

# 13-4

## What is Newton's first law of motion?

### INVESTIGATE

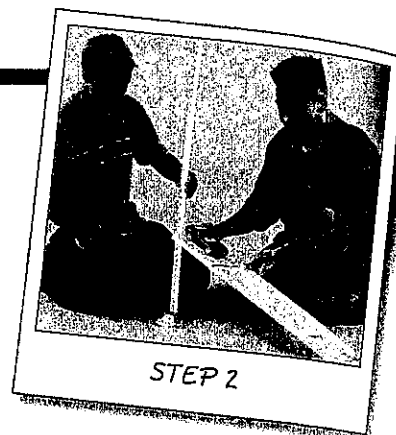


#### Observing Newton's First Law

##### HANDS-ON ACTIVITY

1. Lay a board about 2 m long on the floor. Place a toy car at one end of the board.
2. Slowly lift the end of the board with the toy car until the car starts to move. Hold the end of the board at that level. Have a partner measure the height to which the end of the board was raised. Record this measurement.
3. Press a piece of modeling clay on the top of the toy car to increase its mass. Repeat Steps 1 and 2.
4. Predict how adding a second piece of clay to the car will affect the height you will have to raise the board before the car moves. Record your prediction. Repeat Steps 1 and 2 to test your prediction.

**THINK ABOUT IT:** What keeps the car from moving along the board as it begins to rise? What outside force finally causes the car to move?



### Objective

Describe Newton's first law of motion.

### Key Term

**inertia** (ihn-UR-shuh): tendency of an object to stay at rest or in motion

**Inertia** Place a book on your desk. Does the book move? Unless you push the book, it will remain where you put it without moving. Imagine a spacecraft moving through space. When the engines are turned off, the spacecraft will coast through space at the same speed and in the same direction. The book and the spacecraft have **inertia**. Because of inertia, an object at rest tends to stay at rest. An object in motion tends to keep moving at a constant speed in a straight line.

- 1 IDENTIFY:** What causes a book on a table to remain at rest?

**Newton's First Law** Newton's first law of motion explains how inertia affects moving and nonmoving objects. Newton's first law states that an object will remain at rest or move at a constant speed in a straight line unless it is acted on by an unbalanced force.

According to Newton's first law, an unbalanced force is needed to move the book on your desk. You could supply the force by pushing the book. An unbalanced force is needed to change the speed or direction of the spacecraft. This force could be supplied by the spacecraft's engines.

- 2 PREDICT:** According to Newton's first law of motion, what will happen to an object at rest if no unbalanced force acts on it?

**Effects of Inertia** You can see the effects of inertia everywhere. In baseball, for example, to overcome inertia a base runner has to "round" the bases instead of making sharp turns.



◀ **Figure 13-12**  
The base runner is fighting to overcome inertia as he rounds the bases.

## 13-4 What is Newton's first law of motion?

### Lesson Review

Write *true* if the statement is true. If the statement is false, change the underlined term to make the statement true. Write your answers in the spaces provided.

- \_\_\_\_\_ 1. Inertia is the tendency of an object to stay at rest or in motion.
- \_\_\_\_\_ 2. Balanced forces are needed to move a pencil across a desk.
- \_\_\_\_\_ 3. A chair will move by itself because of its inertia.
- \_\_\_\_\_ 4. Newton's first law of motion explains how inertia affects moving objects.
- \_\_\_\_\_ 5. In a car accident, a passenger not wearing a seat belt may crash through a windshield because of his or her inertia.
- \_\_\_\_\_ 6. A balanced force does not change the velocity of an object.
- \_\_\_\_\_ 7. An object will remain at rest unless a balanced force acts upon it.
- \_\_\_\_\_ 8. In baseball, inertia makes it easy for a baseball player to make sharp turns at the bases.

### Skill Challenge

**Skills:** *experimenting, analyzing*

Read the following description of an experiment. In the space provided, write a conclusion explaining the results of this experiment in terms of inertia.

Shannon placed an uncooked egg on her desk. She gave the egg a gentle turn to start it spinning. She then stopped the egg from spinning for a moment, and quickly released it. When she released the egg, the egg began to spin again.

**Conclusion:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_