Marble Lab

You can measure the time required for an object to travel a certain distance. With the measurements of distance and time, you can determine the average speed of an object by using the following formula:

$$\text{Average speed} = \text{distance} / \text{time}$$

Materials:
- Pre-marked masking tape
- Large Marble
- Stopwatch
- Wooden ramp board
- 10 books low ramp
- 16 books high ramp
- Extra Large Marble

Procedure:

1. Set up measurements every 2 m in the hallway from 2 m to 18 m using masking tape.

2. Set up a low ramp with 10 books. The base of the ramp is at zero m. Mark a starting point on the ramp to release the marble from.

3. Assign students distances. Practice using stopwatches. Have students sit at their distance in the hallway. Do several practice runs before recording data.

4. Record data for the low ramp on lab sheet for Trials 1 and 2.

5. Set up high ramp with 16 books. Do several practice runs and then record data for high ramp on lab sheet for Trials 1 and Trail 2.

6. Have students with the same distance find the average time of their distance. Have students round averages to the nearest tenth. Record data on Smart Board and have students copy all of the data on their lab sheet.

7. Graph # 1 – Average Time and Distance of a Marble on a Low and High Ramp. Label, scale, make a key and plot points.

8. Calculate average speed m/s using distance and average time data from the first data table. Have students round averages to the nearest tenth.

9. Graph # 2 - Average Time and Speed of a Marble on a Low and High Ramp. Label, scale, make a key and plot points.

10. Analyze data and write a conclusion by answering the following questions.

Name _____

Date _____ Per. _____

Marble Lab # 1

You can measure the time required for an object to travel a certain distance. In this lab you will calculate the average time it takes for a marble to roll a certain distance on a low and high ramp.

What is a reference point?

_____

_____

_____

Question # 1: _____

_____

_____

Hypothesis # 1: _____

_____

_____

Collect data of a marble rolling down a low and high ramp.
Calculate the average time to the nearest hundredth.

Distance (m)	Low Ramp			High Ramp		
	Trial 1 (s)	Trial 2 (s)	Average Time (s)	Trial 1	Trial 2	Average Time (s)
2						
4						
6						
8						
10						
12						
14						
16						
18						

Graphing Time and Distance

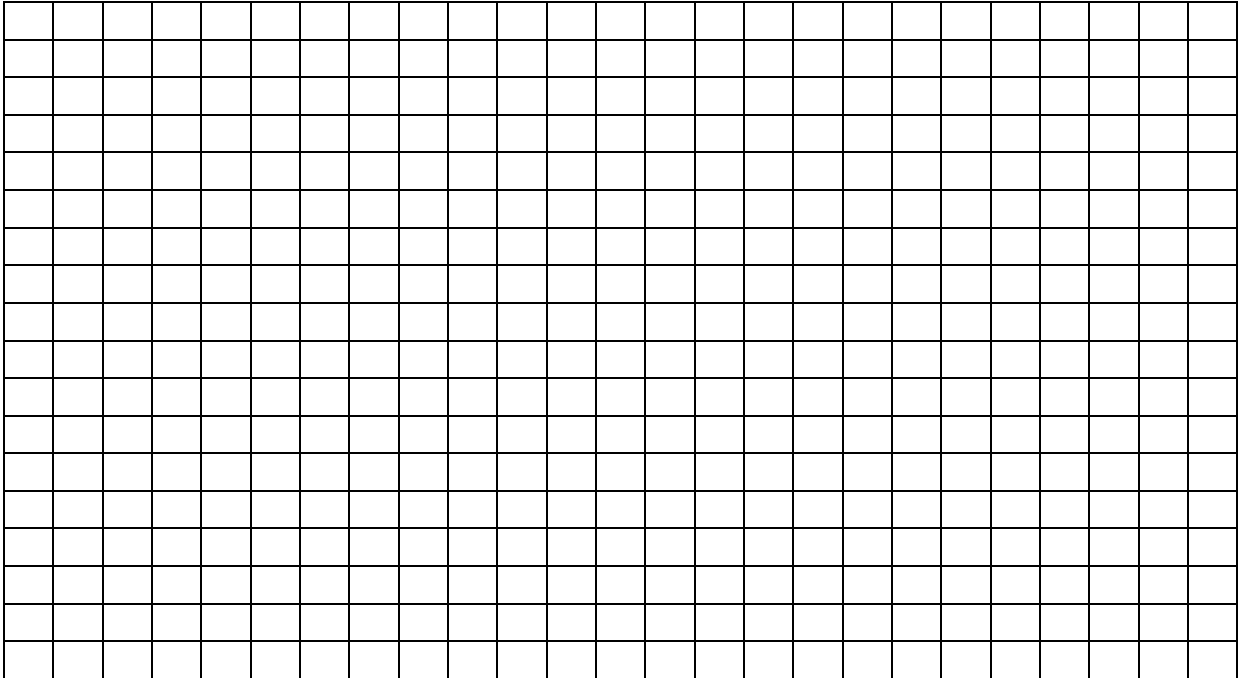Graph # 1 – Create a double line time and distance graph.
Title - Average Time and Distance of a Marble on a Low and High Ramp
X axis - Average Time (remember units)
Y axis – Distance (remember units)
Make a Key for the Low and High Ramps
Scale correctly, plot your points and connect the dots.

