac{(-c_1)(1) - (-c_2)(1)}{1(-m_2) - 1(-m_1)} = \frac{c_2 - c_1}{m_1 - m_2}$

$\therefore B = \left(\frac{c_2 - c_1}{m_1 - m_2} , \frac{m_1 c_2 - m_2 c_1}{m_1 - m_2} \right)$

⇒ $\sqrt{3}-\sqrt{3}m_2 = 1+m_2$ or $\sqrt{3}-\sqrt{3}m_2 = -1-m_2$ [8]

⇒ $\sqrt{3}-1 = m_2(1+\sqrt{3})$ or ...

Area of the ΔABC

$$\Delta = \frac{1}{2}\left| x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)\right|$$

$$= \frac{1}{2}\left| 0\left(c_1 - \frac{m_1c_2-m_2c_1}{m_1-m_2}\right) + 0\left(\frac{m_1c_2-m_2c_1}{m_1-m_2} - c_2\right) + \frac{c_2-c_1}{m_1-m_2}(c_2-c_1)\right|$$

$$= \frac{1}{2}\left|\frac{(c_2-c_1)^2}{m_1-m_2}\right|$$

$$\Rightarrow \boxed{\Delta = \frac{|c_2-c_1|^2}{2|m_1-m_2|}}$$

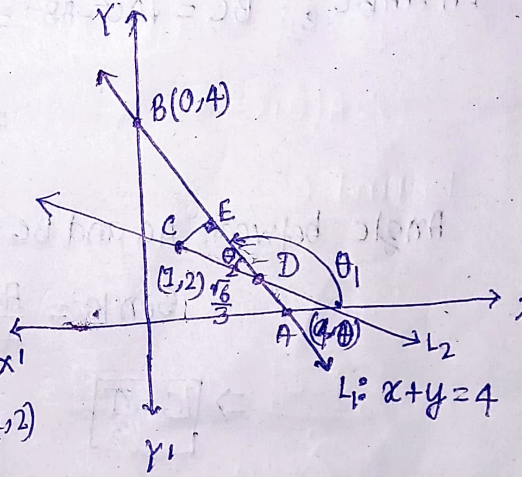
Method-I

(B) Eqⁿ of the line

$L: x+y-4=0$

Slope of $L_1 = m_1 = \tan\theta_1 = -1$

$\Rightarrow \boxed{\theta_1 = \frac{3\pi}{4}}$



Distance from a point $C=(1,2)$ from L is

$$CE = \frac{|1+2-4|}{\sqrt{1^2+1^2}} = \frac{1}{\sqrt{2}}$$

and given $CD = \frac{\sqrt{6}}{3}$

In ΔCDE, $\tan\theta_2 = \frac{CE}{CD} = \frac{1/\sqrt{2}}{\sqrt{6}/3} = \frac{\sqrt{3}}{2}$

$\Rightarrow \boxed{\theta_2 = \frac{\pi}{3}}$

Angle make by L_2 with x-axis $= \theta_1+\theta_2$

∴ Slope of line $(L_2) = \tan(\theta_1+\theta_2)$ or $\tan(\theta_1-\theta_2)$

$= \tan\left(\frac{3\pi}{4}+\frac{\pi}{3}\right)$ or $\tan\left(\frac{3\pi}{4}-\frac{\pi}{3}\right)$

$= \tan(135^\circ + 60^\circ)$ or $\tan(135^\circ - 60^\circ)$

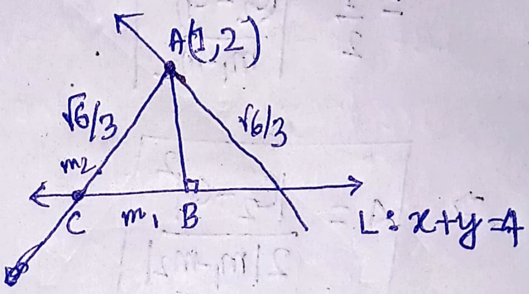
$= \tan 195^\circ$ or $\tan 75^\circ$

$= \tan 15^\circ$ or $\tan 75^\circ$

$= 2-\sqrt{3}$ or $2+\sqrt{3}$

<u>Method-II</u>

Eq^n of the line $L: x+y=4$



Distance of the point $A(1,2)$ from $L = AB = \dfrac{|1+2-4|}{\sqrt{1^2+1^2}} = \dfrac{1}{\sqrt{2}}$

