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Phys 121

Quiz #1

1. Convert $1.12 \frac{\text{km}}{\text{hr} \cdot \text{min}}$ to units of $\frac{\text{m}}{\text{s}^2}$.

$$\left(1.12 \frac{\text{km}}{\text{hr} \cdot \text{min}}\right) \left(\frac{1000 \text{ m}}{1 \text{ km}}\right) \left(\frac{1 \text{ hr}}{3600 \text{ s}}\right) \left(\frac{1 \text{ min}}{60 \text{ s}}\right) = \boxed{5.19 \times 10^{-3} \frac{\text{m}}{\text{s}^2}}$$

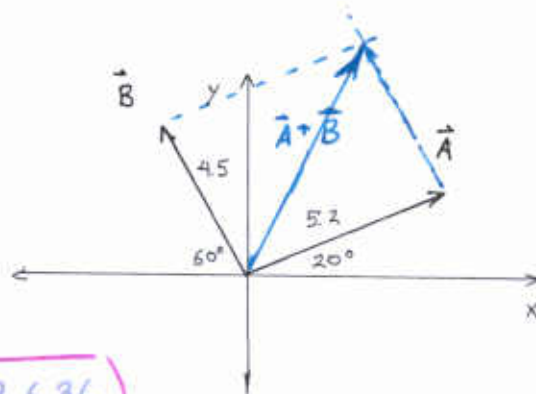
2. Vector **A** has magnitude 5.2 and is directed at 20° above the $+x$ axis. Vector **B** has magnitude 4.5 and is directed at 60° upward from the $-x$ axis, as shown.

a) Find the x and y components of the vector $\mathbf{A} + \mathbf{B}$. x -component is

$$A_x + B_x = 5.2 \cos 20^\circ - 4.5 \cos 60^\circ = \boxed{2.636}$$

 y -component is

$$A_y + B_y = 5.2 \sin 20^\circ + 4.5 \sin 60^\circ = \boxed{5.676}$$

b) Find the magnitude and direction of the vector $\mathbf{A} + \mathbf{B}$.

$$\text{Magnitude of } \vec{A} + \vec{B} \text{ is } \sqrt{(2.636)^2 + (5.676)^2} = \boxed{6.26}$$

$$\text{Direction is } \theta = \tan^{-1} \left(\frac{5.676}{2.636} \right) = \boxed{65.1^\circ} \quad (\text{As meas'd above } +x \text{ axis})$$

c) Sketch the vector $\mathbf{A} + \mathbf{B}$ in the diagram above.

3. A malnourished man, throws a ball up into the air with some initial speed v_0 . (We can assume the ball starts from ground level.) The ball rises to a maximum height of 57.0 m.

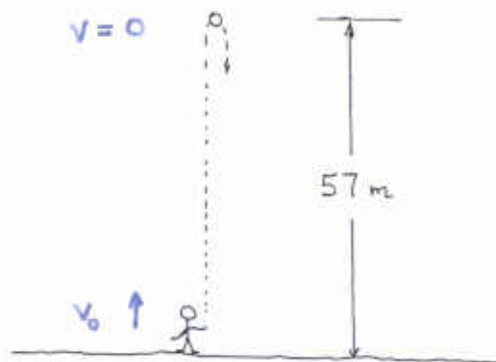
a) Find the initial speed v_0 .

At max ht, $v = 0$. Use:

$$v^2 = v_0^2 + 2ax$$

$$v_0^2 = v^2 - 2ax = 0^2 - 2(-9.8 \frac{m}{s^2})(57m) = 1.12 \times 10^3 \frac{m^2}{s^2}$$

$$v_0 = 33.4 \frac{m}{s}$$



b) How long did it take for the ball to reach maximum height?

Use $v = v_0 + at$

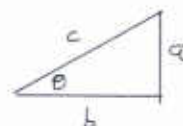
$$t = \frac{v - v_0}{a} = \frac{0 - 33.4 \frac{m}{s}}{(-9.8 \frac{m}{s^2})} = 3.4 s$$

You must show all your work!

$$1 \text{ min} = 60 \text{ s} \quad 1 \text{ hour} = 60 \text{ min} \quad 1 \text{ km} = 1000 \text{ m} \quad g = 9.8 \frac{m}{s^2}$$

$$A_x = A \cos \theta \quad A_y = A \sin \theta \quad \theta = \tan^{-1} \frac{A_y}{A_x}$$

$$v = v_0 + at \quad x = v_0 t + \frac{1}{2} at^2 \quad v^2 = v_0^2 + 2ax \quad x = \frac{1}{2}(v + v_0)t$$



$$\sin \theta = \frac{a}{c} \\ \cos \theta = \frac{b}{c} \\ \tan \theta = \frac{a}{b}$$