Gravitation Lab

Part 1 - Investigation
1. Go to phet.colorado.edu/simulations
2. Select physics Sims on the sidebar, then Gravity Force Lab.
3. When the simulation first starts, the objects the humanoids are holding are 38 kg for the blue one, and 25 kg for the red one. On your paper, write the force in Newtons expressed as scientific notation
   (for example, 0.0035 is written as 3.5 X 10^{-3})

Question 1:
   a) What is the size of the force of the red object on the blue object? _____ N
   b) What is the size of the force of the blue object on the red object? _____ N

4. Increase the size of the red object until it equals the blue object.

Question 2:
   a) What is the size of the force of the red object on the blue object? _____ N
   b) What is the size of the force of the blue object on the red object? _____ N

5. Decrease the size of the red object until it is ½ the mass of the blue object.

Question 3:
   a) What is the size of the force of the red object on the blue object? _____ N
   b) What is the size of the force of the blue object on the red object? _____ N

6. Try changing the mass of the objects in relation to each other. Observe the force on each object.

Question 4:
   What general rule can you write to explain the forces between objects of different mass?

   If the moon were twice as massive as it is (it is about 1/6 the mass of the Earth), how would that change the gravitational pull on the Earth?

7. Increase the blue object's mass to 50 kg, and the red object's mass to 30 kg. Now, move the humanoid holding the red object closer to the blue object.

Question 5:
   How did the force on the blue object change?

Question 6:
   How did the force on the red object change?

8. Predict what would happen if either humanoid moved further away from the other object. Test it.

Part 2 - Experimentation
1. How does the gravitational force that a small mass has towards a large mass compare to the force that a large mass has towards a small mass?

Hypothesis

If we increase the mass the _____ will increase / decrease because _____.

If we increase the distance the _____will increase / decrease because _____.

2. Design experiments to find the best equation for the relationship for mass and gravitational force.

    a. Pick different values for the mass and record the resulting force.
    b. Which quantities do you need to hold constant?

    c. Use Excel to make a graph of mass and force. Which quantity should go on the x axis?
    d. Is the resulting graph linear? Which equation will you use to make the treandline?

3. Design experiments to find the best equation for the relationship for gravitational force and distance.

    a. Pick different values for the distance and record the resulting force.
    b. Which quantities do you need to hold constant?

    c. Use Excel to make a graph of mass and force. Which quantity should go on the x axis?
    d. Is the resulting graph linear? Which equation will you use to make the treandline?

4. Write a conclusion for each of the two hypotheses.