

How Fast?

Standard 3240-03	Students will relate forces and energy to motion	<i>Topic: Changes in Force, Motion and Energy</i> <i>Course: # 3240</i>
Objective 3240-0301	Demonstrate the results of forces.	
ILO's:	1a Make observations and measurements. 2e Plan field studies 6d construct tables, graphs	

Description of Activity

Title: How Fast?

Overview: An inquiry lesson designed to introduce the concept of the results of a force (gravity) and its' effect on speed.

Duration: 1 class period

Materials, Facilities and Resources: This activity could be done anywhere a smooth surface is available, such as a linoleum floor or table top. Students will need an object that moves freely such as a matchbox car or a marble. A ramp can be made from pieces of wood about 5-10 cm wide and of different lengths. Books can be used to provide height to the ramp.

Background Information

Motion is the result of unbalanced forces. The force of gravity moves objects toward the center of the earth at an acceleration rate of 9.8 m/sec/sec. The longer an object falls the greater its' velocity (discounting friction due to air or wheels on the ramp). An object traveling down a ramp is falling the same distance down regardless of the length of the ramp. Therefore, the length of the ramp is unimportant to the eventual velocity that results.

The velocity of a moving object is equal to the distance traveled divided by time. The average velocity of any moving object can be calculated if distance and time can be measured. Velocity is measured using a variety of units, for example, miles per hour or meters per second. Acceleration is the change in velocity of a moving object but is not included in the scope of this lab.

Teaching and Learning Strategies

This lab may be introduced by a discussion of motion and what causes it. The force of gravity should be included in this discussion as the force causing most downward motion on earth.

A measure of motion, velocity, will be measured by the students. However, students should not be told the formula for velocity or how far to apply the force of gravity. Measuring techniques and units of measure, also should be left to the students. They should be encouraged to measure everything they can (ramp length, height of books, speed of car) and record it.

Invitation to Learn

Following the short discussion of force, gravity and motion, ask the students: How can you make a marble move the fastest using the force of gravity and the materials provided?

Give them the Student Page (next page) and have them fill in the materials, procedure and prediction. Show them what materials are available. Check their procedures before they begin and allow time to work. A post-lab discussion should include a summary of the techniques students used to answer the question and what they discovered about forces and motion.

Summary of Learning

Multiple Choice:

1. What two measurements must be taken to measure speed?
 - a. force, distance
 - b. motion, time
 - c. distance, time
 - d. ramp height, weight of object.

answer: c

2. A marble travels 4 meters in 2 seconds, what is it's average speed?
 - a. 2 meters/second
 - b. 4 meters/ second
 - c. 8 seconds/meter
 - d. 10 seconds/meter

answer: a

Student page

Name_____

Title: How fast?

Purpose: To discover which factor is more important to the speed of an object moving down a ramp, the height of the ramp or its' length.

Materials:

Prediction:

Procedure:

Data:

Analysis:

1. Which factor seemed to affect the speed of the car, ramp length or height?
2. Why?
3. How did you determine the speed of your car?
4. What units did you use?
5. Would this be a practical way to measure the speed of a real car? Why?

Conclusion: