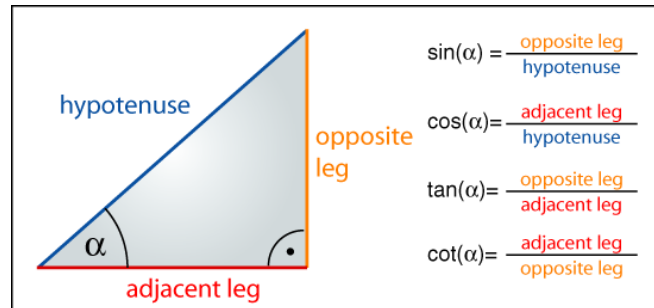Projectile Motion Notes

When objects move in two dimensions they often move at an _____.

Example: For a triangle with a 90° angle, two 45° angles, and each of the legs measuring 1 meter, what is the length of the hypotenuse?

_____

Answer: _____

$sin(\alpha) = \dfrac{\text{opposite leg}}{\text{hypotenuse}}$

$cos(\alpha) = \dfrac{\text{adjacent leg}}{\text{hypotenuse}}$

$tan(\alpha) = \dfrac{\text{opposite leg}}{\text{adjacent leg}}$

$cot(\alpha) = \dfrac{\text{adjacent leg}}{\text{opposite leg}}$
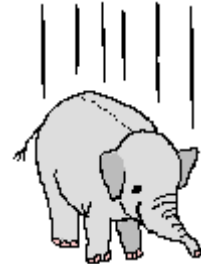
hypotenuse

opposite leg

adjacent leg

In order to understand projectile motion you need to understand motion in the X direction (left and right) and the Y direction (up and down).

Vertical
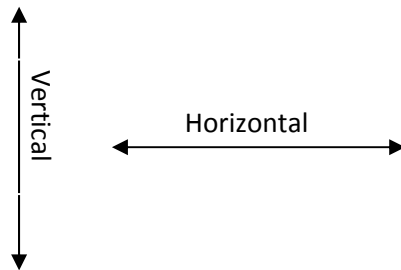
Horizontal

1) Free fall from rest

V_{iy} = _____

a_y = _____

2) Launching an object straight up

V_{iy} _____

a_y = _____
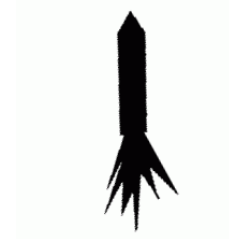
3) Launching an object straight down

V_{iy} _____

a_y = _____

4) Horizontal Motion

V_{ix} = _____

a_x = _____

Then there are the equations. Don't let them overwhelm you, which equation you use depends on the information you are given.

<u>Vertical Y-direction</u>   <u>Horizontal X-direction</u>

$$a_y = 9.8 \ ^m/_{s^2}$$

$$V_{xi} = V_{xf}$$

$$a_y = \frac{V_{yf} - V_{yi}}{t}$$

$$d_x = v_x t$$

$$d_y = v_{iy}t + \frac{1}{2}at^2$$

$$V_{yf}^2 = V_{yi}^2 + 2a_y d_y$$

$$V_y = V_{yo} + a_y t$$

When solving a projectile motion problem you should draw a picture, include angles, distances, velocities, and any other information possible.

Example: Find the max height and range a cannonball reaches if shot at an angle of 35° with an initial velocity of 120 m/s.

Step 1: Sketch with information:

	Y Direction	X Direction
	Viy =	Vix =
	Vfx =	ax =
	ay =	dx =
	dy =	t =
	t =	

Step 2: Circle what you are trying to solve for.

Step 3: Fill in what you already know or can easily find.

Step 3: Use formulas to solve for unknown.