

Changing Direction

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 1—Quarter 3

Activity 23

SC.B.2.1.1

The student recognizes systems of matter and energy

SC.C.1.1.2

The student knows that there is a relationship between force and motion.

SC.C.2.1.1

The student knows that one way to change how something is moving is to give it a push or a pull.

SC.H.1.1.3

The student knows that in doing science, it is often helpful to work with a team and to share findings with others.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 40 hands-on activities at this grade level.

1. Tell students that in the game of Ping Pong, the players use a paddle to hit the ball. Ask, *Does the player push or pull on the ball? (push) What does the push do to the ball? (The push changes the direction in which the ball is moving. It might also change the ball's speed.)* Ask, *Can you think of any other games where players push a ball to change its direction?* (Students could mention baseball, golf, soccer, or other such games.)
2. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide opportunities to identify areas that may require additional review before proceeding further with the activity.

Changing Direction

OBJECTIVES

Students discover that a force can change the direction in which an object moves.

The students

- ▶ observe that a moving object moves in a straight line unless a force acts on it
- ▶ apply a force to a balloon to cause it to change direction

SCHEDULE

About 30 minutes

VOCABULARY

direction

MATERIALS

For each student

- 1 Activity Sheet 23
- 1 crayon, red*

For each team of four

- 1 balloon

For the class

- 1 ball, large*

*provided by the teacher

PREPARATION

- 1 Make a copy of Activity Sheet 23 for each student.
- 2 Inflate a balloon for each team.
- 3 Borrow a basketball, volleyball, or soccer ball from your school's recreation supply.

BACKGROUND INFORMATION

Newton's first law of motion states that an object at rest tends to stay at rest, and an object in motion tends to stay in motion, unless acted on by an unbalanced force. When forces acting in opposite directions on an object are balanced, there is no net force, and the object's motion or lack of motion does not change. For example, if the two teams in a tug-of-war are perfectly balanced—that is, if they are both pulling with the same amount of force but in opposite directions—the net force is zero and neither team will move. However, if one team pulls with greater force than the other team, the force becomes unbalanced. There is now a net force in the direction of the greater force. Motion occurs in the direction of the greater force.

In another example, a person sitting in a chair remains at rest because two balanced forces are acting on the person. The force of gravity pulls the person downward, and the chair pushes up on the person. Because the two forces are equal in magnitude and opposite in direction, they are balanced. The net force equals zero, and the person does not move.

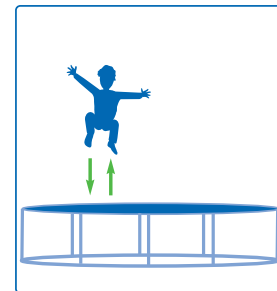
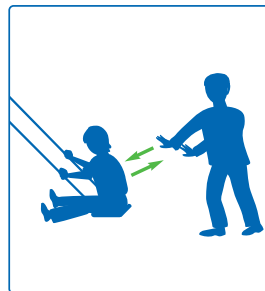
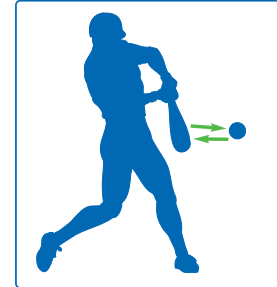
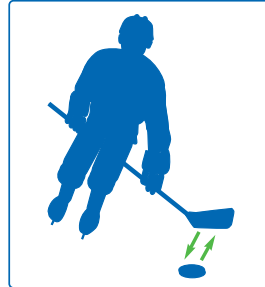
An unbalanced force causes an object's speed and/or direction to change. Objects that are changing their speed or their direction are said to be accelerating. The rate at which speed or direction changes is called **acceleration**. Acceleration can be positive or negative.

Some amusement park rides, such as roller coasters, have rapid changes in speed and direction. These rides have large accelerations. Rides such as a carousel have small accelerations. The riders' speed and direction change slowly.

▼ Activity Sheet 23

Changing Direction

Look at each picture. Decide which direction the object is moving before the force is applied. Draw an arrow to show that direction. Then decide which direction the object will move after the force is applied. Draw another arrow to show how the object changes direction.



Guiding the Activity

1 Move the desks in the classroom to create an open “alley.” Roll a ball down the alley, aiming carefully so the ball does not hit anything. Tell students to watch the ball but not to touch it as it rolls. Ask, **How can you describe the path of the ball?**

2 Ask, **How do you think you could change the direction of the ball as it rolls?**

Write the word *direction* on the board and read it aloud. Tell students that the **direction** of the ball's motion is the path in which the ball is moving. Explain that a moving object travels in a straight path unless a force pushes or pulls on it.

Roll the ball down the alley again. Have a student volunteer apply a force to the ball.

Additional Information

Accept all responses. Guide students to mention that the ball moves in a straight line.

Accept all answers.

Do not tell the student how to apply the force. Most likely, he or she will kick or push the ball so that it changes direction.

