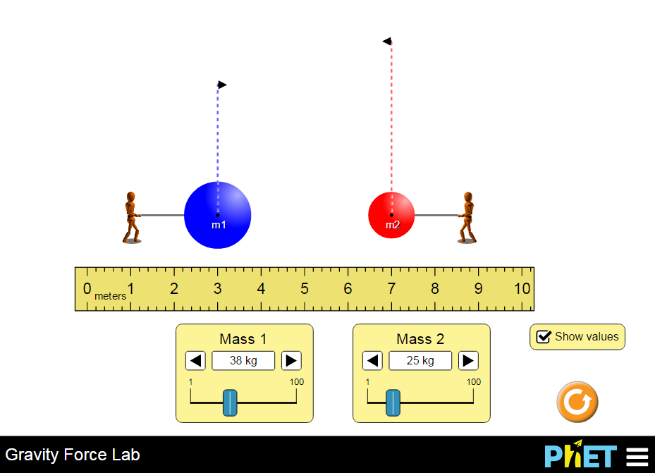
**Determination of the Force of Gravity**

Go to [**http://tinyurl.com/ma8rw9x**](http://tinyurl.com/ma8rw9x)

**Qualitative Observations**

1. How does the changing the separation of the objects affect the force between them? (increases, decreases, not affected)

Increased distance 🡪 decreases the force between the objects

1. What happens to the force between the objects when mass 1 increases? (increases, decreases, not affected)

Increases

1. What happens to the force between the objects if Mass 2 decreases? (increases, decreases, not affected) decreases
2. What is the ratio of the force on the blue object to the force on the red object? What if the mass of the blue one is twice as big as the red object? Explain.
3. What direction are the gravitational forces acting on the objects?

Always toward each other (Attreractive)

**Quantitative**

It is now time to build a model.

1. What THREE things can we change/vary?

Mass 1, Mass 2, distance (separation)

1. Select an independent and dependent variable and constant

* 1. DV \_\_\_Force\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. IV \_\_\_\_Mass 1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. C \_\_\_\_ Mass 2 and Distance\_\_\_\_\_\_\_\_\_\_\_

1. Collect 10 data points and graph

1. Select a new independent and dependent variable and constant

* 1. DV \_\_\_Force\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. IV \_\_\_Distance\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. C \_\_\_\_Mass 1 and Mass 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Collect 10 data points and graph
2. Repeat the varying mass vs. force experiment, changing the second mass.

**Questions**

1. Explain why varying the second mass had the same effect on the force as varying the first mass.

The Force is proportional to the masses of the objects. When either mass is changed, the force changes proportionally.

1. What is the relationship (proportionality) between Mass and force? What happens to the force if you double the mass of the blue object? What happens to the force if you then triple the red object’s masses?

Force proportional to the mass of the object

Double mass 🡪 doubles force

THEN triple red 🡪 triples force, so net change is 6 times greater

1. What is the relationship between distance and the force of gravity? What happens if you triple the distance between the objects? Half the distance between them?

Force is inversely related to the square of the distance

Triple distance 🡪 Force decreases by 9

Half distance 🡪 4 time greater force

1. Combine your proportions between Mass 1 (**m1**), Mass 2 (**m2**) distance (**r**) into a single proportion to the Force of gravity (**Fg**).

**Show your instructor your proportionality before you continue.**

1. Does your lab data for **m1**, **m2**, and **r** does equal **Fg**? Also work out your units, do they equal a unit of force?

The values do not match. Neither do the units

1. Make a graph of Force vs. your proportionality. Make a graph of . Should get a straight line which the slope represents G
2. Determine the gravitational constant (**G**) that will satisfy your units

G=\_\_\_\_≈6.67 x 10-11\_Nm2/kg2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Write your full formula and check with your instructor.