

# Describing and Measuring Motion

## Reading Preview

### Key Concepts

- When is an object in motion?
- How do you know an object's speed and velocity?
- How can you graph motion?

### Key Terms

- motion • reference point
- International System of Units
- meter • speed • average speed
- instantaneous speed
- velocity • slope

## Target Reading Skill

**Using Prior Knowledge** Before you read, write what you know about motion in a graphic organizer like the one below. As you read, write what you learn.

### What You Know

1. A moving object changes position.
- 2.

### What You Learned

- 1.
- 2.

Lab  
zone

## Discover Activity

### How Fast and How Far?

1. Using a stopwatch, find out how long it takes you to walk 5 meters at a normal pace. Record your time.
2. Now find out how far you can walk in 5 seconds if you walk at a normal pace. Record your distance.
3. Repeat Steps 1 and 2, walking slower than your normal pace. Then repeat Steps 1 and 2 walking faster than your normal pace.



### Think It Over

**Inferring** What is the relationship between the distance you walk, the time it takes you to walk, and your walking speed?

How do you know if you are moving? If you've ever traveled on a train, you know you cannot always tell if you are in motion. Looking at a building outside the window helps you decide. Although the building seems to move past the train, it's you and the train that are moving.

However, sometimes you may see another train that appears to be moving. Is the other train really moving, or is your train moving? How do you tell?

## Describing Motion

Deciding if an object is moving isn't as easy as you might think. For example, you are probably sitting in a chair as you read this book. Are you moving? Well, parts of you may be. Your eyes blink and your chest moves up and down. But you would probably say that you are not moving. An object is in **motion** if its distance from another object is changing. Because your distance from your chair is not changing, you could say you are not in motion.

**Reference Points** To decide if you are moving, you use your chair as a reference point. A **reference point** is a place or object used for comparison to determine if something is in motion. **An object is in motion if it changes position relative to a reference point.**

Objects that we call stationary—such as a tree, a sign, or a building—make good reference points. From the point of view of the train passenger in Figure 1, such objects are not in motion. If the passenger is moving relative to a tree, he can conclude that the train is in motion.

You probably know what happens if your reference point is moving. Have you ever been in a school bus parked next to another bus? Suddenly, you think your bus is moving backward. But, when you look out a window on the other side, you find that your bus isn't moving at all—the other bus is moving forward! Your bus seems to be moving backward because you used the other bus as a reference point.

FIGURE 1

### Reference Points

The passenger can use a tree as a reference point to decide if the train is moving. A tree makes a good reference point because it is stationary from the passenger's point of view.

**Applying Concepts** Why is it important to choose a stationary object as a reference point?

