# VECTORS

## 1 $10^{th}$ Maths - EXERCISE-7.4

Let A(4, 2), B(6, 5) and C(1, 4) be the vertices of $\triangle ABC$

1. The median from A meets BC at D. Find the coordinates of the point D.
2. Find the coordinates of the point P on AD such that $AP : PD = 2 : 1$
3. Find the coordinates of points Q and R on medians BE and CF respectively such that $BQ : QE = 2 : 1 and CR : RF = 2 : 1$.
4. What do yo observe?
5. If $A(x_1, y_1), B(x_2, y_2) and C(x_3, y_3)$ are the vertices of $\triangle ABC$, find the coordinates of the centroid of the triangle.

Given points are

$$\mathbf{A} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 6 \\ 5 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 1 \\ 4 \end{pmatrix} \tag{1}$$

1. Solution for problem 1

$$
\begin{aligned}
\mathbf{D} &= \frac{\mathbf{B}+\mathbf{C}}{2} && (2)\\
&= \frac{1}{2}\begin{pmatrix}6\\5\end{pmatrix}+\begin{pmatrix}1\\4\end{pmatrix} && (3)\\
&= \frac{1}{2}\begin{pmatrix}7\\9\end{pmatrix} && (4)\\
\mathbf{D} &= \begin{pmatrix}\frac{7}{2}\\\frac{9}{2}\end{pmatrix} && (5)\\
\mathbf{E} &= \frac{\mathbf{A}+\mathbf{C}}{2} && (6)\\
&= \frac{1}{2}\begin{pmatrix}4\\2\end{pmatrix}+\begin{pmatrix}1\\4\end{pmatrix} && (7)\\
&= \frac{1}{2}\begin{pmatrix}5\\6\end{pmatrix} && (8)\\
\mathbf{E} &= \begin{pmatrix}\frac{5}{2}\\3\end{pmatrix} && (9)\\
\mathbf{F} &= \frac{\mathbf{A}+\mathbf{B}}{2} && (10)\\
&= \frac{1}{2}\begin{pmatrix}4\\2\end{pmatrix}+\begin{pmatrix}6\\5\end{pmatrix} && (11)\\
&= \frac{1}{2}\begin{pmatrix}10\\7\end{pmatrix} && (12)\\
\mathbf{F} &= \begin{pmatrix}5\\\frac{7}{2}\end{pmatrix} && (13)
\end{aligned}
$$

2. Solution for problem 2

$$n = \frac{2}{1} \tag{14}$$

$$\mathbf{P} = \frac{1}{1+n}\left((\mathbf{A} + n\mathbf{D})\right) \tag{15}$$

$$= \frac{1}{1+\frac{2}{1}}\left(\begin{pmatrix}4\\2\end{pmatrix} + \frac{2}{1}\begin{pmatrix}\frac{7}{2}\\\frac{9}{2}\end{pmatrix}\right) \tag{16}$$

$$= \frac{1}{3}\left(\begin{pmatrix}4\\2\end{pmatrix} + \begin{pmatrix}7\\9\end{pmatrix}\right) \tag{17}$$

$$= \frac{1}{3}\begin{pmatrix}11\\11\end{pmatrix} \tag{18}$$

$$\mathbf{P} = \begin{pmatrix}\frac{11}{3}\\\frac{11}{3}\end{pmatrix} \tag{19}$$

3. solution for problem 3

$$n = \frac{2}{1} \tag{20}$$

$$\mathbf{Q} = \frac{1}{1+n}\left((\mathbf{B} + n\mathbf{E})\right) \tag{21}$$

$$= \frac{1}{1+\frac{2}{1}}\left(\begin{pmatrix}6\\5\end{pmatrix} + \frac{2}{1}\begin{pmatrix}\frac{5}{2}\\3\end{pmatrix}\right) \tag{22}$$

$$= \frac{1}{3}\left(\begin{pmatrix}6\\5\end{pmatrix} + \begin{pmatrix}5\\6\end{pmatrix}\right) \tag{23}$$

