

# 1-1.2-24

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## Question:

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

## Solution:

Variable	Description
$x_1$	Displacement-1
$x_2$	Displacement-2
$x$	Net displacement
$x^T$	Transpose of net displacement
$\ x\ $	Magnitude of displacement

TABLE 0: Variables Used

$$x_1 = \begin{pmatrix} -5 \\ 0 \end{pmatrix} \quad (0.1)$$

$$x_2 = \begin{pmatrix} 0 \\ 12 \end{pmatrix} \quad (0.2)$$

Net displacement is given by,

$$x = x_1 + x_2 \quad (0.3)$$

$$x = \begin{pmatrix} -5 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ 12 \end{pmatrix} = \begin{pmatrix} -5 \\ 12 \end{pmatrix} \quad (0.4)$$

$$x^T = \begin{pmatrix} -5 & 12 \end{pmatrix} \quad (0.5)$$

Therefore, the magnitude of x is given by,

$$\|x\| = \sqrt{x^T * x} \quad (0.6)$$

$$\|x\| = \sqrt{25 + 144} = \sqrt{169} = 13 \text{ units} \quad (0.7)$$

Therefore, the distance of man from starting point is 13 units.

### Movement and Distance Calculation

