

# Assignment 1

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Find Python Codes from below link

<https://github.com/praneeth2720/Assignment-1/blob/main/vectors.py>

and latex codes from

<https://github.com/praneeth2720/Assignment-1>

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## 1.1 Question 22

The mid-points of the side of triangle are (3,4) ,(4,6) and (5,7). Find the coordinates of the vertices of the triangle.

## 1.2 Solution

Let the mid points of the sides of triangle are

$$P = \begin{pmatrix} 3 \\ 4 \end{pmatrix} \quad Q = \begin{pmatrix} 4 \\ 6 \end{pmatrix} \quad R = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$$

Let assume coordinates of the vertices of triangle as A B C

By using section formula

$$\frac{A+B}{2} = P \quad (1.2.1)$$

$$\frac{B+C}{2} = Q \quad (1.2.2)$$

$$\frac{A+C}{2} = R \quad (1.2.3)$$

$$(1.2.4)$$

$$A+B=2P \quad (1.2.5)$$

$$B+C=2Q \quad (1.2.6)$$

$$A+C=2R \quad (1.2.7)$$

$$(1.2.8)$$

Let us consider the above three equations as

And  $\begin{pmatrix} I & I & 0 \\ 0 & I & I \\ I & 0 & I \end{pmatrix}$  as T

$$\begin{pmatrix} I & I & 0 \\ 0 & I & I \\ I & 0 & I \end{pmatrix} \begin{pmatrix} A \\ B \\ C \end{pmatrix} = 2 \begin{pmatrix} P \\ Q \\ R \end{pmatrix} \quad (1.2.9)$$

now multiplying each side with  $T^{-1}$  we get

$$\begin{pmatrix} A \\ B \\ C \end{pmatrix} = 2 \frac{1}{2} \begin{pmatrix} 1 & 1 & -1 \\ -1 & 1 & 1 \\ 1 & -1 & 1 \end{pmatrix} \begin{pmatrix} P \\ Q \\ R \end{pmatrix}$$

$$\begin{pmatrix} A \\ B \\ C \end{pmatrix} = \begin{pmatrix} P & Q & -R \\ -P & Q & R \\ P & -Q & R \end{pmatrix} \quad (1.2.10)$$

$$\begin{pmatrix} A \\ B \\ C \end{pmatrix} = \begin{pmatrix} \begin{pmatrix} 4 \\ 5 \end{pmatrix} \\ \begin{pmatrix} 2 \\ 3 \end{pmatrix} \\ \begin{pmatrix} 6 \\ 9 \end{pmatrix} \end{pmatrix} \quad (1.2.11)$$

∴ by comparing rows of each side we get the vertices of triangle. They are as follows

$$A = \begin{pmatrix} 4 \\ 5 \end{pmatrix} \quad B = \begin{pmatrix} 2 \\ 3 \end{pmatrix} \quad C = \begin{pmatrix} 6 \\ 9 \end{pmatrix}$$

