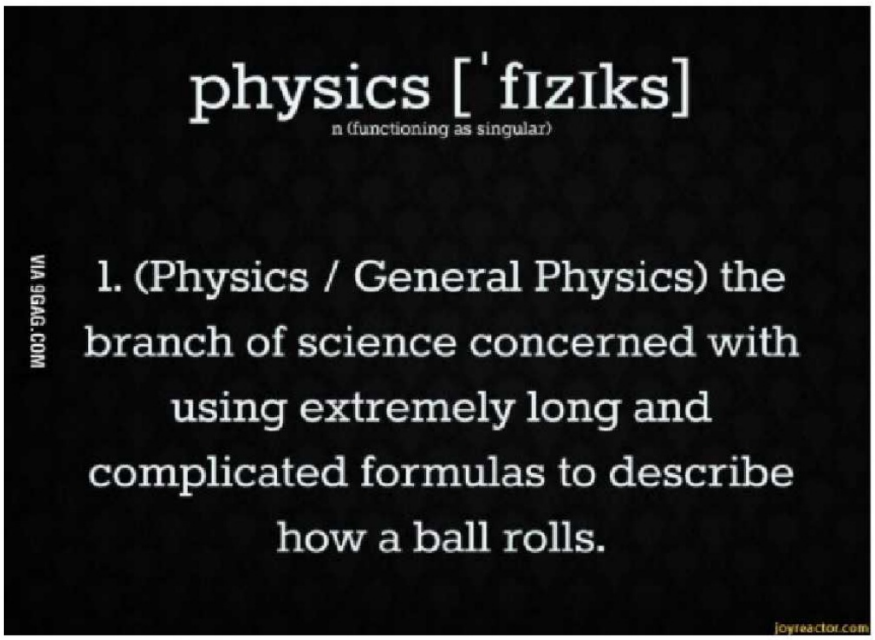


Your Thoughts?

Projectile Motion

- Objects moving through the air in 2 dimensions.
- We ignore air resistance.
- These are essentially free fall problems with a horizontal component.

Equations

- $V_{fx} = V_{ix} + at$
- $V_f^2 = V_i^2 + 2a\Delta x$
- $\Delta x = Vit = 1/2a(t^2)$

Subscripts

- We will break motion into either the x or y directions.
- All of the variables will have to have either an x or y subscript.

$V_x = \frac{\Delta x}{t}$

Variables

- x direction
- Δx 37.1 m
- $V_{i,x} = 15\ m/s$
- $V_{f,x} = 15\ m/s$
- $a_x = 0\ m/s^2$

- y direction
- $\Delta y = -30\ m$
- $V_{i,y} = 0\ m/s$
- $V_{f,y}$
- $a_y = -9.8\ m/s^2$

$t = 2.47\ s$

What's Missing?

Time

- The variable that is **independent** of the direction of motion.
- This will allow us to connect information from the x and y directions of motion.

Assumptions?

- Draw the FBD for projectile in the air.
- Based on this, what can I assume is true for **all** projectile motion problems.

Horizontal velocity remains constant

$$V_{i,x} = V_{f,x}$$

Step by Step

- Draw a picture that represents the problem.
- Divide your work space into two columns: x direction and y direction.
- Write down all of you knowns and unknowns.

A stunt driver wants to ride a motorcycle off of a 30m high cliff. He is going 15m/s and rides horizontally off of the cliff. How far away from the base of the cliff does he land?

- Write down your knowns.
- Draw a picture.

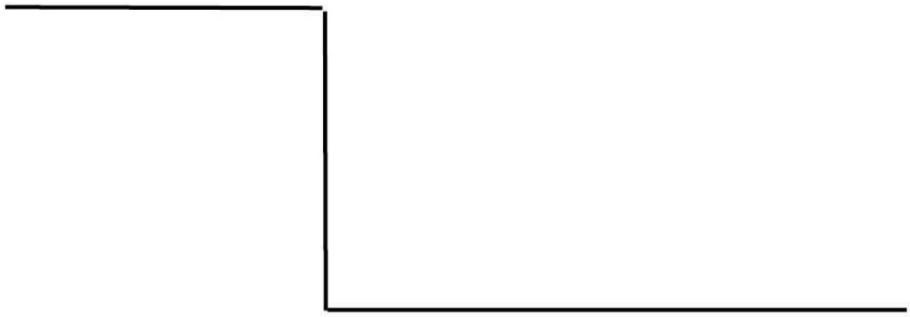
Do Now: Organize the variables on your page.

Variables

- x direction
- Δx
- $V_{i,x}$
- $V_{f,x}$
- a_x
- t

- y direction
- Δy
- $V_{i,y}$
- $V_{f,y}$
- a_y
- t

Picture



Next Steps

- Figure out what you variables you can solve for.
- As you solve for one, write it in your knowns and see what else you can solve for.
- Keep going until you solve for the desired unknown that the question asks for.

A stunt driver wants to ride a motorcycle off of a 30m high cliff. He is going 15m/s and rides horizontally off of the cliff. How far away from the base of the cliff does he land?

A plane is flying at 50m/s at a constant altitude of 300m above the ground. The pilot wants to drop a box of food to people on the ground. How far away from the target does the pilot need to let the package go?

A cat is chasing a mouse across a 0.7m table with a speed of 2.5m/s. The cat slides off of the edge of the table. How tar from the base of the table does the cat land?