$$= \frac{1}{3}\begin{pmatrix}11\\11\end{pmatrix} \tag{24}$$

$$\mathbf{Q} = \begin{pmatrix}\frac{11}{3}\\\frac{11}{3}\end{pmatrix} \tag{25}$$

$$\mathbf{R} = \frac{1}{1+n}\left((\mathbf{C} + n\mathbf{F})\right) \tag{26}$$

$$= \frac{1}{1+\frac{2}{1}}\left(\begin{pmatrix}1\\4\end{pmatrix} + \frac{2}{1}\begin{pmatrix}5\\\frac{7}{2}\end{pmatrix}\right) \tag{27}$$

$$= \frac{1}{3}\left(\begin{pmatrix}1\\4\end{pmatrix} + \begin{pmatrix}10\\7\end{pmatrix}\right) \tag{28}$$

$$= \frac{1}{3}\begin{pmatrix}11\\11\end{pmatrix} \tag{29}$$

$$\mathbf{R} = \begin{pmatrix}\frac{11}{3}\\\frac{11}{3}\end{pmatrix} \tag{30}$$

4. solution for problem 4
   I have observed the $\mathbf{P}, \mathbf{Q}, \mathbf{R}$ are the same values and coincidence where median intersect is known as centrid of triangle.

5. solution for problem 5

$$\mathbf{G} = \frac{\mathbf{D} + \mathbf{E} + \mathbf{F}}{3} \tag{31}$$

$$= \begin{pmatrix}\frac{7}{2}\\\frac{9}{2}\end{pmatrix} + \begin{pmatrix}\frac{5}{2}\\3\end{pmatrix} + \begin{pmatrix}5\\\frac{7}{2}\end{pmatrix} \tag{32}$$

$$\mathbf{G} = \begin{pmatrix}\frac{11}{3}\\\frac{11}{3}\end{pmatrix} \tag{33}$$

## 2 FIGURE

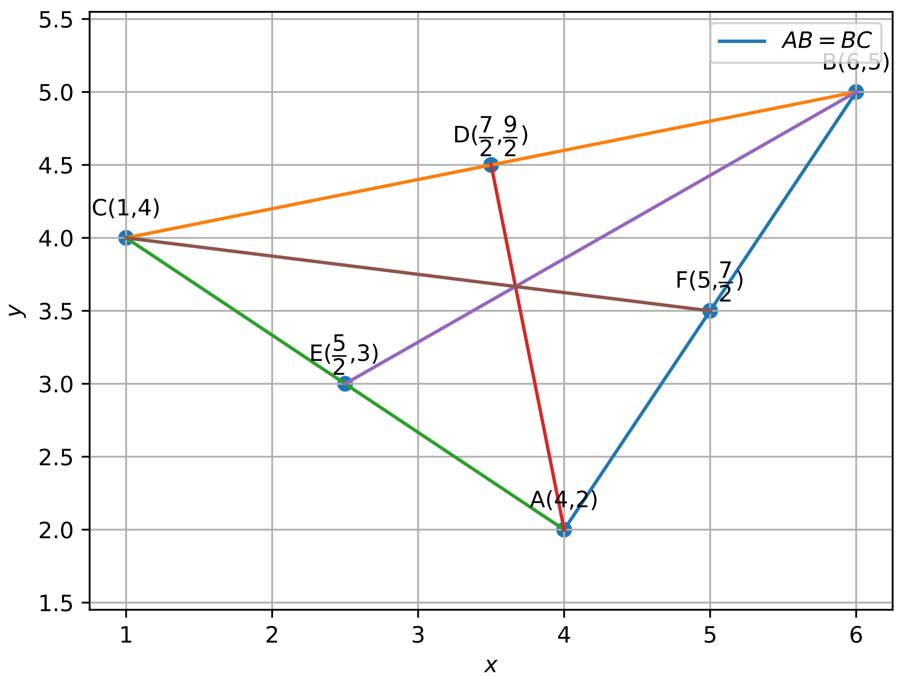


Figure 1: median of triangle