Answer on Question #64422-Physics-Molecular Physics-Thermodynamics

A ship sails 50 km due north and then sails 85 km, 45 degrees north east. How far the ship from its starting point and what is its exact location? Use the graphical method and analytical method

Solution

1. Analytical method.

$$\vec{A} = (0, 50)\ m$$

$$\vec{B} = (85 \cos 45\,, 85 \sin 45) = \left(\frac{85}{\sqrt{2}}, \frac{85}{\sqrt{2}}\right)\ m.$$

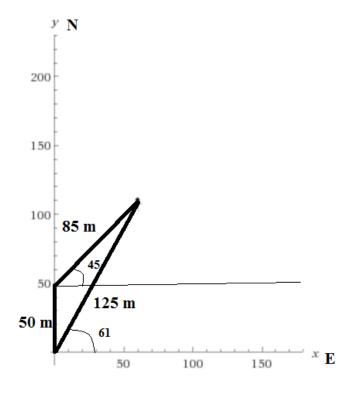$$\vec{A} + \vec{B} = \left(\frac{85}{\sqrt{2}}, 50 + \frac{85}{\sqrt{2}}\right)\ m.$$

The distance is

$$d = \sqrt{\left(\frac{85}{\sqrt{2}}\right)^2 + \left(50 + \frac{85}{\sqrt{2}}\right)^2} = 125\ m.$$

The direction is

$$\theta = \tan^{-1} \frac{50 + \frac{85}{\sqrt{2}}}{\frac{85}{\sqrt{2}}} = 61° \text{ north of east.}$$

2. Graphical method.