## Evidence

The data below was collected by some Science 20 students. **You will need 2 sheets of graph paper. There is a link to suitable graph paper on this page.**

Complete the following table of instantaneous speed versus time for the motion.

Use the equation $v_f = \frac{2d}{t}$ to complete the table.

| Time (s) | Displacement (cm) | Instantaneous velocity (cm/s) |
|---|---|---|
| 0.100 | 0.60 | |
| 0.200 | 2.40 | |
| 0.300 | 5.40 | |
| 0.400 | 9.55 | |
| 0.500 | 15.00 | |
| 0.600 | 21.60 | |
| 0.700 | 29.45 | |
| 0.800 | 38.40 | |
| 0.900 | 48.75 | |

Data by Mike G., Sara M. Nov. 2003.

## Analysis

1. Graph the displacement and time data. Time is on the x-axis and displacement is on the y-axis. Remember to label your axes.

2. How does the shape of your displacement-time graph show acceleration?

3. Graph the instantaneous speed and time data for the motion. Time is on the x-axis and velocity is on the y-axis. Remember to label your axes.

4. Calculate the slope of the line of best fit of the second graph. Show your work and pay attention to the units and significant digits.

$$Slope = \frac{y_2 - y_1}{x_2 - x_1}$$

# Uniform Accelerated Motion Lab

Name ____________________

**Problem**

How is non-uniform motion of an object starting at rest shown on a displacement-time and a velocity-time graph?

**Design**

An air puck will be set in motion from rest on an inclined air table. The position of the puck will be automatically marked at a preset time interval.

**Materials**

metre stick
recording paper
inclined air table

**Procedure**

1. Place a piece of recording paper on the inclined air table.
2. Set the spark timer for 0.100 s (100 milliseconds)
3. Place the air puck at the top of the paper.
4. Activate the timer.
5. Release the puck.
6. Stop the timer and pump when the puck reaches the end of the paper.
7. Measure and record the distance from the start dot to each of the other dots.

**Calculations**

The instantaneous velocity at each dot can be determined by using the equation

$\vec{d} = \left(\frac{\vec{v}_f + \vec{v}_i}{2}\right)\Delta t$ , where $\vec{v}_i$ = 0 m/s and $\vec{v}_f$ = instantaneous velocity at the dot.

$$2\vec{d} = \left(\vec{v}_f + \vec{v}_i\right)\Delta t$$

$$\frac{2\vec{d}}{\Delta t} = \left(\vec{v}_f + \vec{v}_i\right)$$

Since the initial velocity is 0, the velocity at any point down is

$$\frac{2\vec{d}}{\Delta t} = \vec{v}_f$$