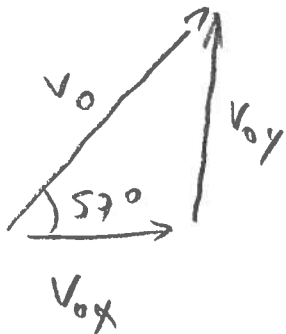


Physics 10154 - Quiz 3B

A projectile is launched at an angle of 57° above the horizontal. 2.5 seconds after launch, the projectile is still on its way up, and it is at an altitude of 88 meters.

- What is the initial velocity of the ball?
- To what maximum height will the projectile reach above ground?
- What will be the magnitude and direction of the projectile's velocity when it reaches its maximum height?

$$\begin{aligned} \text{a) } \Delta y &= 88 \\ v_{0y} &= ? \\ v_y &= ? \\ a_y &= -9.8 \\ t &= 2.5 \end{aligned}$$



$$88 = v_{0y}(2.5) + \frac{1}{2}(-9.8)(2.5)^2$$

$$118.625 = v_{0y}(2.5)$$

$$v_{0y} = 47.45 \text{ m/s}$$

$$\sin 57^\circ = \frac{v_{0y}}{v_0} \Rightarrow v_0 = \frac{v_{0y}}{\sin 57^\circ}$$

$$\Rightarrow \boxed{v_0 = 57 \text{ m/s}, 57^\circ \text{ above } +x}$$

$$\begin{aligned} \text{b) } \Delta y &= ? \\ v_{0y} &= 47.45 \\ v_y &= 0 \\ a_y &= -9.8 \end{aligned}$$

$$v_y^2 = v_{0y}^2 + 2a_y \Delta y$$

$$0 = (47.45)^2 + 2(-9.8)\Delta y$$

$$\boxed{\Delta y = 110 \text{ m}}$$

$$\text{c) } \tan 57^\circ = \frac{v_{0y}}{v_{0x}} \Rightarrow v_{0x} = \frac{v_{0y}}{\tan 57^\circ} = 31 \text{ m/s}$$

$$\text{At } y_{\max}, v_y = 0, v_x = v_{0x} = 31 \text{ m/s} \Rightarrow \boxed{v = 31 \text{ m/s}, +x \text{ dir}}$$