Off The Cliff!

A projectile is any object launched into the air and then no external forces (other than gravity) act upon it.

For all of our problems we will assume air resistance equals zero.
Is this reasonable?

1.

2.

3.

To solve a projectile problem we break it into two parts.
Vector Decomposition!
Use the V_y to find the time in the air.
Use the V_x to find the horizontal displacement.

We will be applying our 4 kinematic formulas;

$d = \frac{(v_f + v_0)t}{2}$	$v_f = v_0 + at$
$v_f^2 = v_0^2 + 2ad$	$v = v_0 t + \frac{at^2}{2}$

Type I

A projectile launched off a surface with a horizontal velocity component.

*careful which direction you call positive in y.

Assume King Leonidas is able to kick the messenger with an initial velocity of 10m/s. The well the messenger falls into is 50 m deep.

What is the range? 31.9m
What is the impact velocity? 32.9m/s@-72°

If all projectile problems have a horizontal acceleration of zero,

What can be said about the time if I double the distance? $d_y = \frac{at^2}{2}$	What can be said about the range if I double the horizontal velocity? $d_x = v_{0x}t$

We throw a zombie head off of the roof of KSA. The roof is 6m high. There is a flaming pool of gasoline 8m away.

With what horizontal velocity do we need to throw the zombie head to hit the flames? 7.3m/s
What is the impact velocity? 10.8m/s@-56°

There is one exception to **having** to find time first.

A zombie is thrown off of a bridge with v_x=4.0m/s, it strikes the ground 8.0m from the base of the bridge. What is the bridge's height?19.6m

Type II Projectiles

These projectiles have a v_y component.

In general:

1) Find v_{0x} and v_{0y}.
2) Find the time using y components $d = v_0 t + \frac{at^2}{2}$
3) Find the range using x components and $d = v_0 t + \frac{at^2}{2}$
4) Find the maximum height using $v_f^2 = v_0^2 + 2ad$

A cooler physics class than our built a catapult that can launch zombie heads at 50 m/s at an angle of 30° across a level surface.
What is the range? 221m
What is the max height?

One of these will be on your test. Unchanged.

Find the range of a zombie head struck by a golf club leaving the ground at 40 m/s on an angle of 60° to horizontal. Also, at 30°.

A zombie head must be shot and have a range of 100m. The cannon we are using has a muzzle velocity of 140 m/s. Determine the angle the cannon must be inclined.

A zombie head is shot from a cannon across level ground at 48m/s on an angle of 70° to the horizontal, find the range and maximum height.

What is the velocity @ 50m?

A zombie head is kicked at 24m/s at 40° above the horizontal. Find the range and max height.