Some Good Things to Know When Working Free-Fall/Projectile-Motion Problems

Notes:

- We are assuming wind resistance is negligible.
- We are labeling the **horizontal** direction as the ***x*-direction**.
- We are labeling the **vertical** direction as the ***y*-direction**.
- θ is measured from the **+*x*-axis**.

1. The acceleration in the ***y***-direction is 9.8 m/s/s downward.

$$\vec{a}_y = 9.8 m/s/s \downarrow$$

2. The acceleration in the ***x***-direction is 0.

$$\vec{a}_x = 0$$

3. The initial velocity in the ***x***-direction is equal to the final velocity in the ***x***-direction.

$$\vec{v}_{i,x} = \vec{v}_{f,x}$$

4. Because the initial velocity can be broken down into two **perpendicular** components, we can use the Pythagorean Theorem to find any component given the other two.

$$(v_i)^2 = (v_{i,x})^2 + (v_{i,y})^2$$

5. $\vec{v}_{i,x} = v_i \cos\theta \hat{x}$
6. $\vec{v}_{i,y} = v_i \sin\theta \hat{y}$