PHET Gravity and Orbits Lab WS

Gravity Computer Activity   http://phet.colorado.edu

Use the Formula and the PhET simulation, Gravity Force Lab, $F = (G*m_1*m_2)/d^2$, to determine the Universal Gravitational Constant, G.

Fill out the chart below with data from the simulation. Calculate the average G value and compare to the published value.

Mass Object 1	Mass Object 2	Distance	Force	Gravitation Constant, G

Average value of G _____   Published Value of G _____

How do the values compare?

Use the simulation to help you answer the following:

1. Gravitational force is always *attractive/repulsive*. (circle)
2. IF a gravitational force exists between two objects, one very massive and one less massive, then the force on the less massive object will be *greater than/equal to/ less than* the force on the more massive object.
3. As the distance between masses decreases, force *increases/decreases*.
4. Doubling the mass of both objects would result in the change in force of *4x/2x/no change/$\frac{1}{2}x$/$\frac{1}{4}x$*
5. Doubling the distance between two objects will change the force of *4x/2x/no change/$\frac{1}{2}x$/$\frac{1}{4}x$*

Now go to the Gravity and Orbits simulation. Run several simulations, changing parameters as you go. Answer the following questions:

1. What direction is the gravitational force of the orbiting object?

2. What direction is the velocity of the orbiting object?

3. If you turn gravity off, what happens? Why does this happen?

4. If you increase the mass of the Sun, what happens to the Earth?

5. If you decrease the mass of the Sun, what happens to the Earth?

6. Click on the Earth/satellite button. Increase the speed of the satellite. What happens? Explain.

7. Decrease the speed of the satellite. What happens? Explain.

8. Move the satellite. Describe what happens. Can you create a stable orbit further from the Earth? How did you do it?

9. Change the mass of the satellite only. Will this change the orbit of the satellite? Why or Why not? Explain what happens.

10. The mass of the moon is 7.35×10^{22}kg and the mass of the earth is 5.97×10^{24}kg. The moon's orbit distance is 3.84×10^{8}m. What is the gravitational force on the moon by the earth? What is the gravitational force of the earth on the moon?

11. What is the centripetal acceleration of the moon around the earth, realizing that the gravitational force is the centripetal force?

12. What is the speed of the moon as it travels around the Earth?

13. What is the gravitational force between you and the earth? You will need to find the mass of the earth and the radius of the earth. Between the earth and you? Have I made my point?