ORANGE TOSS

$$t = ?$$

$$\Delta y = 10 \, ft$$

$$a = -9.8 \, m/s^2$$

**Knowns:**

- $$V = 0 \, m/s^2$$
- $$\Delta y = 10 \, ft = 10 \times \frac{1 \, m}{3.2 \, ft} = 3.04 \, m$$
- $$a = -9.8 \, m/s^2$$

**Unknowns:**

- $$t = ?$$
- $$V_0 = ? = 7.73 \, m/s$$

$$V^2 = V_0^2 + 2a \Delta y$$

$$D = V_0^2 + 2(-9.8 \, m/s^2) \times 3.04 \, m$$

$$D = 59.74 \, m^2/s^2$$

$$V_0 = \sqrt{59.74} \, m/s$$

$$V = V_0 + at$$

$$0 = 7.73 + (-9.8) \, t$$

$$a \, t = 7.73$$

$$t = \frac{7.73}{9.8} \, s$$

$$t = 0.79 \, s$$
WHICH BALL LANDS FASTEST?

1. Mathematical way of thinking:

\[ \Delta y_1 = \Delta y_2 = \Delta y \]
\[ a_1 = a_2 = a = -g \text{ m/s}^2 \]

\[ v^2 = v_0^2 + 2a\Delta x \]

Ball 1:
\[ v_1^2 = (+c)^2 + 2a\Delta y \]

Ball 2:
\[ v_2^2 = (-c)^2 + 2a\Delta y \]

2. Conceptual way of thinking:

Free-fall is always symmetric!

The ball thrown upward passes your hand at the same velocity as thrown (but now going downward).
**Homework Set-Up**

Event 1: Bed to top of floor  
\[ a = -9.8 \text{ m/s}^2 \]

Event 2: Top of floor to actually stopped.  
\[ a \neq -9 = \frac{\Delta v}{\Delta t} \]

Event 1: Think, what can I solve for?  
Event 2: Think, what do I need to know?

The answer to these two Q’s is the same!