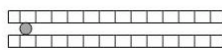


Student Activity:  
Acceleration and Slope



Name _____
Date _____
Period _____ Table _____

### Acceleration and Slope

Overview and Purpose: When a downhill skier glides down a mountain without using her ski poles, her velocity increases and she experiences acceleration. How would gliding down a hill with a greater slope affect her acceleration? In this investigation you will:

- calculate the acceleration of an object rolling down two ramp of different slopes
- determine how the slope of the ramp affects the acceleration of the object.

Procedure:

- Make a ramp by laying two meter sticks side-by-side. Leave a small gap between the meter sticks.
- Use masking tape to join the meter sticks. The marble should be able to roll freely along the groove.
- Set up your ramp on your tabletop. Raise one end of the ramp on top of one book. The other end of the ramp should remain on the table.
- Make a finish line by putting a piece of tape on the tabletop 30cm from the bottom of the ramp. Place a ruler just beyond the finish line to keep your marble from rolling beyond your work area.
- Test your ramp by releasing the marble from the top of the ramp. Make sure that the marble rolls freely. Do not push on the marble.
- Release the marble and measure the time it takes for it to roll from the release point to the end of the ramp. Record the time under Column A for trial 1. Repeat and record three more trials for Column A.
- Release the marble again from the same point, and record the time it takes the marble to roll from the end of the ramp to the finish line. Record this time in Column B for trial 1. Repeat and record three more trials for column B.
- Raise the height of the ramp by propping it up with 2 books. Repeat steps 6 and 7.

Calculations:

- For ramps 1 and 2, calculate the average time it took for the marble to travel from the end of the ramp to the finish line. (Found in column B)
- For ramps 1 and 2, calculate and record  $v_{final}$  using the formula below:

$$V_{final} = \frac{\text{Distance from end of ramp to finish line}}{\text{average time from end of ramp to finish line}}$$

- For ramps 1 and 2, calculate and record acceleration using the formula below. (Hint: Speed at the release of the marble is 0 m/s.)

$$\text{Acceleration} = \frac{V_{final} - V_{initial} \text{ (speed at release)}}{\text{Average time from release to bottom of ramp}}$$

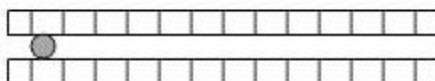


TABLE 1. TIME FOR MARBLE TO TRAVEL DOWN RAMP			
Height of Ramp (cm)	Trial Number	Column A Time from release to end of ramp	Column B Time from end of ramp to finish line
Ramp 1: ____ cm	1		
	2		
	3		
	4		
	Totals		
		Average	Average
Ramp 2: ____ cm	1		
	2		
	3		
	4		
	Totals		
		Average	Average

Calculate the Final Velocity for each Ramp (Use the average from column B) (formula on front page)

Final Velocity for Ramp 1 is \_\_\_\_\_

Final Velocity for Ramp 2 is \_\_\_\_\_

Calculate the Acceleration for each Ramp (Use final Velocity from above calculations; Initial Velocity is Zero; Time average is in column A) (formula on front page)

Acceleration for Ramp 1 is \_\_\_\_\_

Acceleration for Ramp 2 is \_\_\_\_\_

