Problem 4.15
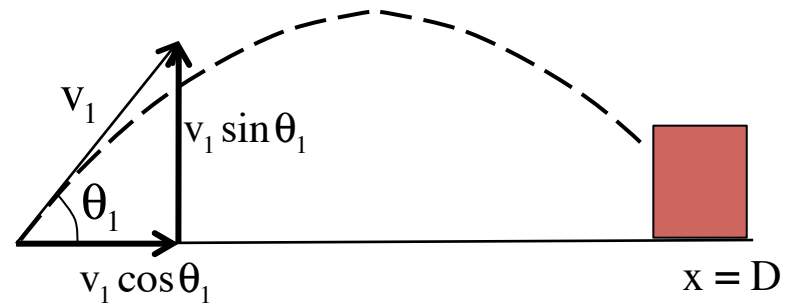
What's the *y-coordinate* of the water hit on the building?

To get the time of flight:

$$x_2 = \cancel{x_1}^{0} + (v_o \cos\theta)\Delta t + \frac{1}{2}\cancel{a_x}^{0}(\Delta t)^2$$

$$\Rightarrow \quad D = v_1 (\cos\theta_1)(\Delta t)$$

$$\Rightarrow \quad (\Delta t) = \frac{D}{v_1 (\cos\theta_1)}$$

For *y-coordinate*:

$$y_{wall} = \cancel{y_1}^{0} + (v_o \sin\theta)\Delta t + \frac{1}{2}(-g)(\Delta t)^2$$

$$\Rightarrow \quad y_{wall} = (v_1 \sin\theta)\left(\frac{D}{v_1 \cos\theta}\right) + \frac{1}{2}(-g)\left(\frac{D}{v_1 \cos\theta}\right)^2$$

$$= D\tan\theta - \frac{gD^2}{2(v_1 \cos\theta)^2}$$

Weirdly awkward, but at least the units match up!