

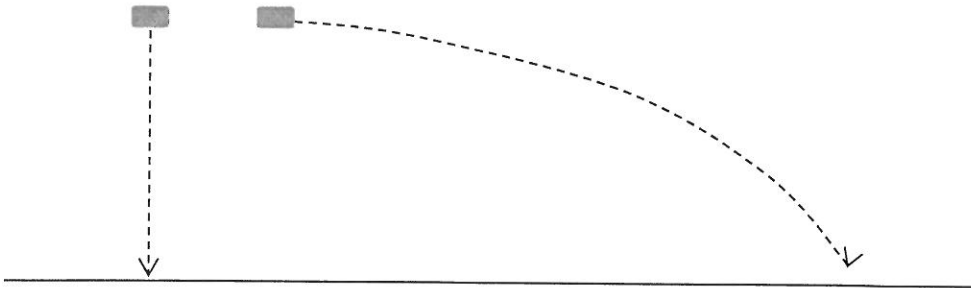
## Projectile Motion:

### Definitions:

A projectile is an object that is only under the influence of \_\_\_\_\_ (once it is fired).

The trajectory is the \_\_\_\_\_ the projectile takes.

Example: If a bullet is fired from a gun, and a bullet is dropped from the same height at the same time, which will hit the ground first?



The x- and y- motions are \_\_\_\_\_ of one another.

For all cases,  $a_y = \underline{\hspace{2cm}}$ ,  $a_x = \underline{\hspace{2cm}}$

To solve projectile problems, what formula would we use in the x-direction?

To solve projectile problems, what formula(s) would we use in the y-direction?

## Projectile Motion—Maximum Range Inquiry

### Pre Lab Reflections:

- What forces are at play on a body undergoing free fall?
- Make a prediction of which angle results in maximum range.

### Activity:

1. Open the sim, *Projectile Motion*.
2. Familiarize yourself with the variables shown there.
3. Ensure that the air resistance check box remains unchecked (no air resistance).
4. Raise the target up such that the ball will land at the same level as the end of the cannon (displacement in the y direction = zero)
5. Using the mouse, set the angle of projection ( $\theta$ ) to 5 deg. or alternatively enter the value in directly.
6. Set the initial speed to a value  $v = 15\text{m/s}$ .
7. Click on *Fire* to start the projectile and record the corresponding value of the range R (the distance in the x direction).
8. Repeat with values = 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 75, 80, 85.

$\theta$ ( $^{\circ}$ )	Range (m)
5	
10	
15	
20	
etc	
etc	

9. Draw a graph (on graph paper) of Range (R) vs. Angle of projection ( $\theta$ )
10. Describe the shape of the graph obtained. What does it mean?
11. Using the graph, determine the angle of projection (the launch angle) that results in maximum range.