Section 9.1.
Describing Acceleration.

Textbook pages 380 to 391.

Before You Read.

Are you accelerating if you are slowing down?

How can you calculate a change in velocity?

A **change in velocity** occurs when the speed of an object changes, or its direction of motion changes, or both. Changes in velocity can be either positive or negative. To find a change in velocity, subtract the initial velocity from the final velocity.

How do signs indicate changes in velocity?

North, east, up, and right are considered positive and south, west, down, and left are negative. If you slow down from nine meters per second forward (positive) to two meters per second forward (positive), your change in velocity is as follows:

- The change in velocity equals the final velocity minus the initial velocity.
- The change in velocity equals positive two meters per second minus positive nine meters per second.
- The change in velocity equals negative seven meters per second.

Your change in velocity is seven meters per second opposite the forward motion. Your initial forward direction is *positive*, so your change in velocity is *negative* when you slow down.

What is acceleration?

Acceleration is the rate at which the velocity of a moving object changes. A change in velocity can be a change in either speed or direction. Thus, acceleration occurs when the speed of an object changes, or its direction of motion changes, or both. Acceleration is a rate of change. This means it also takes into account how quickly the velocity changes.

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How do signs indicate changes in acceleration? Recall that forward motion is defined as positive and backward motion is defined as negative. Different factors can help you decide if an object's acceleration is positive or negative, as explained below:

Increase in speed while travelling forward.

- For example, accelerating after you have stopped at a stop sign.
- The velocity is positive.
- The acceleration is positive.

Decrease in speed while travelling forward.

- For example, applying the brakes on a bicycle.
- The velocity is positive.
- The acceleration is negative.

Increase in speed while travelling backward.

- For example, a ball falling to earth.
- The velocity is negative.
- The acceleration is negative.

No change in speed.

- For example, running at a constant speed.
- The velocity is constant.
- The acceleration is zero.

Note that an object that is slowing down is changing its velocity; therefore, it is accelerating. Acceleration in a direction that is opposite the direction of motion is sometimes called **deceleration.**