1.9.13

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Problem Statement

A man goes 5 meters due west and then 12 meters due north. How far is he from the starting point?

Solution:

Let's assume that the man starts from the origin. He moves 5 m west to point A.

$$\mathbf{A} = 5\begin{pmatrix}-1\\0\end{pmatrix} \tag{1.9.13.1}$$

He then moves 12m north from B.

$$\mathbf{B} = 5\begin{pmatrix}-1\\0\end{pmatrix} + 12\begin{pmatrix}0\\1\end{pmatrix} = \begin{pmatrix}-5\\12\end{pmatrix} \tag{1.9.13.2}$$

Therefore the corrdinates are

Symbol	Value	Description
0	$\begin{pmatrix}0\\0\end{pmatrix}$	Origin
A	$\begin{pmatrix}-5\\0\end{pmatrix}$	First Point
B	$\begin{pmatrix}-5\\12\end{pmatrix}$	Second Point

We need to find the distance between the starting point O and the final point B.

$$\mathbf{O}-\mathbf{B}=\begin{pmatrix}0\\0\end{pmatrix}-\begin{pmatrix}-5\\12\end{pmatrix}=\begin{pmatrix}5\\-12\end{pmatrix} \tag{1.9.13.3}$$

$$(\mathbf{0}-\mathbf{B})^{\top}(\mathbf{0}-\mathbf{B})=169=\|0-B\|^2 \tag{1.9.13.4}$$

Thus the desired distance is

$$d=\|\mathbf{O}-\mathbf{B}\|=\sqrt{169}=13 \tag{1.9.13.5}$$

The distance between the man and the starting point = 13

See Figure **??**.

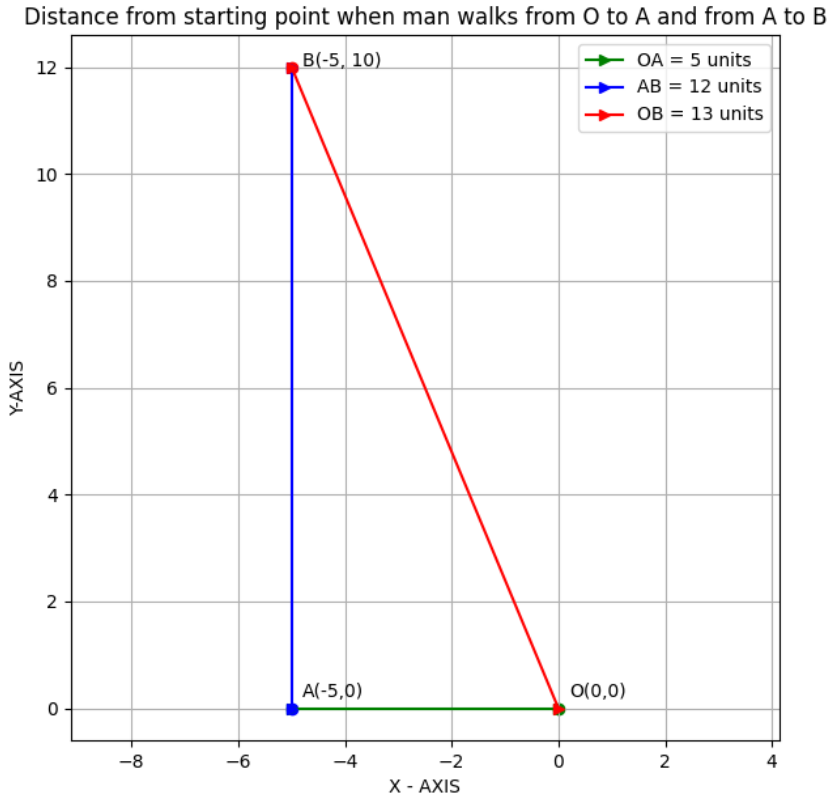

Figure 1.9.13.1