Guiding the Activity

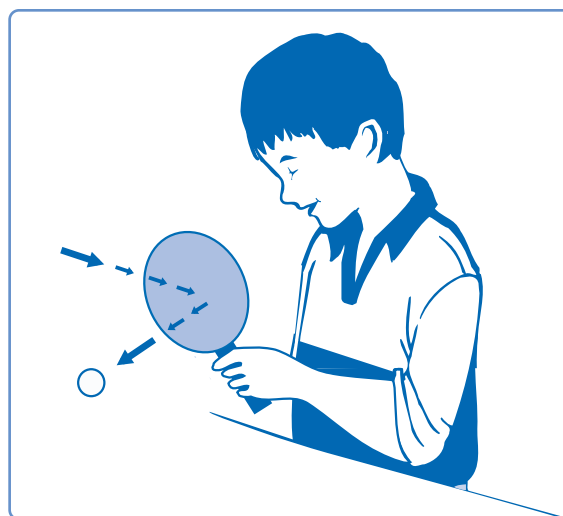
Ask, **How did the force change the motion of the ball?**

Tell students that a moving object can change direction when something pushes or pulls on it. Have them think of everyday examples from sports or playground activities in which an object changes direction when a force is applied (see Figure 23-1).

Additional Information

Students may say that the ball changed direction. If the force was in the same direction as the motion, the ball may speed up rather than change directions. Accept all responses.

There are many examples, such as in ice skating, baseball, soccer, skate boarding, tennis, and the motion of seesaws and playground swings.



▲ **Figure 23-1.** The paddle pushes on the moving ball and causes it to change direction.

3

Form students into teams of four. Distribute an inflated balloon to each group. Ask, **How can we use a balloon to show that a force makes an object change direction?**

Tell students that they are going to make a balloon change direction by pushing on it. Have each group form a circle a few feet in diameter. Tell the student with the balloon to throw it at someone in the group, who will bat it with the palms of his or her hands like in a volleyball game. Students should count the number of times they can make the balloon change direction before it hits the

Accept all responses.

This game is best played outdoors where students can spread out, count aloud, and make noise. If played outdoors, a data chart can be made on a large piece of paper for recording the number of direction changes for each team.

Guiding the Activity

ground. Students can repeat the game as many times as you have time for. If you want to make the game more competitive, have each group report the number of direction changes after each game. Record the number for each team in a data chart on the board.

4 Ask, **What kind of force did you use to make the balloon change direction?**

Ask, **What can you conclude about how to make an object change direction?**

5 Distribute a copy of **Activity Sheet 23** to each student. Have students look at each picture and decide in which direction the object is moving before the force is applied and in which direction the object will move after the force is applied. Tell students to use a red crayon to draw one arrow to show the first direction and another arrow to show how the object changes direction.

Additional Information

a push

Students should conclude that a force, either a push or a pull, is needed to make an object change direction.

Draw a similar picture on the board, such as Figure 23-1, and demonstrate how the arrows should be drawn—the first in a straight line toward the object that will apply the force, and the second in a straight line away from the object.

REINFORCEMENT

Have students cut out pictures that show pushing and pulling motions that change directions in various sports. Sports magazines or the sports section of a newspaper are good places for students to look. An example of such pictures might show a field hockey player hitting a ball with a hockey stick. Students can paste the pictures in a sports scrapbook or display them on a bulletin board. With your help, students can write captions that describe how the direction of the motion changes when a force is applied.

SCIENCE JOURNALS

Have students place their completed activity sheets in their science journals.

CLEANUP

Have students return the balloons to the kit. Return the ball to its usual storage place.

• Connections •

Science Challenge

Challenge students to think about what will happen if a force is applied to an object in the same direction the object is moving. Then have groups of students roll a ball across the floor. While the ball is moving, have them roll a second ball directly behind the first ball so it hits and pushes the first ball from behind. If the first ball is hit straight on, it will not change direction but will speed up

Science Extension

Ask students to make a small ball move over the ground or table in as many ways as they can. Students should describe the methods they used to make the ball move, identifying them as pushes in particular directions. A push may come from the students themselves or from other objects hitting the ball.

Science and Language Arts

Have students brainstorm a list of direction words. Some examples might be *above*, *below*, *over*, *under*, *in*, *out*, *in front of*, *in back of*, *left*, and *right*. Have pairs of students act out the words for the rest of the class in a game of Direction Charades.

Science and Health

Explain to students that muscles pull on bones to make them move. Marionettes use strings to make body parts move, so they can serve as a model for muscles and bones. Obtain a marionette and demonstrate how pulls on the strings make the marionette's arms and legs move.

Science and the Arts

Have students think about some musical instruments and how they need pushes and pulls to make sounds. Have students brainstorm a list of instruments and the force needed to produce the sounds. For example, when playing a guitar, you push on the strings to produce different notes, and you pluck or pull on the string to make it vibrate. Drums produce sounds when they are hit with drumsticks; the sticks apply pushes. Wind instruments are played by pushing air through the instrument. Write the instruments and kind of force on the board if this is done as a class activity.

