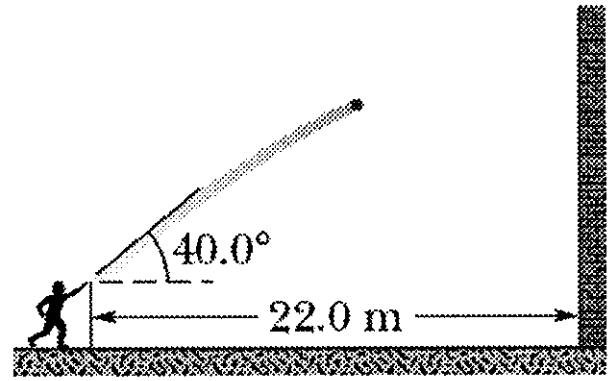
Physics 101
Quiz # 2
Chapter 4

Name : Solution Id : Sec. # : **25**

A ball is thrown toward a wall with a speed of 25.0 m/s and at an angle of 40.0 above the horizontal (see fig. below). The wall is 22.0 m from the release point of the ball.

a) How far above the release point does the ball hit the wall?



The time it takes the ball to hit the wall is

$$\Delta x = (v_0 \cos\theta_0)\, t$$

$$\Rightarrow t = \frac{\Delta x}{v_0 \cos\theta_0} = \frac{22.0}{25.0 \times \cos 40}$$

$$\Rightarrow t = 1.15 \text{ s}$$

The vertical displacement is

$$\Delta y = (v_0 \sin\theta_0)t - \frac{1}{2} g t^2 = 25 \times \sin(40) \times 1.15 - \frac{1}{2} \times 9.8 \times (1.15)^2 = \boxed{12.0 \text{ m}}$$

b) What is the velocity of the ball just before it hits the wall?

The velocity is a vector. One needs to find both the x, and y components of $\vec{V}$.

$$V_x = V_0 \cos(40) = 25 \times \cos(40) = 19.2 \text{ m/s}$$

$$V_y = V_0 \sin\theta_0 - gt = 25 \times \sin(40) - 9.8 \times 1.15 = 4.80 \text{ m/s}$$

$\Rightarrow$ The velocity of the ball just before it hits the wall is

$$\boxed{\vec{V} = (19.2\,\hat{i} + 4.80\,\hat{j}) \text{ m/s}}$$