

# Assignment-1(EE5600)

Satyam Singh  
EE20MTECH14015

**Abstract**—This assignment deals with basic coordinate geometry.

Download tex file from

<https://github.com/satyam463/EE5600Ass1/blob/main/Ass1.tex>

## 1 PROBLEM STATEMENT

22.The coordinates of vertices of a triangle are  $(x_1, y_1), (x_2, y_2),$  and  $(x_3, y_3)$ . The line joining the first two is divided into the ratio  $l:k$ , and line joining this point of division to the opposite angular point is then divided in the ratio  $m:k+l$ . Find the coordinates of the latter point of section.

## 2 SOLUTION

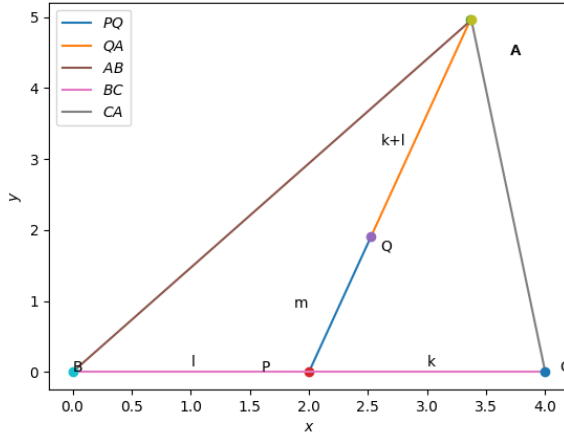


Fig. 0: Triangle ABC with vertices A(3.366,4.96), B(0,0), C(4,0), and P(2,0), Q(2.5,1.98) are used for python plot.

Consider Fig.0

$$\mathbf{B} = \begin{pmatrix} x_1 \\ y_1 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} x_2 \\ y_2 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} x_3 \\ y_3 \end{pmatrix} \quad (2.0.1)$$

The line joining  $\mathbf{BC}$  divided into the ratio  $l:k$  at point of division  $\mathbf{P}$  can be written as

$$l(\mathbf{CP}) = k(\mathbf{PB}) \quad (2.0.2)$$

$$l(\mathbf{P} - \mathbf{C}) = k(\mathbf{B} - \mathbf{P}) \quad (2.0.3)$$

$$(l + k)\mathbf{P} = l\mathbf{C} + k\mathbf{B} \quad (2.0.4)$$

$$(l + k)\mathbf{P} = \begin{pmatrix} \mathbf{C} & \mathbf{B} \end{pmatrix} \begin{pmatrix} l \\ k \end{pmatrix} \quad (2.0.5)$$

Now, the line joining  $\mathbf{PA}$  divided into the ratio  $m:k+l$  at point of division  $\mathbf{Q}$  can be written as

$$(l + k)(\mathbf{PQ}) = m(\mathbf{QA}) \quad (2.0.6)$$

$$(l + k)(\mathbf{Q} - \mathbf{P}) = m(\mathbf{A} - \mathbf{Q}) \quad (2.0.7)$$

$$(l + k + m)\mathbf{Q} = (l + k)\mathbf{P} + m\mathbf{A} \quad (2.0.8)$$

From Eq.2.0.5 substitute  $(l + k)\mathbf{P}$  in Eq.2.0.8

$$(l + k + m)\mathbf{Q} = \begin{pmatrix} \mathbf{C} & \mathbf{B} \end{pmatrix} \begin{pmatrix} l \\ k \end{pmatrix} + m\mathbf{A} \quad (2.0.9)$$

$$(l + k + m)\mathbf{Q} = l\mathbf{C} + k\mathbf{B} + m\mathbf{A} \quad (2.0.10)$$

$$\mathbf{Q} = \frac{1}{l + k + m} \begin{pmatrix} \mathbf{C} & \mathbf{B} & \mathbf{A} \end{pmatrix} \begin{pmatrix} l \\ k \\ m \end{pmatrix} \quad (2.0.11)$$

Hence,  $\mathbf{Q}$  is the required coordinate of the latter point of section.