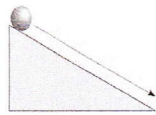


# Accelerated Marbles!



Name: \_\_\_\_\_

Learn how to calculate acceleration by looking at how the speed of a marble changes when rolled down a ramp.

You will need to know

- a) Starting speed (cm/s)      b) Final speed (cm/s)      c) Time it took marble to change speeds (s)

## Procedure

1. You will use textbooks for your ramp heights (1,2,3). You will test one ramp at a time.
2. Lay out your meterstick track (2 metersticks).
3. Test your ramp by releasing the marble from the top of the ramp. Make sure that the marble rolls freely (let gravity do the work).
4. Release the marble and measure the time it takes for to roll from the release point to the end of the ramp. Record the time under Column A. Do two more trials.
5. Release the marble again from the same point. But, this time, record how long it takes for the marble to roll from the end of the ramp until the finish point. Record this time in Column B. Do two more trials.
6. Raise the height with two books. Repeat process.
7. Raise the height with three books. Repeat processes.

# of books	Trial #	Column A Time from release to end of ramp.	Column B Time from end of ramp to finish line.
<b>1</b>	<b>1</b>		
	<b>2</b>		
	<b>3</b>		
		<b>Average =</b>	<b>Average =</b>
<b>2</b>	<b>1</b>		
	<b>2</b>		
	<b>3</b>		
		<b>Average =</b>	<b>Average =</b>
<b>3</b>	<b>1</b>		
	<b>2</b>		
	<b>3</b>		
		<b>Average =</b>	<b>Average =</b>

**Calculations:**

1. What is your speed **at rest**? \_\_\_\_\_ m/s (This is your starting speed or initial speed)

**Final Speed =**

**Distance from end of ramp to finish line / average time from end of ramp to finish line (Column B)**

1. What is your final speed for the 1<sup>st</sup> ramp (1 book): \_\_\_\_\_
2. What is your final speed for the 2<sup>nd</sup> ramp (2 books): \_\_\_\_\_
3. What is your final speed for the 3<sup>rd</sup> ramp (3 books): \_\_\_\_\_

**What is the Acceleration of the marble for each trial? (See Column A)**

$\frac{\text{Final speed of marble (cm/s)} - \text{Initial speed of marble (cm/s)}}{\text{Time from release to bottom of ramp (s)}} = \text{Acceleration (cm/s/s)}$ <p style="text-align: center;">→ (See Column A)</p>
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1. What is your acceleration of your marble for ramp 1:  
(Show work – plug in numbers with units, box answer)
  
2. What is your acceleration of your marble for ramp 2:  
(Show work – plug in numbers with units, box answer)
  
3. What is your acceleration of your marble for ramp 3:  
(Show work – plug in numbers with units, box answer)

Questions:

1. Define **acceleration**.
  
2. Can you have **negative acceleration**?
  
3. Why is **velocity** a better word choice than **speed** for calculating acceleration?