

Physics 10154 - Quiz 3A

A ball is launched at an angle of 41.0° above the horizontal and reaches its maximum height above ground 3.80 seconds after launch.

- What is the initial velocity of the ball?
- What is the magnitude and direction of the ball's velocity when the ball reaches its maximum height?
- What is the total horizontal distance travelled by the ball from launch until it hits the ground again?

$$a) \Delta y = ?$$

$$v_{0y} = ?$$

$$v_y = 0$$

$$a_y = -9.8$$

$$t = 3.80$$

$$v_y = v_{0y} + a_y t$$

$$0 = v_{0y} + (-9.8)(3.8)$$

$$v_{0y} = 37.24 \text{ m/s}$$

$$\sin 41^\circ = \frac{v_{0y}}{v_0} \Rightarrow v_0 = \frac{v_{0y}}{\sin 41^\circ}$$

$$= \boxed{56.8 \text{ m/s}, 41^\circ \text{ above } +x}$$



$$b) \tan 41^\circ = \frac{v_{0y}}{v_{0x}} \Rightarrow v_{0x} = \frac{v_{0y}}{\tan 41^\circ} = 42.8 \text{ m/s}$$

$$\text{At max height } v_y = 0 \quad v_x = v_{0x} = 42.8$$

$$\Rightarrow \boxed{v = 42.8 \text{ m/s}, +x \text{ direction}}$$

$$c) \text{ total flight time} = 2 * 3.80 = 7.60 \text{ s}$$

$$\Delta x = v_{0x} t = (42.8)(7.6) = \boxed{326 \text{ m}}$$