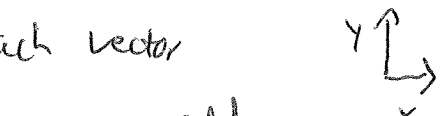
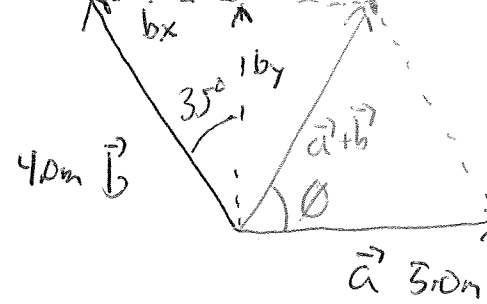
**3-46** Need to break each vector into $\hat{x}, \hat{y}$ components so we can add them numerically:




$\vec{a} = 5.0\text{m}\,\hat{x} + 0\text{m}\,\hat{y}$ (already all on $\hat{x}$)

$\vec{b} = |\vec{b}|(-\sin 35^\circ \hat{x} + \cos 35^\circ \hat{y})$ (see diagram for direction and sin vs. cos)

$= (4.0\text{m})(-0.819\hat{x}) + 4.0(0.574)\hat{y}$

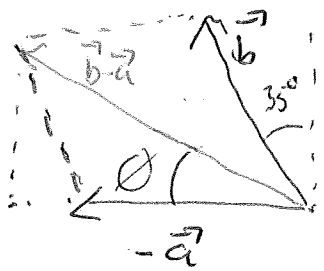
$= -2.3\text{ m}\,\hat{x} + 3.28\text{ m}\,\hat{y}$ (visual check!)

so: $\vec{a} + \vec{b} = (5.0 - 2.3)\text{m}\,\hat{x} + 3.3\text{m}\,\hat{y} = 2.7\text{m}\,\hat{x} + 3.3\text{m}\,\hat{y}$

a) $|\vec{a}+\vec{b}| = \sqrt{2.7^2 + 3.3^2}\text{ m} =$ **4.2 m**

b) direction: $\tan\theta = \frac{3.3\text{m}}{2.7\text{m}} \Rightarrow$ **$\theta = 51^\circ$ from x-axis**

What about $\vec{b} - \vec{a}$? Vector subtraction is the same as addition, just put a "−" in front of the vector components, and flip the negative vector on the diagram:




With unit vectors:

$\vec{b} - \vec{a} = (-2.3 - 5.0)\text{m}\,\hat{x} + 3.3\text{m}\,\hat{y}$

$= -7.3\text{m}\,\hat{x} + 3.3\text{m}\,\hat{y}$

so c) $|\vec{b}-\vec{a}| = \sqrt{7.3^2 + 3.3^2}\text{ m} =$ **8.0 m**

d) direction? $\tan^{-1}\frac{\text{opp}}{\text{adj}} = \frac{(b-a)_y}{(b-a)_x} = \left(\frac{3.3}{7.3}\right) =$ **24° (up from −x axis)**