



HOW DOES MASS AFFECT A MOVING OBJECT?

You will be rolling objects of different masses down a metal track to observe differences in speed and how far the objects will roll before stopping. Before starting this activity, think about Newton's 2nd Law. If both objects start rolling from a stopped position, will they have the same speed, the same acceleration? Will both objects travel the same distance before they stop rolling?

Question: If objects of different masses roll from the same stopped position, will they travel the same distance before they stop moving?

Hypothesis: Write a hypothesis answering the question above. Make sure to use the appropriate "If _____, then _____, because _____" format.

Materials: Metal track
Meter stick
Book
Marble
Steel ball bearing
Electronic balance

Procedures:

1. Use the electronic balance to mass the marble and the steel ball bearing. Record your measurements in your science notebook.
2. Place the book on the floor and prop one end of the metal track on the book to form an angled ramp. Make note of the placement of the ramp so as to duplicate this step exactly each time.
3. Roll the marble down the track. Note the position on the track where you released the marble.
4. Measure the distance the marble traveled before stopping. Record this measurement in a data table.
5. Repeat steps 3-4 two more times so that you have three trials.
6. Repeat steps 3-5 using the steel ball bearing.

Analysis:

Complete #1-6 in complete sentences in your notebook.

1. Calculate an average distance traveled for the marble and the steel ball bearing.
2. Graph the average data you collected. Remember to place the manipulated variable on the x-axis and the responding variable on the y-axis. Title the graph and label the axes.
3. Write a statement that summarizes the data.
4. What force caused the objects to come to a stop?
5. What you were discovering in this activity was that objects of different masses have different *momentum*. Momentum is a measure of how hard it is to change a body's state of motion. What object had greater momentum, the ball bearing or the marble? What is your evidence?
6. Use the results of this activity to write a mathematical equation defining momentum (p). Hint: think about all of the variables that could cause momentum to change (what was going on in this activity?).

Conclusion:

Write a conclusion answering the original question and stating whether you supported or rejected your hypothesis. Include numeric data to support your conclusion.