

# Vector Algebra

## 12<sup>th</sup> Maths - Chapter 10

This is Problem-3 from Exercise 10.4

1. A girl walks 4 km towards west, then she walk 3 km in a direction  $30^\circ$  east of north and stops. Determine the girl's displacement from her initial point of departure.

**Solution:** Let **A**, **B** and **C** be the initial point, mid point and final point respectively, as girls moves from point **A** to **B** towards west then,

$$\mathbf{AB} = \begin{pmatrix} -4 \\ 0 \end{pmatrix} \quad (1)$$

Then girl walks 3 km in the direction  $30^\circ$  east of north

$$\mathbf{BC} = \begin{pmatrix} 3 \cos 60^\circ \\ 3 \sin 60^\circ \end{pmatrix} \quad (2)$$

$$= \begin{pmatrix} \frac{3}{2} \\ \frac{3\sqrt{3}}{2} \end{pmatrix} \quad (3)$$

By triangle law of vector addition, we have

$$\mathbf{AC} = \mathbf{AB} + \mathbf{BC} \quad (4)$$

$$= \begin{pmatrix} -4 \\ 0 \end{pmatrix} + \begin{pmatrix} \frac{3}{2} \\ \frac{3\sqrt{3}}{2} \end{pmatrix} \quad (5)$$

$$= \begin{pmatrix} \frac{-5}{2} \\ \frac{3\sqrt{3}}{2} \end{pmatrix} \quad (6)$$

Hence, the girl's displacement from her initial point of departure is

$$\mathbf{A} = \begin{pmatrix} \frac{-5}{2} \\ \frac{3\sqrt{3}}{2} \end{pmatrix} \quad (7)$$

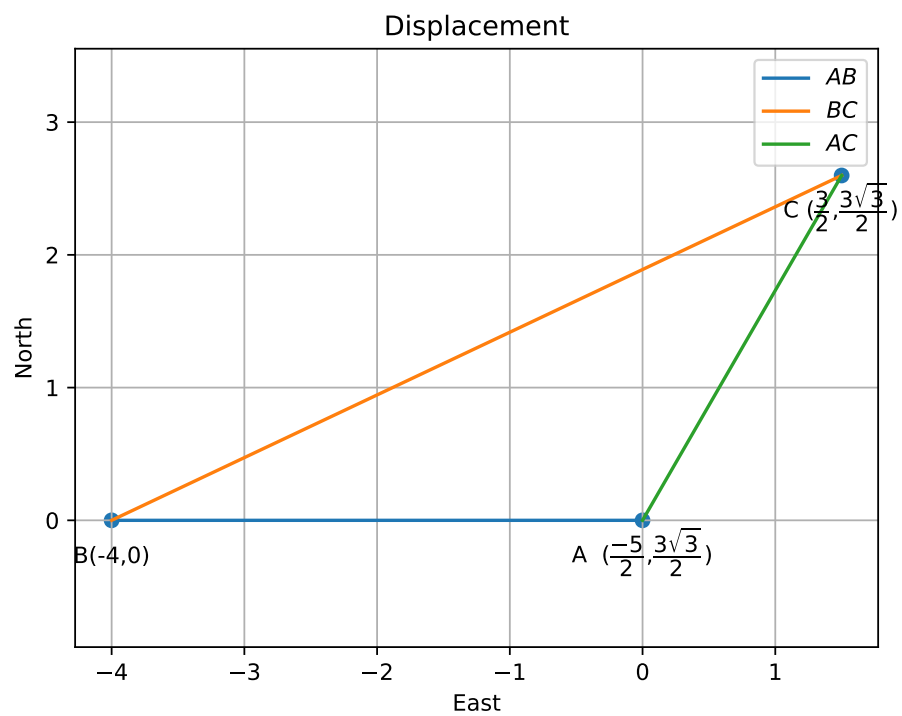


Figure 1