Mini-Lab: Acceleration & Slope

Problem: As you snowboard down a mountain, your velocity increases and you experiences acceleration (until you crash). How does the steepness of the slope affect your acceleration? In this lab, you examine how the slope of a ramp affects the acceleration of a marble rolling down the ramp?

Hypothesis: If _____

_____

Procedures

1. **RAMP**: Make a ramp by laying two meter sticks side by side. Raise one end of the ramp up on 1 textbook. Leave a small gap between the meter sticks, large enough for a marble to roll down. Place a piece of tape at the end of the ramp (Point A). *Note: **Ramp Distance= 100 cm = 1 meter***

2. **TRACK:** Continue the track for the marble by placing two more meter sticks after the ramp. Make a finish line by placing a piece of tape at the very end of this track (Point B). *Note: **Track Distance= 100 cm = 1 meter***

3. Release your marble and measure the time it takes for it to roll from the release point to the end of the ramp (Point A). Record this time in Column A for Trial 1.

4. Release the marble from the same point again and record the time it takes the marble to roll from the end of the ramp (Point A) to the finish line (Point B). Record this time in Column B for Trial 1.

5. Repeat steps 3 & 4 two more times, for a total of 3 trials.

6. Raise the height of the ramp by adding two more textbooks. Repeat steps 3-5.

Data Table *(5 points)*

	Trial	Column A *Time on Ramp*	Column B *Time on Track*
Ramp 1 1 Textbook	1		
	2		
	3		
	Average		

	Trial	Column A *Time on Ramp*	Column B *Time on Track*
Ramp 2 3 Textbooks	1		
	2		
	3		
	Average		

Analysis:

For tracks 1 & 2, calculate the Final Velocity of the marble using the following equation:

$$\text{Final Velocity} = \frac{\text{Distance of Track}}{\text{Average Time on Track}}$$

Final Velocity of Track 1: _____ cm/s

Final Velocity of Track 2: _____ cm/s

For ramps 1 & 2, calculate the **Acceleration** of the marble using the following equation.
(Use the final velocity previously calculated and an initial velocity of 0 cm/s).

$$\text{Acceleration} = \frac{\text{Final Velocity} - \text{Initial Velocity}}{\text{Average Time on Ramp (Column A)}}$$

Acceleration of Ramp 1: _____ cm/s^2

Acceleration of Ramp 2: _____ cm/s^2

Conclusion: Answer on a separate sheet of paper & attach it to this lab:

1. Which ramp had the most acceleration? _____
2. How does the slope of a ramp affect the acceleration of a marble rolling down the ramp?
3. Compare your results with the hypothesis. USE DATA to support your answer.
4. Do you think your results are accurate? In other words, what errors may have been made?
5. What is the independent (manipulated) variable in this experiment?
6. Why is it important to conduct 5 trials for each ramp?

BONUS QUESTION: Why was it necessary to measure the marble's final velocity on the track, rather than measuring its final velocity at the end of the ramp?

Lab: Bubble Gum Physics

Part A: Chomper Challenge

1. For this experiment, you will conduct five trials to determine the number of chomps you can do in 30 seconds. A chomp is defined as a "big chew", or the kind that usually causes you to get caught with gum!

$$\text{Speed} = \frac{\text{\# of chomps}}{\text{time}}$$

2. Set the clock for 30 seconds. Chew! Count the # of chomps.

3. Use the equation to calculate the speed of your chomping.

Trial	# of Chomps	Time	Speed
1		30 s	
2		30 s	
3		30 s	
4		30 s	
5		30 s	
Average		30 s	

Part B: Speedy Chompers

1. Set the timer for 1 minute & start chewing!

2. After 20 seconds of chewing, record the # of chomps.

3. After 40 seconds of chewing, record the # of chomps.

4. After 60 seconds of chewing, record the # of chomps.

5. Did your chewing get faster or slower?

Time	# of Chomps
20 seconds	
40 seconds	
60 seconds	

Part C: Think About It!
1. What other experiments could you do with bubble gum?

Part D: Conclusion & Analysis: **What did you learn: 5 sentences:**
_____
_____
_____
_____
_____