opposite the displacement. For example, the force of kinetic friction between a sliding box and the floor is opposite to the displacement of the box, so the work done by the force of friction on the box is negative. If you are very careful in applying the equation for work, your answer will have the correct sign: $\cos\theta$ is negative for angles greater than 90° but less than 270°.

If the work done on an object results only in a change in the object's speed, the sign of the net work on the object tells you whether the object's speed is increasing or decreasing. If the net work is positive, the object speeds up and work is done *on* the object. If the net work is negative, the object slows down and work is done *by* the object on something else.

SECTION REVIEW

1. For each of the following cases, indicate whether the work done on the second object in each example will have a positive or a negative value.

a. The road exerts a friction force on a speeding car skidding to a stop.
b. A rope exerts a force on a bucket as the bucket is raised up a well.
c. Air exerts a force on a parachute as the parachutist falls to Earth.

2. If a neighbor pushes a lawnmower four times as far as you do but exerts only half the force, which one of you does more work and by how much?

3. A worker pushes a 1.50×10^3 N crate with a horizontal force of 345 N a distance of 24.0 m. Assume the coefficient of kinetic friction between the crate and the floor is 0.220.

a. How much work is done by the worker on the crate?
b. How much work is done by the floor on the crate?
c. What is the net work done on the crate?

4. A 0.075 kg ball in a kinetic sculpture moves at a constant speed along a motorized vertical conveyor belt. The ball rises 1.32 m above the ground. A constant frictional force of 0.350 N acts in the direction opposite the conveyor belt's motion. What is the net work done on the ball?

5. Critical Thinking For each of the following statements, identify whether the everyday or the scientific meaning of work is intended.

a. Jack had to work against time as the deadline neared.
b. Jill had to work on her homework before she went to bed.
c. Jack did work carrying the pail of water up the hill.

6. Critical Thinking Determine whether work is being done in each of the following examples:

a. a train engine pulling a loaded boxcar initially at rest
b. a tug of war that is evenly matched
c. a crane lifting a car