Ed Chi

Marble Motion Lab
Level 1 Lesson Plan

In this lab you will be recording the distance a marble travels over a period of time with a TI-83 CBR and TI-83 Plus Silver. Upon completion of this lab and analysis of the data, you will be able to determine the average speed of the marble over a given time interval and the average distance the marble traveled during the time period.

The materials needed are a marble, metric ruler, three (3) wood blocks, tape, a TI-83 CBR and a TI-83 Plus Silver calculator.

*** It is important to decide ahead of time who will be the marble releaser and who will run the CBR!!!

Setup-
1. Place one (1) block of wood against the outer edge of the lab bench.
2. Set the ruler ramp on the block, so that the bottom of the ramp points towards the wall.
3. Practice releasing the marble so it does not roll off the bench. Adjust the ramp's direction if necessary.
4. Set up the CBR 0.5 meters from the bottom of the ramp.
5. Run the RANGER program on your graphing calculator.
6. From the MAIN MENU, select 2:DEFAULTS. With the cursor at
▸ START NOW, press ENTER. Follow the directions on the screen to collect data as the marble rolls on the bench in front of the motion detector.

Procedures
1. Release the marble from the top of the ramp
2. The moment the marble leaves the ramp and begins to roll on the bench activate the CBR.
3. LIST PROCEDURES FOR DOWNLOADING CBR data and graphing it on the TI-83.
4. The graph should look like fig 1. INCLUDE SCREENSHOT

5. If you are not satisfied with your results repeat the procedures. If you are satisfied answer the following three (3) questions then continue to the next step.

Using the graph of the distance vs. time of the marble. How far had the marble rolled after 2 seconds on the bench? How do you know?

_____
_____
_____

How far had the marble rolled after 3 seconds on the bench?
_____

Write an equation to find how far has the marble rolled between 2 and 3 seconds and solve it. _____

6. Now repeat procedures 1-5 this time using three (3) blocks under the ruler ramp. Then answer the following four (4) questions

Using the graph of the distance vs. time of the marble. How far had the marble rolled after 2 seconds on the bench? How do you know?

_____
_____
_____

How far had the marble rolled after 3 seconds on the bench?
_____

Write an equation to find how far has the marble rolled between 2 and 3 seconds and solve it. _____

Why was the slope of the distance vs. time graph with one (1) block and the distance vs. time graph with (3) blocks different? _____

_____
_____
_____

7. Predict the shape of the distance vs. time graph for a ramp with six (6) blocks under it. Draw your prediction in the space provided.

INCLUDE EMPTY SCREEN SHOT OF TI-83

Scoring Rubric for Marble Motion Lab

For one block high ramp questions

Questions	0 points	1 point	2 points
Using the graph of the distance vs. time of the marble. How far had the marble rolled after 2 seconds on the bench? How do you know?	No answer or provides an incorrect one.	Find the distance the marble traveled in 2 seconds.	Finds the distance marble traveled in 2 seconds and provides reason based in graph.
How far had the marble rolled after 3 seconds on the bench?	No answer or provides an incorrect one.	Find the distance the marble traveled in 2 seconds.	
Write an equation to find how far has the marble rolled between 2 and 3 seconds and solve it	No answer or provides an incorrect one.	Provides a correct equation but does not solve it.	Provides a correct equation and solves it.

For three block high ramp questions

Questions	0 points	1 point	2 points
Using the graph of the distance vs. time of the marble. How far had the marble	No answer or provides an incorrect one.	Find the distance the marble traveled in 2 seconds.	Finds the distance marble traveled in 2 seconds and provides reason

rolled after 2 seconds on the bench? How do you know?			based in graph.
How far had the marble rolled after 3 seconds on the bench?	No answer or provides an incorrect one.	Find the distance the marble traveled in 2 seconds.	
Write an equation to find how far has the marble rolled between 2 and 3 seconds and solve it	No answer or provides an incorrect one.	Provides a correct equation but does not solve it.	Provides a correct equation and solves it.
Why was the slope of the distance vs. time graph with one (1) block and the distance vs. time graph with (3) blocks different?	No answer or provides an incorrect one.	Provides an answer but does not mention the ramp height difference.	Provides an answer and does mention the ramp height difference.