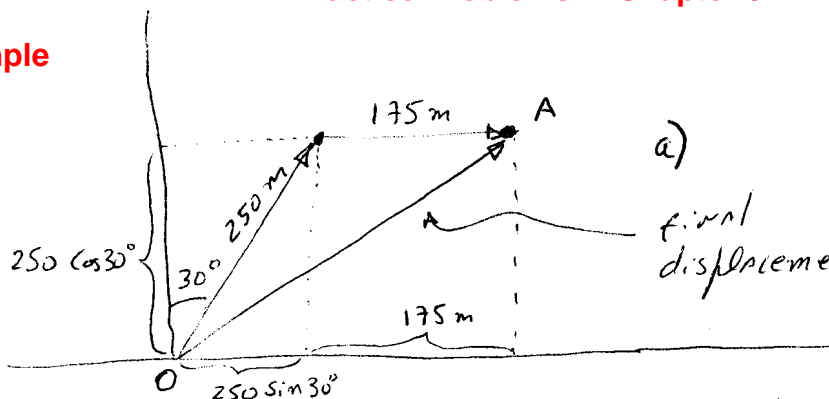


Practice Problems Chapter 3

Example



A woman walk 250 m in the direction 30° east of north, then 175 m directly east. Find a) the magnitude and b) the angle of her final displacement from the starting point. c) Find the distance she walks. d) Which is greater, that distance or the magnitude of her displacement?

b) Magnitude of the vector displacement:  $\vec{r}_{OA}$

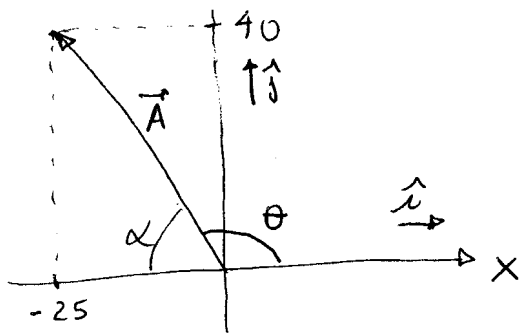
$$\begin{aligned} \vec{r}_{OA} &= (250 \sin 30^\circ + 175) \hat{i} + 250 \cos 30^\circ \hat{j} \quad \text{in meters} \\ &= (250 \times \frac{1}{2} + 175) \hat{i} + 250 \times \frac{\sqrt{3}}{2} \hat{j} \\ &= 300 \hat{i} + 216.25 \hat{j} \end{aligned}$$

$$|\vec{r}_{OA}| = \sqrt{(300)^2 + (216.25)^2} = \sqrt{90,000 + 46,764} = 369.8 \text{ m} \quad (1)$$

Distance she walked:  $250 \text{ m} + 175 \text{ m} = 425 \text{ m} \quad (2)$

distance she walked  $> |\vec{r}_{OA}|$

Problem 1  
CH-3



Notice  $\tan \alpha = \frac{40}{25} = 1.6$   
 $\Rightarrow \alpha =$

$$\vec{A} = -25 \hat{i} + 40 \hat{j}$$

a) Magnitude of the vector

$$\begin{aligned} |\vec{A}| &= \sqrt{(-25)^2 + (40)^2} = \\ &= \sqrt{625 + 1600} = 47 \end{aligned}$$

b) Finding angle  $\theta$

Since  $\alpha + \theta = 180^\circ$

Then  $\theta = 180^\circ - \alpha =$

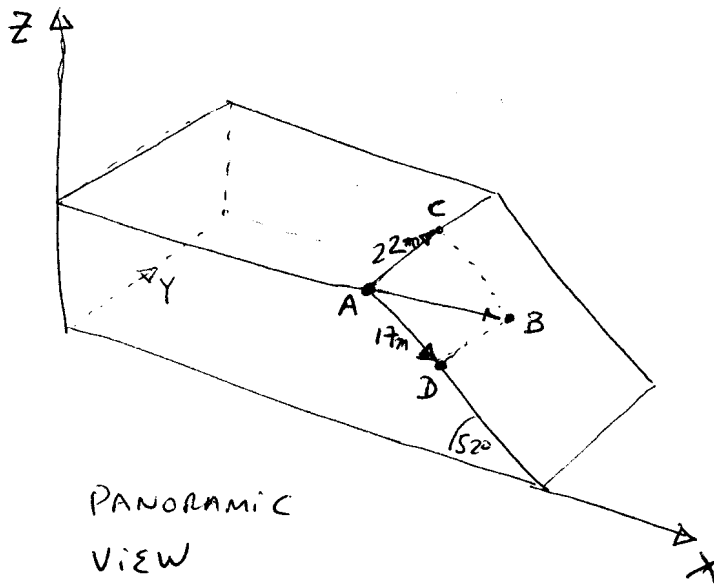
**Problem**

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CH-3

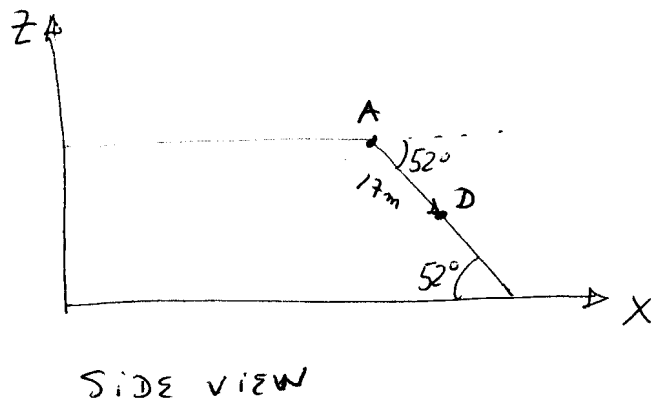
the figures show the system of coordinates XYZ we have chosen

We need to find  $\vec{AB}$



• NOTICE  $\vec{AB} = \vec{AC} + \vec{AD}$  (1)

•  $\vec{AC} = (22\text{ m})\hat{j}$  (2)



•  $\vec{AD} = 17 \cos 52 \hat{i} + 17 \sin 52 (-\hat{k})$

$\vec{AD} = 17 \cos 52 \hat{i} - 17 \sin 52 \hat{k}$  (3)

a) From (1), (2) and (3) we obtain

•  $\vec{AB} = 17 \cos 52 \hat{i} + 22 \hat{j} - 17 \sin 52 \hat{k}$  (in meters)

b) The vertical (Z) component of vector  $\vec{AB}$  is  $-17(\sin 52) \text{ m}$ .

c) The magnitude of vector  $\vec{AB}$  is

$$|\vec{AB}| = \sqrt{\underbrace{(17 \cos 52)^2}_{\cos 52} + (22)^2 + (-17 \sin 52)^2} = \sqrt{(17)^2 + (22)^2} = \sqrt{289 + 484} = 27.8 \text{ m}$$