

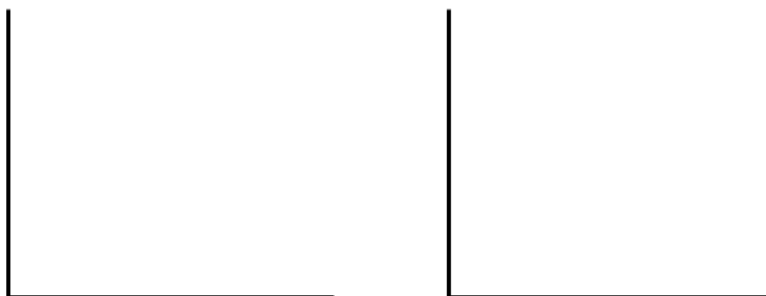
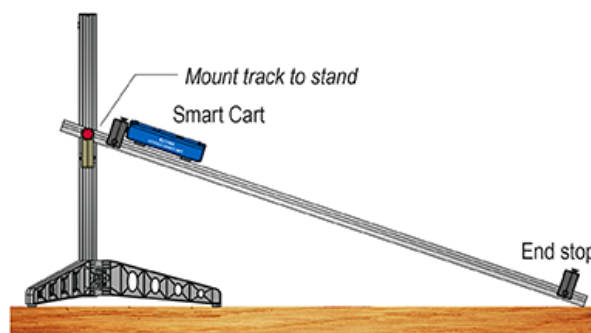
Investigation 6C: Acceleration on an inclined plane

Essential questions: What is the acceleration of an object down an inclined plane?
What do the motion graphs of an object down an inclined plane look like?

Galileo Galilei used *inclined planes* for his quantitative experiments into the nature of position, time, and acceleration. Galileo took advantage of the property that objects roll faster down steeper ramps. In this investigation, you will use the slope of a velocity versus time graph to determine how acceleration varies with the *inclination* of a ramp.

Part 1: Acceleration down a ramp

1. Set up the track to act as an inclined plane with height around 30 cm.
2. Open the experiment file **06C_AccelerationOnAnInclinedPlane**, and then power-on the Smart Cart and connect it wirelessly to your software.
3. Begin data collection and release the Smart Cart down the track. Stop data collection just after the cart reaches the bottom of the track.
4. Use your software to fit a curve to each graph as the cart moves down the track. Sketch the shape of the graphs.



Questions

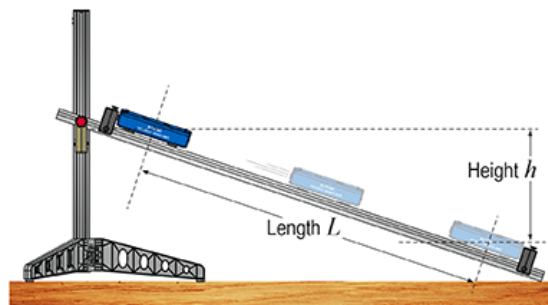
- a. What is the motion equation you are fitting to the position vs. time graph?

What is the motion equation you are fitting to the velocity vs. time graph?

- b. Explain the connection between the slope of the velocity vs. time graph and the acceleration.

Part 2: How does acceleration vary with the ramp's inclination?

1. Measure the height h and length L of the ramp.
2. Record data and release the Smart Cart.
3. Use the resulting graphs to measure the acceleration a of the Smart Cart down the inclined plane.
4. Repeat for four more values of h , lowering the height around 2-3 cm each time. Enter your values in the table.
5. Calculate the inclination of the ramp (h/L) for each run and enter the values in the table.

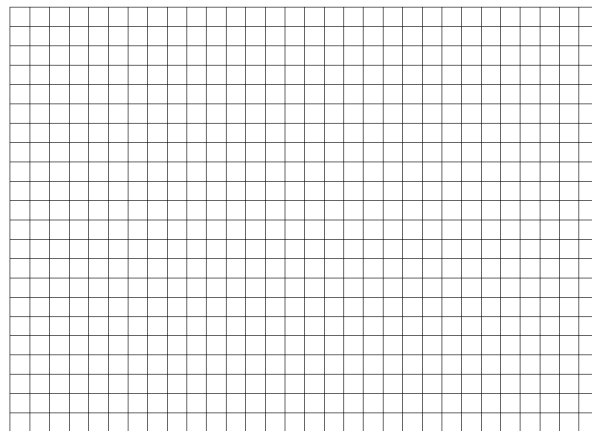


Questions

- a. How does the acceleration vary as the inclination of the ramp increases?
- b. Go to Page 2 of the experiment file and graph acceleration versus inclination. Fit a line to the graph. What is the value of the slope of a line through your data (with units)?
- c. Is this slope similar to any physical constant you have learned about in Physics? Explain.

Table 1: Acceleration varies with ramp angle

Height (m)	Length (m)	Acceleration (m/s ²)	Inclination



- d. Prepare a written report for your investigation (parts 1 and 2). In addition to addressing the above questions, describe the procedure, results, and conclusion or interpretation of your investigation.