

# Virtual Energy Preliminary Lab

## Physics

From the website <http://phet.colorado.edu>, find the applet called “The Ramp” (not “The Ramp: Forces and Motion”). Explore how the applet works for a little while – make sure you understand how to change all the variables in the applet as well as knowing (qualitatively) what happens as you change those variables. Also familiarize yourself with the graphs and other information displayed on the screen. Make sure to click on the “More Features” tab to explore additional options (including the measuring tape tool, which you will need to use for this lab).

Your goals for the lab protocol are to work with your group – discuss and experiment – to make sure you have mastered the following questions, calculations, and concepts. You will need to be able to repeat these calculations for an arbitrary trial for the lab report. General equations and descriptions of all this information should be in your notes so you can apply them as necessary in the lab report. You should be able to make your calculations simply by seeing (or knowing) the values of the relevant variables – in other words, you shouldn’t have to actually touch your computer or start a trial in order to accurately find all of the calculated values.

1. What is a general equation you can use to find the force of gravity acting down the incline?
2. What is a general equation you can use to determine the force of friction opposing an object’s motion along the incline **OR** the ground? Make sure you understand why the actual force of friction will change at the instant an object moves from the ramp to the ground.
3. What is a general equation you can use to determine the amount of work gravity does in moving an object any distance down (or up?) the incline?
4. What is a general equation you can use to determine the amount of work friction does on any object as it moves along the incline **OR** the ground?
5. What is a general equation you can use to find the speed of an object just as it reaches the bottom of the ramp?
6. What is a general equation you can use to find how far an object will travel AFTER reaching the bottom of the ramp?
7. For the following questions, set up a trial with a piano, using friction, with the incline at  $25^\circ$ , with no applied force from the person, starting at 15 meters. *Use your equations above to predict your answers BEFORE using the applet to verify your predictions.*
  - a. Will the piano move? Be sure you can explain your answer.
  - b. How much work does gravity do on the piano by the time it reaches the bottom of the ramp?
  - c. How much work does friction do on the piano by the time it reaches the bottom of the ramp?
  - d. How much work does friction do between the time the piano reaches the bottom of the ramp and the time the piano stops?
  - e. How fast is the piano going at the bottom of the ramp?
  - f. How far past the bottom of the ramp does the piano travel?