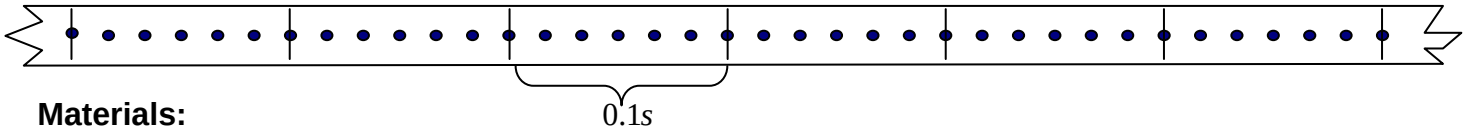
Purpose: The purpose of this lab is to demonstrate the relationship between distance and time under constant motion.

Theory: Under constant motion, an object will cover the same amount of ground over the same period of time. A ticker tape timer is used to record time. The ticker tape timer will place a dot every 60^{th} of a second along a piece of ticker tape, as the tape passes through the timer. Since it produces a dot every 60^{th} of a second, every 6 dots on the ticker tape represents 0.1 seconds



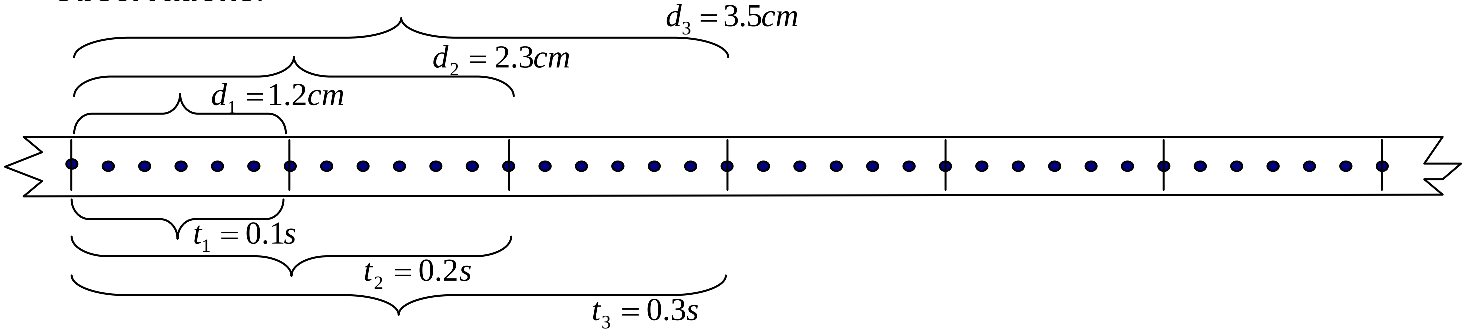
Materials:

- 2 sections of 1.5m of ticker tape
- 2 pieces of masking tape
- 1 Incline plane
- 1 ticker tape timer
- 1 cart
- 1 text book

Procedure:

1. Move into your assigned groups
2. Set up incline plane at the minimum angle so that the force of friction is over come, as demonstrated by your teacher. This will allow the cart to move at a constant speed down the ramp.
3. Feed the ticker tape through the timer as demonstrated by your teacher. Ensure that the timer is set to $60Hz$
4. Using masking tape, attach the ticker tape to the back of the cart.
5. Place one hand gently on the ticker tape so that it moves smoothly through the timer. Careful not to use too much force otherwise you will slow the cart down.
6. Have one member of the group operate the timer while another member launches the car. Be sure you turn on the timer ***before*** you launch the car.
7. Perform two trials of the experiment; a slow run and moderately faster run. Make sure the cart is not moving too slowly other wise your points will be too close.
8. On the back of each ticker tape, indicate which was the faster of the two trials and which was the slower of the two trials trial.
9. On the ticker tape for each trial, mark every 6 dots as demonstrated in the theory section.

Observations:



Trial 1

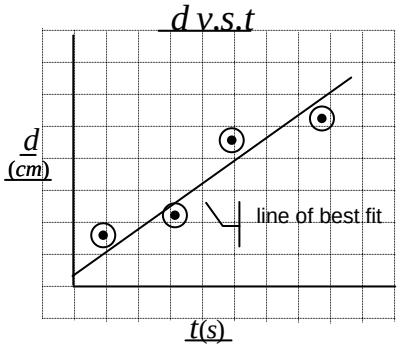
$t(s)$	$d(cm)$	Δt	Δd	$\Delta d \div \Delta t$

Trial 2

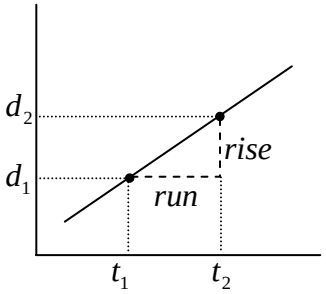
$t(s)$	$d(cm)$	Δt	Δd	$\Delta d \div \Delta t$

Calculations:

1. On two separate graphs, plot d *v.s.* t for both ticker tapes. (Use the cumulative d and t, not the Δd.
   Note:
   a) Graphs are to be done in pencil.
   b) The labels may be done in pen but MUST BE underlined in red
   c) Use the full scale of the graph
   d) Plot each point in pencil and draw a small circle around each point.
   e) Draw a line of best fit between the points, **DO NOT PLAY CONNECT THE DOTS**.



2. On the line of best fit, find two convenient points to calculate the slope. Find the slope of the line of best fit (include the units in your calculations).



$$slope = \frac{rise}{run} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

3. Calculate the average $\Delta d \div \Delta t$ for each graph from your observation table.
4. Measure and record the length of your ticker tape from the first dot that you measured to the last dot that you measured.

Questions:

1. What do you notice about the spacing of the dots?
2. Why do you think we use a line of best fit on the graphs?
3. What do you notice about the slope and the average results for $\Delta d \div \Delta t$
4. What does the Δy of the slope represent?
5. What does the Δx of the slope represent?
6. By looking at the units of the slope, what does the slope itself represent?
7. Derive a formula for constant motion using the slope formula.