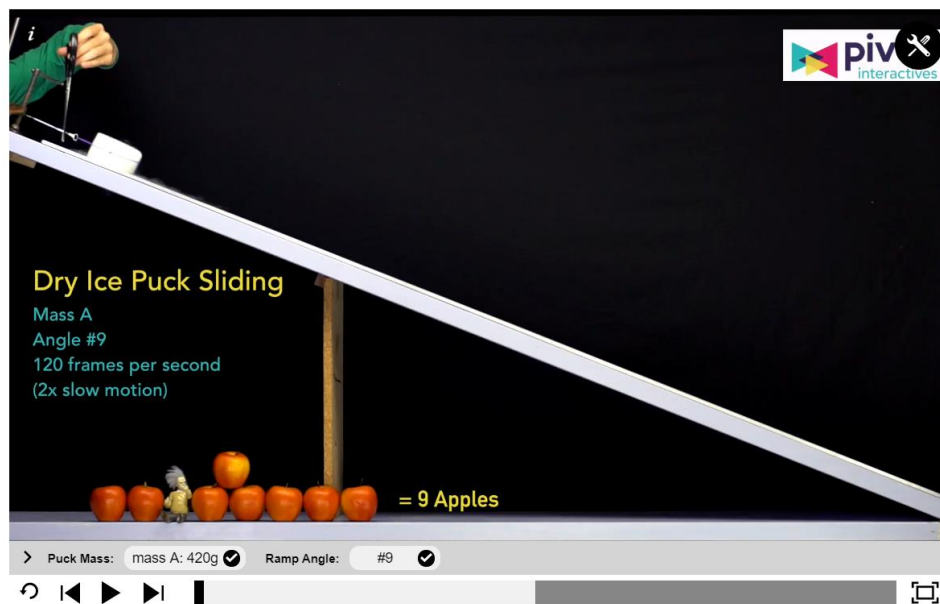


Pivot Interactives Motion Graphing a Dry Ice Puck on a Ramp

Purpose: To analyze constant acceleration motion and learn the mathematical relationship between position, velocity and acceleration.

Access the Pivot Interactives lab “Motion Graphing a Dry Ice Puck on a Ramp”. For this lesson we will be using the video and measurement tools, but we will be using an Excel spreadsheet for the analysis.

Scroll down to “Dry Ice Puck Interactive” and then expand that section. You will see this:



The default settings for the video are for a 420 gram puck and ramp angle #9. Pick any other combination of mass and angle for your measurement – just not either the default puck or angle.

Before you begin, click on the toolbox in the upper right hand part of the screen. Then click on the stopwatch. You will see time measured in both seconds and frames (with the frame rate expressed in frames per second, or fps).

Now click on the ruler. When the ruler appears, you will see that it is oriented horizontally – not particularly convenient for measuring motion down the ramp. But you can rotate the ruler to line up with the ramp. To do so, click on the ruler. You will notice that four white dots appear around the ruler. You can click on the white dot near 0 cm and drag it to rotate the ruler so it aligns with the ramp. Finally, click on the center of the ruler and drag it down to the surface of the ramp so that you can make convenient and accurate measurements of the puck position.

Now click on the protractor in the toolbox and drag it to measure the angle of the ramp.

Now run the video to see what the motion is like. You can then reset the video. To analyze the motion, click through frame by frame to identify the moment at which the ribbon holding the puck up is cut and the motion begins. When you get to that moment, click on "RESET" on the clock to set the clock to zero. Type the time (0.0000 seconds) and position at that moment into your spreadsheet. Continue to take data points by measuring the time and position every tenth frame until the end of the video recording is reached.

In your spreadsheet, make a position vs. time scatter plot. Then fit a polynomial trendline and print the equation in the plot. Using this plot and your equation, answer the following questions:

- 1) What is the velocity of the puck at the moment the ribbon holding the puck up is cut?
- 2) What is the acceleration of the puck during its motion?
- 3) What is the velocity of the puck at the last point you measured?
- 4) An object in free fall at the Earth's surface accelerates at 9.8 m/s^2 . Consider the angle at which the ramp in your video is tilted and show why the acceleration you measured makes sense given the free fall acceleration.

Copy your plot into a Word document, and then type the answers to the questions into that document. Then submit the document via Canvas.