

# Assignment-1

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Question 1.1.6.)The area of  $\Delta ABC$  is defined as

$$\frac{1}{2} \|(\mathbf{A} - \mathbf{B}) \times \mathbf{A} - \mathbf{C}\|$$

where

$$\mathbf{A} \times \mathbf{B} = \begin{vmatrix} 1 & -4 \\ -1 & 6 \end{vmatrix}$$

Find the area of  $\Delta ABC$ .

Ans) Given in the question that,

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}; \mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}; \mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} \quad (1)$$

Formula for area of  $\Delta ABC = \frac{1}{2} \|(\mathbf{A} - \mathbf{B}) \times (\mathbf{A} - \mathbf{C})\|$

$$\text{Value of } \mathbf{A} - \mathbf{B} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix} = \begin{pmatrix} 5 \\ -7 \end{pmatrix} \quad (2)$$

$$\text{Value of } \mathbf{A} - \mathbf{C} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} -3 \\ -5 \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad (3)$$

$$\therefore (\mathbf{A} - \mathbf{B}) \times (\mathbf{A} - \mathbf{C}) = \begin{vmatrix} 5 & 4 \\ -7 & 4 \end{vmatrix} \quad (4)$$

The value of Determinant is

$$\begin{vmatrix} 5 & 4 \\ -7 & 4 \end{vmatrix} = 5 \times 4 - 4 \times (-7) = 20 + 28 = 48 \quad (5)$$

$$\therefore \|(\mathbf{A} - \mathbf{B}) \times (\mathbf{A} - \mathbf{C})\| = \sqrt{48^2} = 48 \quad (6)$$

$$\Rightarrow \frac{1}{2} \|(\mathbf{A} - \mathbf{B}) \times (\mathbf{A} - \mathbf{C})\| = \frac{48}{2} = 24 \quad (7)$$

$\therefore$  Area of  $\Delta ABC = 24 \text{ square units}$