

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Purpose:** To calculate and identify any changes in speed due to an \_\_\_\_\_ in ramp \_\_\_\_\_ or a change in the marble's \_\_\_\_\_.

**Research:** (Responsibility of the Table Captain to make sure everyone contributes and records information)

Speed is the measurement of \_\_\_\_\_

The formula for SPEED = \_\_\_\_\_

Acceleration is any change in \_\_\_\_\_

**Materials:**

- 2 meter sticks
- 1 iPad (stopwatch)
- 8 textbooks
- Tape
- Stainless steel marble

**Prediction:** Will increasing the ramp height always increase the speed of the marble?

**Experiment # 1:** Marble Speed vs. Ramp Height

**Procedures:**

1. Set up the equipment as drawn below:
2. Place the marble at the top of the ruler and prepare the stopwatch. Release and begin timing. When the marble hits the table, stop the timer and record the time for the marble to roll 100 cm in the data table.
3. Repeat for 3 trials and average the time for all three marble rolls for same ramp height.
4. Repeat steps 2-3 for the remaining 7 ramp (book) heights.
5. Calculate average marble speed for each ramp height.

**Data Collection:**

Ramp Height in Books	Distance Rolled	Marble Roll Times Seconds (round to nearest tenth)			Average Marble Time (sec)	Distance ÷ Time	Average Marble Speed (show correct unit)
		Trial 1	Trial 2	Trial 3			
1	100 cm					<u>100 cm</u>	
2	100 cm					<u>100 cm</u>	
3	100 cm					<u>100 cm</u>	
4	100 cm					<u>100 cm</u>	
5	100 cm					<u>100 cm</u>	
6	100 cm					<u>100 cm</u>	
7	100 cm					<u>100 cm</u>	
8	100 cm					<u>100 cm</u>	

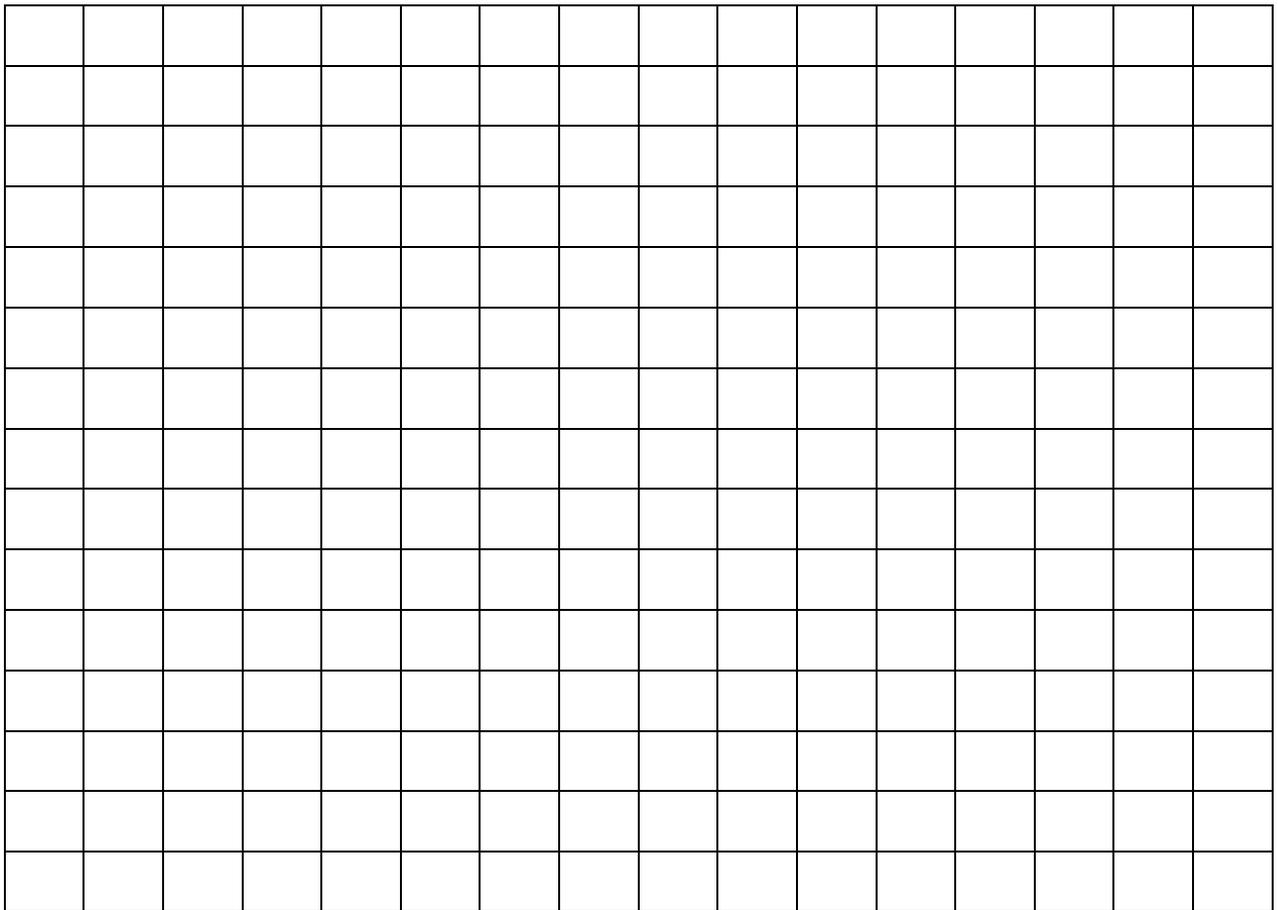
**Experiment # 2 Predictions:** Does the size of the marble change how fast it rolls?

\*\* Get the data from a team nearby that tested a marble of a different size than your team. Fill out the data table below then graph the results above using a BLUE colored line.

Results: Different Marble Size: _____								
Ramp Height	1	2	3	4	5	6	7	8
Marble Speed								

**Analysis:** Graph your results from the experiment by creating a LINE GRAPH showing the change in SPEED vs RAMP HEIGHT. Use a RED line for **your** marble's data. Be sure to add a Title, label each axis, and add appropriate numbers to reflect **speed** of **both** experiments. You will use a blue line to represent the data from experiment # 2 (marble of a different size).

Title: \_\_\_\_\_



**Conclusion:**

1. Was either of your predictions correct? Explain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
2. What is the relationship between the average speed of the marble and the height of the ramp? \_\_\_\_\_  
\_\_\_\_\_
  
3. Would the average speed be the same if you measured the time to roll 500 cm? Explain.  
\_\_\_\_\_  
\_\_\_\_\_
  
4. Calculate the average acceleration between ramp height # 1 and ramp height # 8 for **your** team's marble size?

Compare another group's calculation that used a different sized marble than your team. Which marble accelerated faster?

5. What force is causing the marble motion? When is it a balanced force and when is it an unbalanced one? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
6. Would increasing the ramps steepness always increase the marbles speed? Why is there a limit? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
7. Was there a significant difference between the speed of the small and large marbles? Why do you suppose this is? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_