

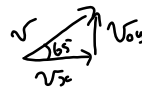
With what minimum speed does a baseball have to come off the bat to clear the Green Monster at Fenway Park? The wall is 115.5 m from home plate and 11.3 m high. Assume the batter makes contact 1.0 m off the ground at an angle of 65°.

$$V = ?$$

$$d_{fx} = 115.5 \text{ m}, d_{ox} = 0$$

$$d_{fy} = 11.3 \text{ m} \quad g = -9.81$$

$$d_{oy} = 1.0 \text{ m}$$



$$V_x = V \cos 65$$

$$V_x = \frac{d_{fx} - d_{ox}}{t} = \frac{115.5}{t} \Rightarrow V_x = \frac{115.5}{t}$$

y-dir

$$V_{oy} = V \sin 65$$

$$d_{fy} = d_{oy} + V_{oy}t + \frac{1}{2}gt^2$$

$$11.3 = 1.0 + V_{oy}t - 4.9t^2 \quad \text{Sub } V_{oy} = V \sin 65 \text{ in}$$

$$11.3 = 1.0 + (V \sin 65)t - 4.9t^2$$

from above

$$V_x = V \cos 65 \text{ and } V_x = \frac{115.5}{t}$$

$$\therefore V \cos 65 = \frac{115.5}{t}$$

$$\text{Solve for } t: t = \frac{115.5}{V \cos 65} \quad \text{Sub in } t \text{ in eqn.}$$

$$11.3 = 1.0 + (V \sin 65)t - 4.9t^2$$

$$11.3 = 1.0 + \cancel{V \sin 65} \left(\frac{115.5}{\cancel{V \cos 65}} \right) - 4.9 \left(\frac{115.5}{V \cos 65} \right)^2$$

$$11.3 = 1.0 + 115.5 \tan 65 - 4.9 \left(\frac{115.5^2}{V^2 \cos^2 65} \right)$$

$$-237.4 = \frac{-365985.2}{V^2}$$

$$V^2 = \frac{-365985.2}{-237.4}$$

$$V = \sqrt{1541.6}$$

$$V = 39.3 \text{ m/s}$$

PhET this sucker!

Attachments

projectile-motion_en.jar