

# 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:

- (i) the coordinates of M and N
- (ii) the slope of MN.

### Solution:

Various paraetres used in this question are:

Symbol	Value	Description
P	$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$	Given point
$e_1$	$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$	Standard X-axis vector
$e_2$	$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$	Standard Y-axis vector
M	$ae_1$	A point on X-axis and $a \in \mathbb{R}$
N	$be_2$	A point on Y-axis and $b \in \mathbb{R}$
k	$\frac{2}{3}$	Ratio in which P divides MN

TABLE I  
VARIABLES

According to Section formula,

If P divides MN in the ratio k:1, then:

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

$$P = \frac{bk e_2 + ae_1}{k + 1} \quad (0.0.2)$$

$$P = \left( \frac{a}{k + 1} \right) e_1 + \left( \frac{bk}{k + 1} \right) e_2 \quad (0.0.3)$$

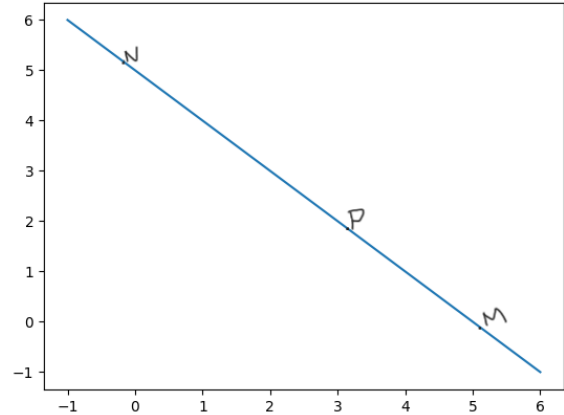
But we have,

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

Therefore,

$$\left( \frac{a}{k + 1} \right) e_1 + \left( \frac{bk}{k + 1} \right) e_2 = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad (0.0.4)$$

$$\left( \frac{a}{k + 1} \right) e_1 + \left( \frac{bk}{k + 1} \right) e_2 = 3e_1 + 2e_2 \quad (0.0.5)$$



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

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

Substituting  $k = \frac{2}{3}$ , we get:

$$a = 5 \text{ and } b = 5$$

$$(i) M = 5e_1 \text{ and } N = 5e_2$$

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