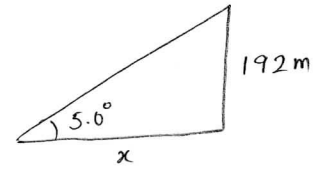


Solutions

Prob. 1

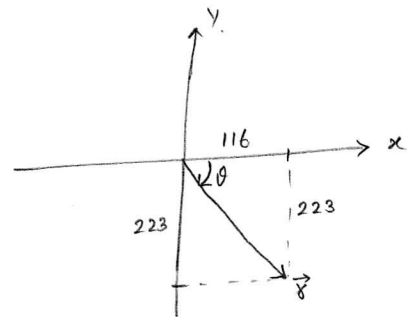
$$\tan(5.0^\circ) = \frac{192 \text{ m}}{x}$$

$$x = \frac{192 \text{ m}}{\tan(5.0^\circ)} = 2195 \text{ m} \\ = 2.2 \text{ km}$$



Prob. 2

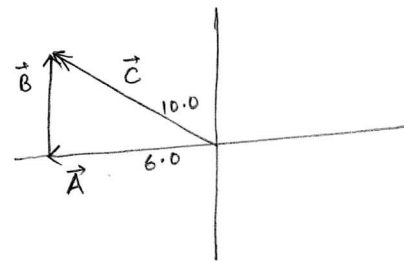
$$(a) \text{ magnitude} = |\vec{r}| \\ = \sqrt{116^2 + 223^2} \\ = 251 \text{ m}$$



$$(b) \text{ direction} \quad \theta = \tan^{-1}\left(\frac{223}{116}\right) \\ = 62.5^\circ \text{ clockwise with respect to } \hat{x}.$$

Prob. 3

$$\vec{c} = \vec{A} + \vec{B} \\ |\vec{c}|^2 = |\vec{A}|^2 + |\vec{B}|^2 \quad (\text{they form right angled triangle}). \\ |\vec{B}| = \sqrt{|\vec{c}|^2 - |\vec{A}|^2} \\ = \sqrt{10.0^2 - 6.0^2} \\ = 8.0 \text{ units}$$



Prob. 4

$$\vec{D} = \vec{A} + \vec{B} + \vec{C}$$

$$\vec{A} = 4.0 \hat{i} + 0 \hat{j}$$

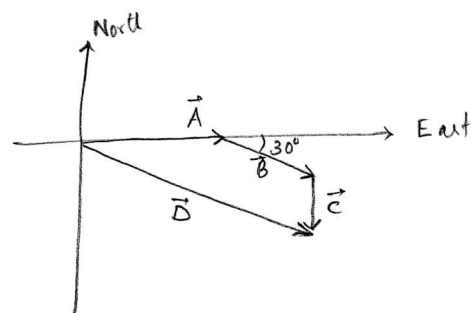
$$\vec{B} = 1.73 \hat{i} - 1.0 \hat{j}$$

$$\vec{C} = 0 \hat{i} - 0.50 \hat{j}$$

$$\vec{D} = 5.73 \hat{i} - 1.50 \hat{j}$$

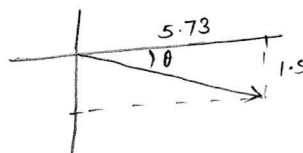
magnitude: $|\vec{D}| = \sqrt{5.73^2 + 1.50^2}$
 $= 5.9 \text{ m}$

direction: $\theta = \tan^{-1}\left(\frac{1.5}{5.73}\right) = 15^\circ \text{ South of East.}$



$$\vec{B} = 2.0 \cos 30^\circ \hat{i} - 2.0 \sin 30^\circ \hat{j}$$

$$= 1.73 \hat{i} - 1.0 \hat{j}$$



Prob. 5

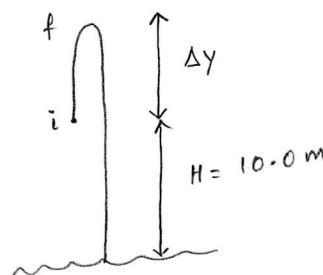
$$\Delta y = ?$$

$$\Delta t =$$

$$a = -9.8 \frac{\text{m}}{\text{s}^2}$$

$$v_i = 6.0 \frac{\text{m}}{\text{s}}$$

$$v_f = 0$$



$$2 a \Delta y = v_f^2 - v_i^2$$

$$2 (-9.8) \Delta y = 0^2 - 6.0^2$$

$$\Delta y = \frac{6.0^2}{2(9.8)} = 1.8 \text{ m}$$

Total height above water level = $10.0 \text{ m} + 1.8 \text{ m}$
 $= 11.8 \text{ m}$

Prob. 6

$$\Delta x = ?$$

$$\Delta t =$$

$$a = -4.00 \frac{\text{m}}{\text{s}^2}$$

$$V_i = +15 \frac{\text{m}}{\text{s}}$$

$$V_f = 0$$

$$2a \Delta x = V_f^2 - V_i^2$$

$$2(-4.00) \Delta x = 0^2 - 15^2$$

$$\Delta x = \frac{15^2}{2(4.00)} = 28 \text{ m}$$

Prob. 7

$$\Delta y = 0$$

$$\Delta t = 4.0 \text{ s}$$

$$a = -9.8 \frac{\text{m}}{\text{s}^2}$$

$$V_i = ?$$

$$V_f =$$

$$\Delta y = V_i \Delta t + \frac{1}{2} a \Delta t^2$$

$$0 = V_i (4.0) + \frac{1}{2} (-9.8) (4.0)^2$$

$$V_i = 19.6 \frac{\text{m}}{\text{s}}$$

Prob. 8Boat

$$\Delta x = 10.0 - 2.00 = 8.00 \text{ m}$$

$$\Delta t =$$

$$V_B = ?$$

Stone

$$\Delta y = -40.0 \text{ m}$$

$$\Delta t =$$

$$a = -9.8 \frac{\text{m}}{\text{s}^2}$$

$$V_i = 0$$

$$V_f =$$

$$\Delta y = \cancel{V_i}^{\nearrow=0} \Delta t + \frac{1}{2} a \Delta t^2$$

$$-40.0 = 0 + \frac{1}{2} (-9.8) \Delta t^2$$

$$\Delta t = \sqrt{\frac{(40.0)^2}{9.8}} = 2.86 \text{ sec.}$$

$$\Delta x = V_B \Delta t$$

$$8.00 = V_B (2.86)$$

$$V_B = \frac{8.00}{2.86} = 2.8 \frac{\text{m}}{\text{s}}$$