



UNIFORM MOTION – Dynamics Cart Analysis

Name: _____ Date: _____

PROBLEM:

1. What is uniform motion?
2. How is uniform motion shown on a position-time graph?

MATERIALS:

- Dynamics cart
- Spark timer
- Laptop (Excel & Word, Google Docs, Open Office, etc.)
- ruler & calculator

PROCEDURE:

1. You will need 2 pieces (each approx. 0.5 metres) of ticker tape, a ticker timer and a dynamics cart. Fasten one end of the ticker tape to the back of the cart.
2. The time between successive points is approximately **0.02 seconds**. This will tell you how much time there is between successive dots on the ticker tape.
3. Set up the apparatus and straighten the ticker tape so it will run smoothly through the timer.
4. Start the timer and push the cart with a constant force and then release.
5. Repeat step 4 using a new piece of ticker tape, using more force to make the cart travel faster.
6. Observe the lines of dots on the ticker tape and label them trial 1 and trial 2.
7. Perform this analysis:
 - a) Choose a section of dots that is straight, about 20 cm long and uniformly spaced.
 - b) Mark the first and last dot in the section.
 - c) Measure the **displacement from the first to the second dot** and record in a table. Remember that the time interval between the dots was given to you by the teacher.
 - d) Measure the **displacement from the first to the third dot** and record in the data table. Repeat for the remaining dots in the section of the line.
8. Repeat all of step 7 for Trial 2.

ANALYSIS:

Plot the data on a position-time graph (put both trials on the same graph and label the trials clearly).

- Position is the dependent variable and is plotted on the vertical axis (y-axis).
- Time is the independent variable and is plotted on the horizontal axis (x-axis).
- Join the points with a line of best fit (trendline) through the origin.

DISCUSSION:

1. If the space between the dots is uniform, what does this tell about the motion of the cart?

2. Why are the dots spaced differently between the two trials?

3. Calculate the slope of the lines on your graph (or simply use the slopes from the line of best fit from the trendline). Include units.

Trial 1 (slow trial): _____

Trial 2 (fast trial): _____

4. *Answer the question:* How is uniform motion shown on a position-time graph?

5. Looking at the graph, how can you tell which trial the cart is moving more quickly?

6. In the **first** trial (1), at what time has the cart traveled 8.5 cm? (use the equation and show your work)

7. In the **second** trial (2) , how long will it take the cart to travel 2.35 m? (use the equation and show your work)