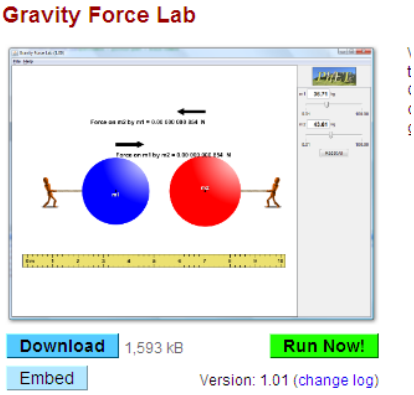
Gravity Lab Introduction

Name_____

Go to http://phet.colorado.edu/en/simulation/gravity-force-lab
And select RUN



Qualitative Observations.

1. Move the masses closer. When they move closer the force between them becomes **(Greater/Less/the same)**
2. Move the masses further apart. When the masses move away the force between them becomes **(Greater/Less/the same)**
3. Double Mass 1. When mass 1 is doubled the force between them becomes **(Greater/Less/the same)**
4. Cut Mass 2 in half. When the mass is reduced the force between them becomes **(Greater/Less/the same)**
5. In any of the situations did the forces ever differ in magnitude?
6. In any of the situations did the forces ever not point in opposing directions?
7. What physics LAW explains questions 5 and 6 (either give name or definition)

Quantitative Observations

MASS
It is now time to build a model. First, let us examine the relationship between masses.

-Separate Mass 1 and Mass 2 so that their centers of mass (*black dots*) are 6 meters apart.

-Set Mass 2 to 30.0 kg.

-Start Mass 1 at zero kg. Collect 10 data points with the gravitational force being your dependent variable and your Mass 1 being independent.

-Sketch a graph.

-Redo the experiment but set Mass 1 to 30.0 kg and collect data on Mass 2's relationship to force.

8. Does it matter which mass increases?

9. What type of relationship is there between Mass and force?

DISTANCE

-Set both masses to 30.0 kg.

-Collect 10 data points of different distances between the masses. Take note you can move the ruler and the masses to maximize your range.

-Create a graph of Force vs. Distance (F vs. r) in Graphical Analysis and find the type of fit (linear, quadratic, inverse, inverse square, etc..) that best fits your graph.

10. What is the relationship between distance and the force of gravity?

See if you can write out the proportions between Mass 1 ($\mathbf{m_1}$), Mass 2 ($\mathbf{m_2}$) distance ($\mathbf{r}$) to the Force of gravity ($\mathbf{F_g}$).

$$F_g \propto$$

If you are correct, you should notice entering lab data for $\mathbf{m_1}$, $\mathbf{m_2}$, and $\mathbf{r}$ does not equal $\mathbf{F_g}$. Also work out your units, do they equal a Newton? This means there is also a constant (**G**) that we need to multiply to our proportionality to complete our formula.

Make a graph of Force vs. your proportionality; this will help determine your constant (**G**)

Determine the gravitational constant (**G**) that will multiply to your units. Give k its proper unit too. *Hint, all your units combined need to = a Newton*.

G=_____