

Momentum

Teacher Resource

Grade Level **5-12**

Objectives

1. The student will investigate the concept of momentum and how it affects an object.
2. The student will employ simple equipment and tools to gather data.
3. The student will demonstrate the use of 21st century technology with a document camera.

National Standards

<u>NS.5-8.1; NS.9-12.1</u>	Science as Inquiry
<u>NS.5-8.2; NS.9-12.2</u>	Physical Science
<u>NS.5-8.5; NS.9-12.5</u>	Science & Technology
<u>NT.K-12.1</u>	Basic Operations and Concepts
<u>NT.K-12.3</u>	Technology Productivity Tools
<u>NT.K-12.6</u>	Technology Problem-Solving & Decision-Making Tools

Teacher Background Information

In this experiment, the student will investigate momentum of an object. The greater mass an object has the greater momentum of the object. The momentum of an object depends on its mass and velocity using the following equation below:

$$p=mv$$

p =momentum	m =mass	v =velocity
---------------------------------	-----------------------------	---------------------------------

MATERIALS

Document Camera	Basic Wheeled Test Vehicle
Personal Computer	Steel Marbles
Interactive White Board/Projector	Metric Ruler
Adjustable Track	Timing Gate

PROCEDURE

1. Position the document camera so the track, timer, and vehicle are present on the computer and interactive white board.
Rubber band is stretched uniformly each time due to the stop at the back of the track.
2. Make sure that the track is level.
3. Set the timing gate to a specific measurement away from the rubber band back stop.
4. Release the vehicle up against the rubber stopper each time and record the time in seconds for all four average trials.
5. Record all trials in the data table below.
6. For Trial 1, set the vehicle on the level track and add no steel marbles.
7. Record the time and repeat Trial 1 three times and take an average.
8. For Trial 2, set the vehicle on the level track and add 1 steel marble.
9. Record the time and repeat Trial 2 three times and take an average.
10. For Trial 3, set the vehicle on the level track and add 2 steel marbles.
11. Record the time and repeat Trial 3 three times and take an average.
12. For Trial 4, set the vehicle on the level track and add 3 steel marbles.
13. Record the time and repeat Trial 4 three times and take an average.

Data Table

Marble	Time (s)			
	Trial 1	Trial 2	Trial 3	Average
0				
1				
2				
3				

QUESTIONS

1. What is the momentum for Trial 1-4? Show all your work in the space provided below.
2. Identify the following:
 - a. Independent variable
 - b. Dependent variable
 - c. The constants
3. Plot a graph of your data.

PRESENTATION

Have students prepare a lab report including the data, images, and video to give a presentation on the interactive white board or projector for the class.

EXTENSION

- Have the students explore collisions of two objects for total momentum.