VECTORS

1 10^{th} Maths - EXERCISE-7.3

1. That a median of a triangle divides it into two triangles of equal areas. verify this result for $\triangle ABC$ whose vertices are $\mathbf{A}(4,-6), \mathbf{B}(3,-2)$ and $\mathbf{C}(5,2)$.

2 SOLUTION

Given points are

$$\mathbf{A} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} \tag{1}$$

The formula of the equation

$$\frac{1}{2} \left\| (\mathbf{A} - \mathbf{B}) \times (\mathbf{A} - \mathbf{D}) \right\| \tag{2}$$

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix} 4 \\ -6 \end{pmatrix} - \begin{pmatrix} 3 \\ -2 \end{pmatrix} = \begin{pmatrix} 1 \\ -4 \end{pmatrix} \tag{3}$$

$$\mathbf{A} - \mathbf{D} = \begin{pmatrix} 4 \\ -6 \end{pmatrix} - \begin{pmatrix} 4 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ -6 \end{pmatrix} \tag{4}$$

Substituting the values of (**??**) and (**??**) in (**??**),

$$\frac{1}{2} \begin{vmatrix} 1 & 0 \\ -4 & -6 \end{vmatrix} = \frac{6}{2} \tag{5}$$

$$= 3 \tag{6}$$

Also, the ar(ACD) can be expressed as

$$\frac{1}{2} \left\| (\mathbf{B} - \mathbf{C}) \times (\mathbf{B} - \mathbf{D}) \right\| \tag{7}$$

$$\mathbf{A}-\mathbf{C}=\begin{pmatrix}4\\-6\end{pmatrix}-\begin{pmatrix}5\\2\end{pmatrix}=\begin{pmatrix}-1\\-8\end{pmatrix} \tag{8}$$

$$\mathbf{A}-\mathbf{D}=\begin{pmatrix}4\\-6\end{pmatrix}-\begin{pmatrix}4\\0\end{pmatrix}=\begin{pmatrix}0\\-6\end{pmatrix} \tag{9}$$

Substituting the values of (**??**) and (**??**) in (**??**),

$$\frac{1}{2}\begin{vmatrix}-1 & 0\\-8 & -6\end{vmatrix}=\frac{6}{2} \tag{10}$$

$$=3 \tag{11}$$

The median of the triangle is both side areas are equal $\triangle ABD=\triangle ACD$

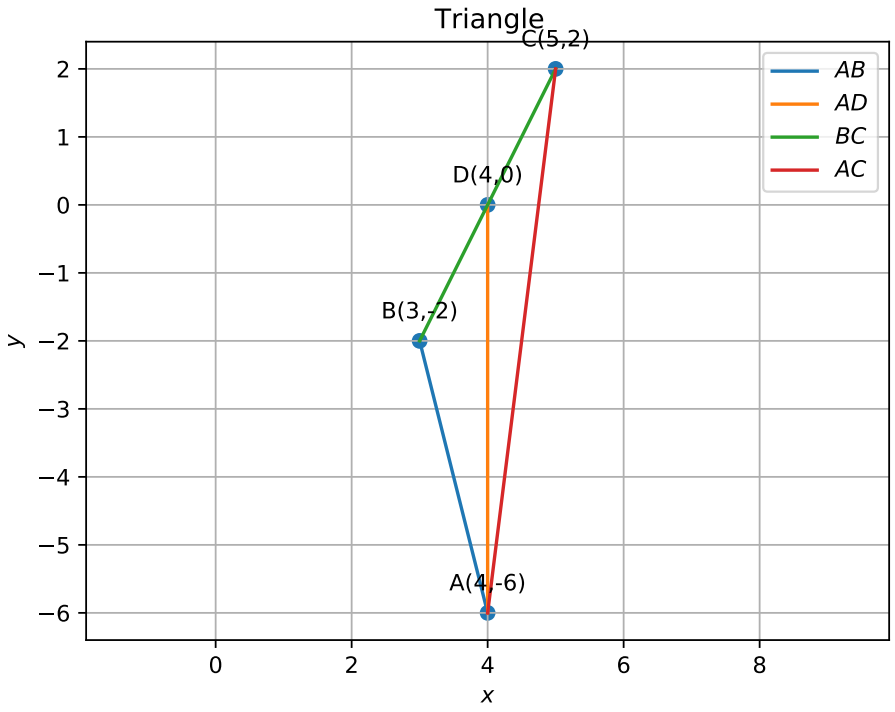

Figure 1: Triangle