What was the reference point used in this lab?

What is the relationship between the height of a ramp and the average time a marble travels? (Question # 1 and Graph # 1) Answer the question and use quantitative data to support your answer.

Name _____

Date _____ Per. _____

Marble Lab # 2

With the measurements of distance and time, you can determine the average speed of an object by using the following formula:

Average speed = distance/time

Question # 2: _____
_____
_____

Hypothesis # 2: _____
_____
_____

Enter the Average Times for the low and high ramp from the Marble Lab # 1 data table. Calculate the average speed to the nearest tenth.

Distance (m)	Low Ramp		High Ramp	
	Average Time (s)	Average Speed (m/s)	Average Time (s)	Average Speed (m/s)
2				
4				
6				
8				
10				
12				
14				
16				
18				

Graphing Time and Speed

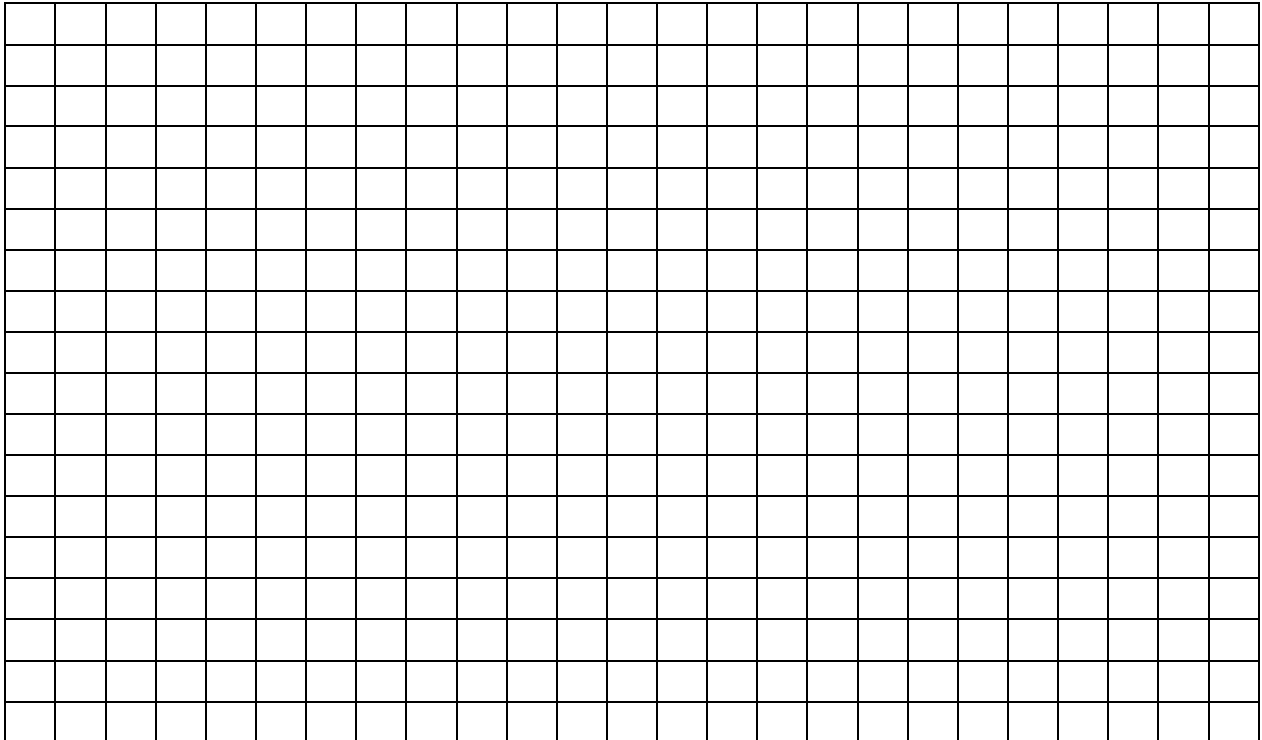Graph # 2 – Create a double line time and speed graph.
Title - Average Time and Speed of a Marble on a Low and High Ramp
X axis - Average Time (remember units)
Y axis – Average Speed (remember units)
Make a Key for the Low and High Ramps
Scale correctly, plot your points and connect the dots.

What is the relationship between the height of a ramp and the average speed a marble travels? (Question # 2 and Graph # 2) Answer the question and use quantitative data to support your answer.

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Is the marble traveling at a constant speed during this lab? Explain your answer.

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_____

Name _____

Date _____ Per. _____

Marble Lab # 3

Would you get the same speed at 18 m if you dropped a larger sized marble on a low and high ramp?

Speed = distance/time

Question # 3: _____

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Hypothesis # 3: _____

_____

_____

_____

Distance (18m)	Low Ramp		High Ramp	
Marble Size	Time (s)	Speed (m/s)	Time (s)	Speed (m/s)
Small				
Large				

Analyze the data. What is the relationship between the size of the marble and the speed the marble travels? (Question # 3 and Data Table # 3) Answer the question and use quantitative data to support your answer.

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