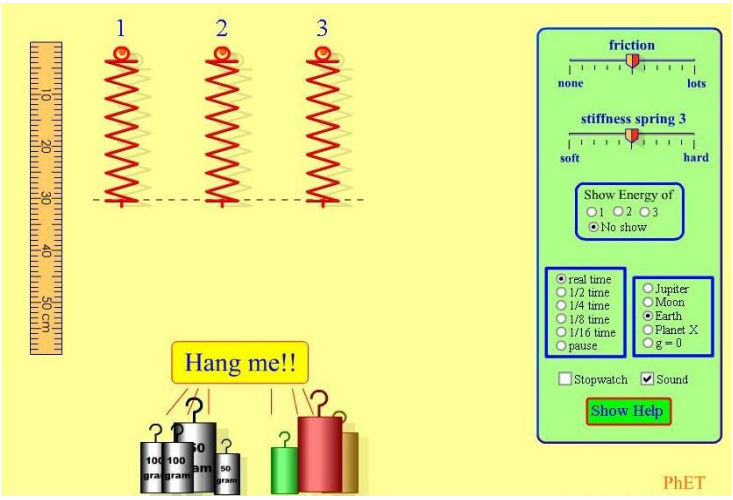
Phys 12 -- Spring 2013 **Simu-Lab 2: Masses and Spring**

NAME_____ PARTNER_____

Objective: Study the elastic force (spring force) and verify the Hooke's Law

This is a "virtual lab". We will do an experiment by using simulation which can be found at the PhET simulations page: http:phet.colorado.edu
Find the simulation "Masses and Springs" and run it. You should see this:



Introduction:

1) Play the simulation for a while. Try to figure out what all those buttons do.
2) Drag the "friction" button to "lots".
3) Click and drag the vertical ruler anywhere you like, for convenience of measurement.(You can "zoom in" by right-clicking with the mouse. The ruler can be moved by left-clicking and drag)
4) Use spring 3 for the measurements.
5) Drag the "softness spring 3" to change softness.
6) Choose "earth" in the planet box
7) Choose mass 50g, 100g and 250g for

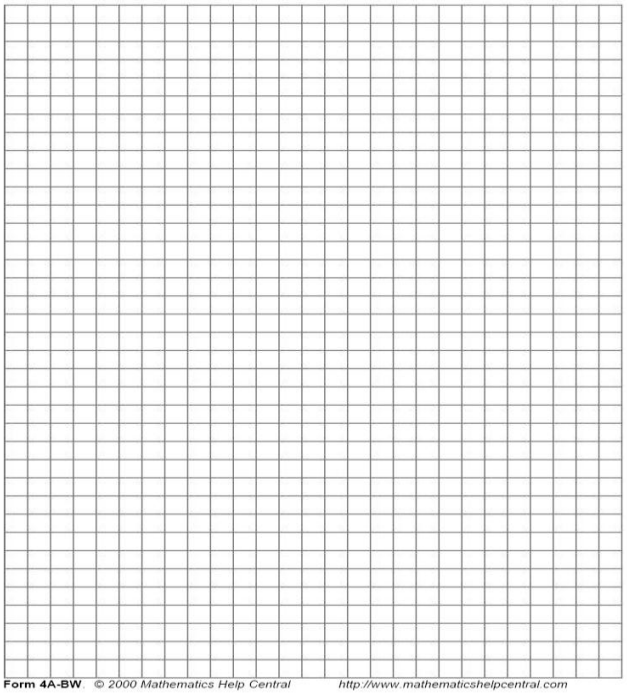
1) When you put a mass on the spring, and the mass eventually stays still, draw free body diagram.

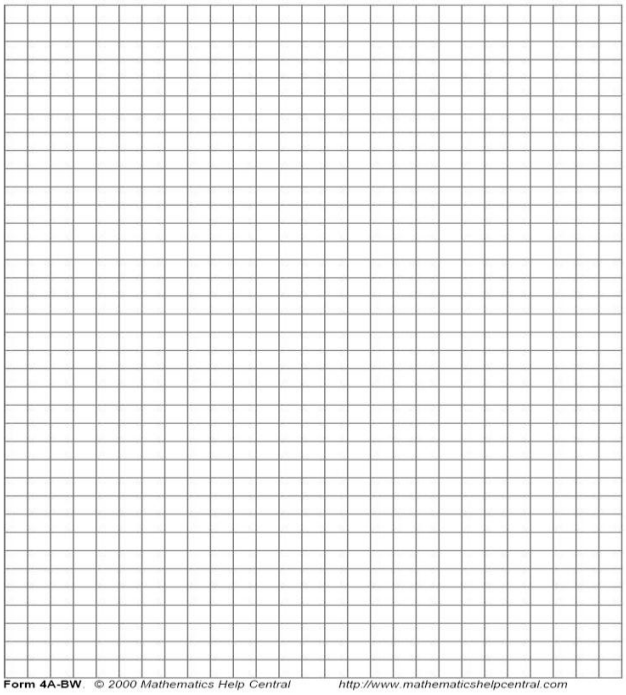
2) When the mass is hanging on the spring and stay at rest, what is the relation between $|\mathbf{F}_{\mathbf{spring}}|$ and $|\mathbf{F}_{\mathbf{gravity}}|$?

3) Measure mass vs. stretched length and fill in the following table:

Mass (kg)	$F_{gravity}$ (N)	F_{spring} (N)	Stretched length $\Delta x = x\text{-}x_0$ (m)	
			Spring 3: softness = 4	Spring 3: softness = 7
0.0500kg				
0.100 kg				
0.250 kg				

4) Make a graph of the F_{spring} vs. stretched length ($\Delta x = x\text{-}x_{0;}$ F_s vs. Δx). **Is the curve linear? Write the relationship between F_s and Δx into an equation.** Describe how to determine the spring constant k by the graph, for both cases. (on the surface of the earth, g = 9.80 m/s^2)





5) Summarize the method you used for finding the spring constant of a spring, step by step.

6) Using your results above, determine the masses of the three colored unknown objects. Explain the procedure step by step, including the measurement and calculation.

7) Discuss question: are you able to find the gravitational acceleration on an unknown planet X by using the data and results above? Explain your method step by step.

Conclusion: Hooke's Law is _____, where Δx, k and F_s are _____; F_s and Δx has (linear / nonlinear) relationship.