Matrix Assignment - Lines

Adarsh Kumar (FWC22068)

CONTENTS

I. PROBLEM

The Vertices of Triangle PQR is P(2,1), Q(-2,3), R(4,5) . Find the equation of the Median Through R.

II. SOLUTION

Given the Vertices are :

$$\mathbf{P} = \begin{pmatrix}2\\1\end{pmatrix} \qquad \mathbf{Q} = \begin{pmatrix}-2\\3\end{pmatrix} \qquad \mathbf{R} = \begin{pmatrix}4\\5\end{pmatrix}$$

We know that the Median through R , will divide the side PQ in two equal parts.
We know that the the median through R will divide or intersect the side PQ into two equal parts.
So , By using section formula , we can find the Coordinates of the point A(say) on PQ where the median intersect the side PQ.

Section Formula :

$$PointA = \frac{P + K(Q)}{1 + K} \tag{1}$$

where PQ is a line and P and Q is the coordinates and K is the ratio in which the line is being divided.

Now , we know that the Median from R will divide the side PQ in two equal parts
(i.e in th ratio 1 : 1)
So , by using Section Formula,

$$A = \frac{P + K(Q)}{1 + K} \tag{2}$$

where , K=1

$$\mathbf{P} = \begin{pmatrix}2\\1\end{pmatrix} \qquad \mathbf{Q} = \begin{pmatrix}-2\\3\end{pmatrix}$$

$$\mathbf{A} = \frac{\begin{pmatrix}2\\1\end{pmatrix} + 1\begin{pmatrix}-2\\3\end{pmatrix}}{1+1} \tag{3}$$

$$\mathbf{A} = \begin{pmatrix}0\\2\end{pmatrix} \tag{4}$$

Now ,our Aim is to find the equation of Median(line AR)

So, Now we have two points

$$\mathbf{A} = \begin{pmatrix}0\\2\end{pmatrix} \qquad \mathbf{R} = \begin{pmatrix}4\\5\end{pmatrix}$$

We know that ,
The Parametric Equation of line is :

$$\mathbf{X} = \mathbf{A} + \lambda\mathbf{m} \tag{5}$$

Where **m** is the direction vector of the line

So , the Direction Vector **m** of line AR is :

$$\mathbf{m} = \left(\mathbf{R} - \mathbf{A}\right) \tag{6}$$

$$\mathbf{m} = \begin{pmatrix}4\\5\end{pmatrix} - \begin{pmatrix}0\\2\end{pmatrix} \tag{7}$$

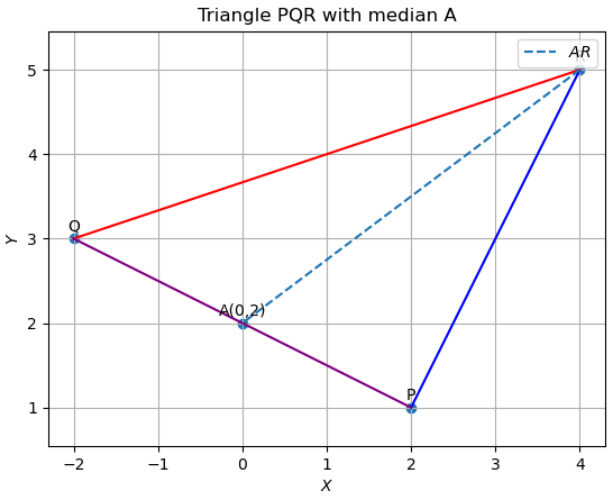
$$\mathbf{m} = \begin{pmatrix}4\\3\end{pmatrix} \tag{8}$$

Therefore the equation of line AR will be:

$$\mathbf{X} = \begin{pmatrix}0\\2\end{pmatrix} + \lambda\begin{pmatrix}4\\3\end{pmatrix} \tag{9}$$

Equation 9 ,represents the equation of line AR in Parametric Form .

III. FIGURE



CONSTRUCTION

The dimensions of the Triangle made by using Python are taken as below

vertex	co-ordinates
P	(2,1)
Q	(-2,3)
R	(4,5)
A	(0,2)

IV. CODE LINK

https://github.com/aadrshptel/Fwc_module1/tree/main/Assignments/Matrix%20assignments/Lines/codes

Execute the code by using the command
python3 line.py