

Line Assignment

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Problem Statement - Find a point on the x-axis, which is equidistant from the points $\begin{pmatrix} 7 \\ 6 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$

Symbol	Co-ordinates	Description
A1	$\begin{pmatrix} 7 \\ 6 \end{pmatrix}$	co-ordinates of A
B1	$\begin{pmatrix} 3 \\ 4 \end{pmatrix}$	co-ordinates of B
P	$\begin{pmatrix} x \\ 0 \end{pmatrix}$	lying on x-axis

$$\|(\mathbf{A} - \mathbf{P})\|^2 = \begin{pmatrix} A1 \\ A2 \end{pmatrix} \begin{pmatrix} A1 & A2 \end{pmatrix}$$

$$\|(\mathbf{A} - \mathbf{P})\|^2 = (A1)^2 + (A2)^2$$

$$\|(\mathbf{B} - \mathbf{P})\|^2 = (\mathbf{B} - \mathbf{P})^\top (\mathbf{B} - \mathbf{P})$$

$$\|(\mathbf{B} - \mathbf{P})\|^2 = \begin{pmatrix} B1 \\ B2 \end{pmatrix} \begin{pmatrix} B1 & B2 \end{pmatrix}$$

$$\|(\mathbf{B} - \mathbf{P})\|^2 = (B1)^2 + (B2)^2$$

5. From equation 1

$$(7 - x)^2 + 36 = (3 - x)^2 + 16$$

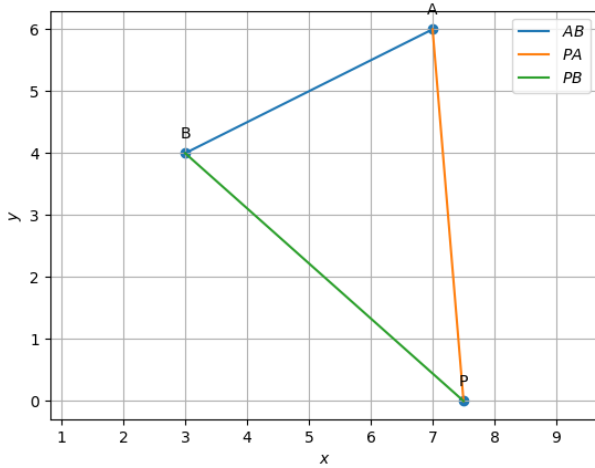
$$(7 - x)^2 + 20 = (3 - x)^2$$

$$49 + x^2 - 14x + 20 = 9 + x^2 - 6x$$

$$60 = 8x$$

$$x = 60/8$$

$$x = 7.5$$



Solution

- Given points $A = \begin{pmatrix} 7 \\ 6 \end{pmatrix}$ and $B = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$
- If the point is lying on x-axis then y-axis will be zero i.e., $y=0$
- Distance between the points $\begin{pmatrix} 7 \\ 6 \end{pmatrix}$ and $\begin{pmatrix} x \\ 0 \end{pmatrix}$ is equal to distance between the points $\begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} x \\ 0 \end{pmatrix}$
- Consider P on x-axis $P = \begin{pmatrix} x \\ 0 \end{pmatrix}$

$$\|(\mathbf{A} - \mathbf{P})\| = \|(\mathbf{B} - \mathbf{P})\| \quad (1)$$

$$\|(\mathbf{A} - \mathbf{P})\|^2 = (\mathbf{A} - \mathbf{P})^\top (\mathbf{A} - \mathbf{P})$$