Answer on Question #46717-Physics-Other

Aroldis Chapman threw a fastball at $v_0 = 105.1$ miles per hour on September 24, 2010, the record speed for a pitched baseball in a Major League Baseball game. If the ball was thrown at an angle exactly parallel to the ground, how far would the ball drop in the $\Delta x = 16.8 m$ between when it left Champan's hand and when it crossed home plate?

Solution

The horizontal displacement is

$$\Delta x = v_0 t.$$

The vertical displacement is

$$\Delta y = \frac{gt^2}{2}.$$

Therefore

$$\Delta y = \frac{g\left(\frac{\Delta x}{v_0}\right)^2}{2} = \frac{9.81 \frac{m}{s^2}\left(\frac{16.8m}{105.1 \cdot 0.44704 \frac{m}{s}}\right)^2}{2} = 0.627 \, m.$$

Answer: $0.627 \, m$.