

# AI1110 ASSIGNMENT 1

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## ICSE class 10 paper 2019

**Q3 (b):** M and N are two points on the X axis and Y axis respectively. P(3, 2) divides the line segment MN in the ratio 2:3.

Find:

- the coordinates of M and N
- the slope of MN.

### Solution:

Various paraetres used in this question are:

Symbol	Value	Description
<b>P</b>	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	Given point
<b>e<sub>1</sub></b>	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	Standard X-axis vector
<b>e<sub>2</sub></b>	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$	Standard Y-axis vector
<b>M</b>	$ae_1$	A point on X-axis and $a \in R$
<b>N</b>	$be_2$	A point on Y-axis and $b \in R$
<b>k</b>	$\frac{2}{3}$	Ratio in which P divides MN

TABLE I  
VARIABLES

According to Section formula,  
If P divides MN in the ratio k:1, then:

$$\mathbf{P} = \frac{k(\mathbf{N}) + 1(\mathbf{M})}{k + 1} \quad (0.0.1)$$

$$\mathbf{P} = \frac{bk\mathbf{e}_2 + a\mathbf{e}_1}{k + 1} \quad (0.0.2)$$

$$\mathbf{P} = \left( \frac{a}{k + 1} \right) \mathbf{e}_1 + \left( \frac{bk}{k + 1} \right) \mathbf{e}_2 \quad (0.0.3)$$

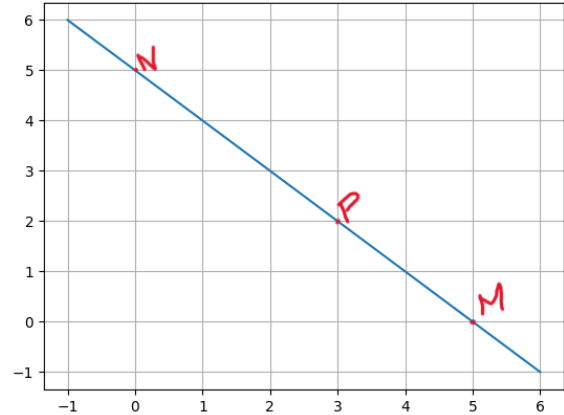
But we have,

$$\mathbf{P} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

Therefore,

$$\left( \frac{a}{k + 1} \right) \mathbf{e}_1 + \left( \frac{bk}{k + 1} \right) \mathbf{e}_2 = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad (0.0.4)$$

$$\left( \frac{a}{k + 1} \right) \mathbf{e}_1 + \left( \frac{bk}{k + 1} \right) \mathbf{e}_2 = 3\mathbf{e}_1 + 2\mathbf{e}_2 \quad (0.0.5)$$



$$\Rightarrow \frac{a}{k + 1} = 3 \text{ and } \frac{bk}{k + 1} = 2$$

$$\Rightarrow a = 3(k + 1) \text{ and } b = \frac{2(k + 1)}{k}$$

Substituting  $k = \frac{2}{3}$ , we get:  
 $a = 5$  and  $b = 5$

$$(i) \mathbf{M} = 5\mathbf{e}_1 \text{ and } \mathbf{N} = 5\mathbf{e}_2$$

$$(ii) \text{ Slope of MN} = \frac{5 - 0}{0 - 5} = -1$$