

Lesson plan for Homework activity for Masses and Springs: Determine unknowns

Learning Goal: Students will be able to

- explain how the mass of an object is determined using spring balances.
- use the spring balance to determine the mass of an unknown object
- find the gravity on Planet X and describe their experiment

Background: I tried to do this as a homework for two years with only the first 2 goals, but the results were poor. The next year, my class became a college class and the students were more responsible and also more began to be able to run the simulations at home. In this coming year, The fourth year of doing this activity, I decided to put it at the end of the semester as a homework and add the third goal. They will have found the gravity on Planet X of Pendulum lab, so I think it is reasonable to add. (the two Planets are different) Results are pending.

Masses and Springs **Introduction:** Because we will have already used the sim, I'll will have shown them the springs, but I left my notes here for others to use. I plan to get out some spring scales and hang some objects that are familiar on them so the students know what the sim is demonstrating. I am not going to show how to use the sim.

Lesson: Have the students use the lab sheet for guidance to learn the objective.

Here are some ideas from Perkins' **Masses and Springs Homework SIM Answer Key** written for physics 1010 at CU that could be added.

d) Classic footage of the Apollo 11 astronauts show them taking large leaps bounding around the surface of the moon. By transporting this simple springs and mass system to the moon, we can measure the force of gravity exerted by the moon on people at its surface and compare it to the force of gravity exerted by the earth on people at its surface.

i) (1 pt) Use the apparatus to measure the force of gravity exerted by the moon on the 50 g mass. What is the value of this force? **Be careful with units**

ii) (1 pt) If this mass is dropped from 10 m high, at what rate does this mass accelerate towards the surface?

iii) (1 pt) If you can jump to a height of 2 ft on earth, explain why the change in gravity enables you to jump much higher on the moon? Be sure to identify the physics principles you use and how you apply them to the situation.