



Impact Car

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OBSERVE THE RELATIONSHIP BETWEEN MASS AND MOMENTUM

Make a **hypothesis** to determine if an increase in **mass** causes an increase in **momentum**.

Material provided: Rolling (Impact) car

Materials to collect: Several books with the same length and width, inclined plane with edges, masses of 20 grams, 50 grams and 100 grams, stop watch, duct tape, scissors, meter stick, balance, paper and pencil for recording data, and a screwdriver.

Procedures:

- Place a book 3 meters from a wall on the floor. Tear off two or more pieces of duct tape. Turn each of the tape's sticky sides to the outside and make rings; put the tape under the book to hold it in place.
- Measure the width of the inclined plane. Tear off two pieces of duct tape the width of the inclined plane. Place one end of your inclined plane on the edge of the book. The other end of the inclined plane should be aimed toward the wall. Turn each of the tape's sticky sides to the outside and make rings. Place one piece of duct tape circle under the edge of the book. Position the 2nd piece of duct tape circle under the edge of the inclined plane aimed toward the wall. This duct tape placement will allow your inclined plane to remain stationary.
- Measure the distance from the top edge of the inclined plane to the wall. It should be 3 meters. Record the distance in meters. Keep your measurement now for accuracy.
- Weigh the rolling car. Record its weight.
- Position the empty rolling car at the top of the inclined plane. Have one person get the stopwatch. This individual will record the time it takes the rolling car to hit the wall. Have the person start the stopwatch as the car is released and stop the watch when the car hits the wall. Record the time in seconds.

- Divide 3 meters by the amount of time recorded to determine velocity (m/sec) in our equation.
- Use your screwdriver to take off the 4 screws on the top of the car. Do not lose them. Place the 20 grams mass in the car. Tape it down to keep it from rolling. Put the top back on by using the 4 screws.
- Record the weight of the car (empty weight plus 20 grams).
- Place the rolling car at the top of the inclined plane. Reset the stopwatch to zero. Release the car. Have another student check the time for the car to hit the wall. Record the time again.
- Repeat the activity using the 50 grams, 100 grams and for a total of 150 grams using both masses. Add the new weights to the empty car weights and record. Record the number of seconds it took the car to hit the wall.
- Write down your analysis after you have completed the activity.

Analysis: This activity is related to Newton's First Law of Motion. A body will remain at rest unless acted upon by an external force. This property is called inertia. Momentum is the tendency for a body in motion to continue in motion. Momentum is measured by multiplying mass (grams) by velocity (cm/sec).

Critical Thinking: At what racetrack every Memorial Day weekend does the amount of momentum determine the resulting damage?

ROLLING CAR USING THE PLUNGER

Make a **hypothesis** to determine if an increase in **mass** causes a change in plunger position.

Material provided: Rolling car and a clear plastic handle shaped like an "L"