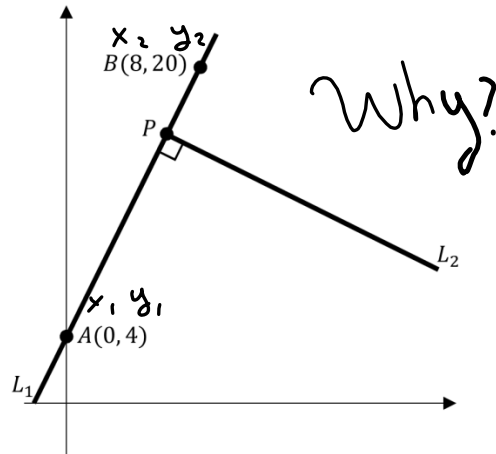


ANALYTIC GEOMETRY IN GRAPHS PROBLEMS

1) P?

- 1) What is the equation of Line 2?
 - Line 1 is perpendicular to Line 2
 - Point P divides \overline{AB} in a ratio of 3:1

$$\begin{aligned}x_p &= x_1 + \frac{a}{a+b}(x_2 - x_1) \\ &= 0 + \frac{3}{3+1}(8-0) \\ &= \frac{3}{4}(8) \\ &= \frac{24}{4} = 6\end{aligned}$$



$$y_p = y_1 + \frac{a}{a+b}(y_2 - y_1) = 4 + \frac{3}{4}(20-4) = 4 + 12 = 16$$

(6, 16)

2) a?

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{20-4}{8-0} = \frac{16}{8} = \frac{2}{1} \rightarrow -\frac{1}{2}$$

3) b?

$$y = -\frac{1}{2}x + b$$

$$16 = -\frac{1}{2}(6) + b$$

$$\begin{aligned}16 &= -3 + b \\ b &= 19\end{aligned}$$

$$y = -\frac{1}{2}x + 19$$

2) L_1 and L_2 are parallel. Find the length of the segment \overline{PQ} .

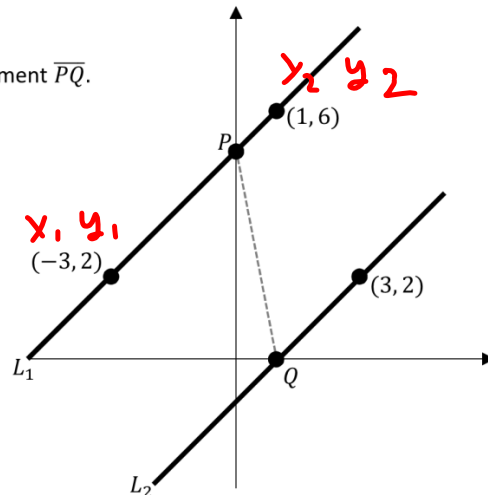
$$\begin{aligned} 1) \underline{a?} \\ a &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{6 - 2}{1 - (-3)} = \frac{4}{4} = 1 \end{aligned}$$

$$\begin{aligned} 2) \underline{b?} \\ y &= x + b \\ 6 &= 1 + b \\ b &= 6 - 1 = 5 \end{aligned}$$

$$\begin{aligned} 3) \underline{P?} \\ y &= x + 5 \\ y &= 0 + 5 \\ y &= 5 \\ P(x_1, y_1) \\ P(0, 5) \end{aligned}$$

$$7) \underline{d?}$$

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(1 - 0)^2 + (0 - 5)^2} \\ &= \sqrt{26} \\ &= 5.1 \end{aligned}$$

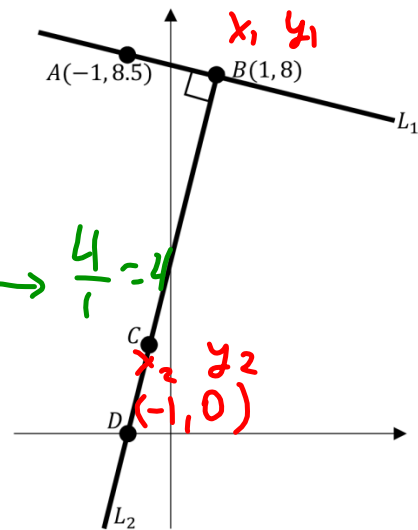


$$4) \underline{a?} \\ a = 1$$

$$\begin{aligned} 5) \underline{b?} \\ y &= x + b \\ 2 &= 3 + b \\ b &= -1 \\ y &= x - 1 \end{aligned}$$

$$\begin{aligned} 6) \underline{Q?} \\ 0 &= x - 1 \\ x &= 1 \\ Q(x_2, y_2) \\ Q(1, 0) \end{aligned}$$

- 3) L_1 is perpendicular to L_2 . Find the coordinates of point C , which divides the segment \overline{BD} into a ratio of 3:1.



1) a?

$$a = \frac{8 - 8.5}{1 - (-1)} = \frac{-0.5}{2} = -\frac{1}{4} \rightarrow \frac{4}{1} = 4$$

2) b?

$$y = 4x + b$$

$$8 = 4(1) + b$$

$$-4 \quad 8 = 4 + b$$

$$b = 4$$

$$y = 4x + 4$$

3) D?

$$0 = 4x + 4$$

$$-4 = 4x$$

$$x = \frac{-4}{4} = -1$$

$$D(-1, 0)$$

4) C?

$$x_p = x_1 + \frac{a}{a+b}(x_2 - x_1)$$

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

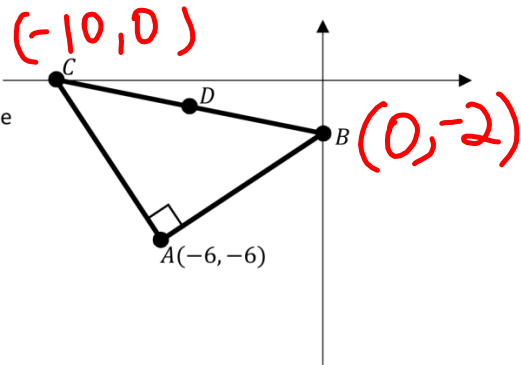
$$= 1 + (-1.5)$$

$$= -\frac{1}{2} = -0.5$$

$$y_p = 2$$

$$C(-0.5, 2)$$

- 4) A right-angled triangle $\triangle ABC$ is formed, with perpendicular sides \overline{AB} and \overline{AC} crossing at vertex $A(-6, -6)$. Given that the slope of \overline{AB} is $\frac{2}{3}$, find the coordinates of D , the midpoint of \overline{BC} .



$$D(-5, -1)$$

- 5) Amanda lives at $A(20, 40)$ and Vishal at $V(60, 88)$. They meet halfway, at point T , and walk to school, at point $S(30, 10)$ together. How far do they walk from point T ?

1) T?

$$x_p = \frac{x_1 + x_2}{2} = \frac{20 + 60}{2} = 40$$

$$y_p = \frac{y_1 + y_2}{2} = \frac{40 + 88}{2} = 64$$

$$T(40, 64)$$

2) d?

$$T(x_1, y_1) \quad S(x_2, y_2)$$

$$T(40, 64) \quad S(30, 10)$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(-10)^2 + (-54)^2}$$

$$= \sqrt{100 + 2916}$$

$$= \sqrt{3016}$$

$$= 54.92$$