Given $AC = \sqrt{6}/3$

In $\triangle ABC$, $BC = \sqrt{AC^2 - AB^2} = \sqrt{\left(\frac{\sqrt{6}}{3}\right)^2 - \left(\frac{1}{\sqrt{2}}\right)^2} = \sqrt{\frac{6}{9} - \frac{1}{4}} = \sqrt{\frac{2}{3} - \frac{1}{4}}$

$= \sqrt{\frac{8-3}{12}} = \sqrt{\frac{5}{12}} = \frac{1}{2}\sqrt{\frac{5}{3}} = \frac{\sqrt{5}}{2\sqrt{3}}$

Angle between AC and BC is

$\sin \angle C = \dfrac{AB}{AC} = \dfrac{1/\sqrt{2}}{\sqrt{6}/3} = \dfrac{\sqrt{3}}{2}$

$\Rightarrow \boxed{\angle C = \frac{\pi}{3}}$

$\therefore$ Slope of $L = m_1 = -1$

Let slope of $AC = m_2$

Angle between BC and AC is $\frac{\pi}{3}$

So $\tan\frac{\pi}{3} = \pm \dfrac{m_1 - m_2}{1 + m_1 m_2}$

$\Rightarrow \sqrt{3} = \pm \dfrac{(-1) - m_2}{1 - m_2} = \mp \dfrac{1+m_2}{1-m_2}$

$\Rightarrow \boxed{\sqrt{3} = \frac{1+m_2}{1-m_2}}$ or $\boxed{\sqrt{3} = -\frac{1+m_2}{1-m_2}}$ (not possible)

$\Rightarrow \sqrt{3} - \sqrt{3}\, m_2 = 1 + m_2$ or $\sqrt{3} - \sqrt{3}\, m_2 = -1 - m_2$

$\Rightarrow \sqrt{3} - 1 = m_2(1 + \sqrt{3})$ or $\sqrt{3} + 1 = (\sqrt{3} - 1)\, m_2$

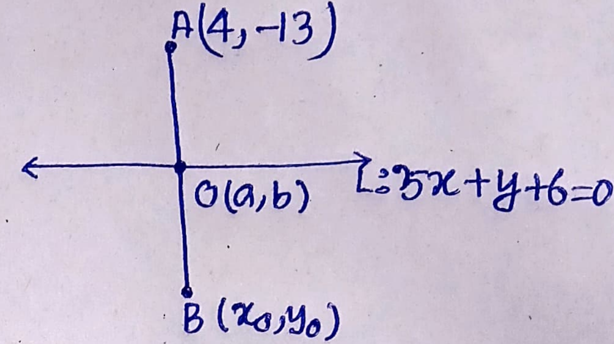
$\Rightarrow m_2 = \dfrac{\sqrt{3}-1}{\sqrt{3}+1}$ or $m_2 = \dfrac{\sqrt{3}+1}{\sqrt{3}-1}$

$\Rightarrow m_2 = \dfrac{(\sqrt{3}-1)^2}{(\sqrt{3})^2 - 1^2}$ or $m_2 = \dfrac{(\sqrt{3}+1)^2}{(\sqrt{3})^2 - 1^2}$

$= \dfrac{4 - 2\sqrt{3}}{2}$ $\qquad$ $= \dfrac{4 + 2\sqrt{3}}{2}$

$\Rightarrow \boxed{m_2 = 2 - \sqrt{3}}$ $\qquad$ $\Rightarrow \boxed{m_2 = 2 + \sqrt{3}}$

4. Slope of AO $= \dfrac{-1}{\text{Slope of } L}$



$\Rightarrow \dfrac{b+13}{a-4} = \dfrac{-1}{-5}$

$\Rightarrow 5b - a + 69 = 0$ —— (i)

Again $5a + b + 6 = 0$ —— (ii)

Eq^n (i) × 5 : $25b - 5a + 345 = 0$
Eq^n (ii) × 1 : $5a + b + 6 = 0$

$26b + 351 = 0$

$\Rightarrow b = -\dfrac{351}{26} \Rightarrow \boxed{b = -\dfrac{27}{2}}$

$\therefore a = 5\left(-\dfrac{27}{2}\right) + 69 = \dfrac{-135 + 138}{2} \Rightarrow \boxed{a = \dfrac{3}{2}}$

$\therefore O = \left(\dfrac{3}{2}, \dfrac{-27}{2}\right)$ and it is mid-point of AB.

So $\dfrac{x_0 + 4}{2} = \dfrac{3}{2}$ and $\dfrac{y_0 - 13}{2} = -\dfrac{27}{2}$

$\Rightarrow \boxed{x_0 = -1}$ and $\boxed{y_0 = -14}$

Hence reflection point is $B = (-1, -14)$