

VECTORS

1 10th 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 you 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

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

1. Solution for problem 1

$$\mathbf{D} = \frac{B + C}{2} \quad (2)$$

$$= \frac{\binom{6}{5} + \binom{1}{4}}{2} \quad (3)$$

$$= \frac{\binom{7}{9}}{2} \quad (4)$$

$$\mathbf{D} = \binom{\frac{7}{2}}{\frac{9}{2}} \quad (5)$$

$$\mathbf{E} = \frac{A + C}{2} \quad (6)$$

$$= \frac{\binom{4}{2} + \binom{1}{4}}{2} \quad (7)$$

$$= \frac{\binom{5}{6}}{2} \quad (8)$$

$$\mathbf{E} = \binom{\frac{5}{2}}{3} \quad (9)$$

$$\mathbf{F} = \frac{A + B}{2} \quad (10)$$

$$= \frac{\binom{4}{2} + \binom{6}{5}}{2} \quad (11)$$

$$= \frac{\binom{10}{7}}{2} \quad (12)$$

$$\mathbf{F} = \binom{5}{\frac{7}{2}} \quad (13)$$

2. Solution for problem 2

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

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

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

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

$$= \frac{1}{3} \left(\binom{11}{11} \right) \tag{18}$$

$$\mathbf{P} = \binom{\frac{11}{3}}{\frac{11}{3}} \tag{19}$$

3. solution for problem 3

$$n = \frac{2}{1} \quad (20)$$

$$\mathbf{Q} = \frac{1}{1+n} ((B + nE)) \quad (21)$$

$$= \frac{1}{1+\frac{2}{1}} \left(\binom{6}{5} + \frac{2}{1} \binom{5}{2} \right) \quad (22)$$

$$= \frac{1}{3} \left(\binom{6}{5} + \binom{5}{6} \right) \quad (23)$$

$$= \frac{1}{3} \left(\binom{11}{11} \right) \quad (24)$$

$$\mathbf{Q} = \begin{pmatrix} \frac{11}{3} \\ \frac{11}{3} \end{pmatrix} \quad (25)$$

$$\mathbf{R} = \frac{1}{1+n} ((C + nF)) \quad (26)$$

$$= \frac{1}{1+\frac{2}{1}} \left(\binom{1}{4} + \frac{2}{1} \binom{5}{7} \right) \quad (27)$$

$$= \frac{1}{3} \left(\binom{1}{4} + \binom{10}{7} \right) \quad (28)$$

$$= \frac{1}{3} \left(\binom{11}{11} \right) \quad (29)$$

$$\mathbf{R} = \begin{pmatrix} \frac{11}{3} \\ \frac{11}{3} \end{pmatrix} \quad (30)$$

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 centroid of triangle.

5. solution for problem 5

$$\mathbf{G} = \frac{D + E + F}{3} \quad (31)$$

$$= \begin{pmatrix} \frac{11}{3} \\ \frac{11}{3} \end{pmatrix} + \begin{pmatrix} \frac{11}{3} \\ \frac{11}{3} \end{pmatrix} + \begin{pmatrix} \frac{11}{3} \\ \frac{11}{3} \end{pmatrix} \quad (32)$$

$$\mathbf{G} = \begin{pmatrix} \frac{11}{3} \\ \frac{11}{3} \end{pmatrix} \quad (33)$$

2 FIGURE

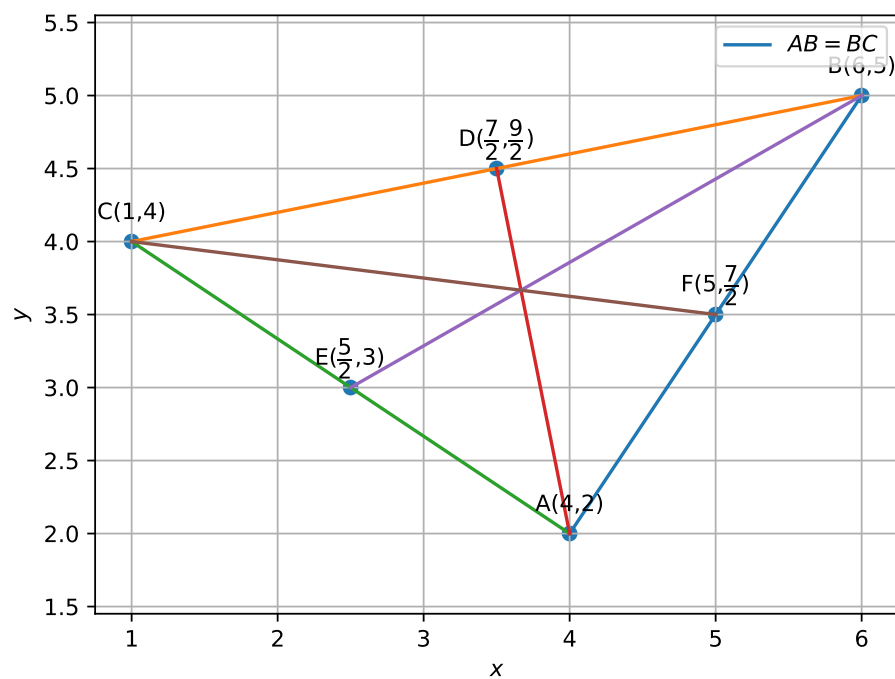


Figure 1: median of triangle