b) Sketch the graph of a person walking away from the motion detector at a normal speed.

c) Sketch the graph of a person walking away from the motion detector then toward it at a very slow speed.

d) Sketch the graph of a person walking in both directions at a fast speed.

e) Describe the similarities and differences among the graphs. Explain how the direction and speed that the person walked contributed to these similarities and differences.

5. Predict what the graph will look like if you walk toward the motion detector at a slow speed and away from it at a fast speed.

a) Sketch a graph of your prediction.

b) Test your prediction. How accurate was your prediction?

6. Do two more trials using the motion detector. In trial 1, walk slowly away from the detector. In trial 2, walk quickly away from the detector.

a) Sketch the lines from the two trials on the same labeled axes. Be sure to record the endpoints for each line.

b) Suppose someone forgot to label the two lines. How can you determine which graph goes with which line?

7. In physics, the total distance traveled by an object during a given time is the *average speed* of the object.

a) From your graph, determine the total distance you walked in the most recent trial.

b) How long did it take you to walk each distance?

c) Divide the distance you walked (your change in position) (d) by the time it took for the most recent trial (t).

This calculation gives you your average speed in meters per second (m/s).

$$v_{av} = \frac{d}{t}$$

d) How could you go about predicting your position after walking for twice the time in trial 2? When you extrapolate data, you make an assumption about the walker. What is the assumption? (Extrapolate means to estimate a value outside the known data points.)

8. An automobile is traveling at 60 ft/s (about 40 mi/h or 65 km/h).

a) If the reaction time is 0.5 s, how far does the automobile travel in this time?

b) How much farther will the automobile travel if the driver is distracted by talking on a cell phone or unwrapping a sandwich, so that the reaction time increases to 1.5 s?

c) Answer the questions in *Steps 8.a*) and *8.b*) for an automobile moving at 50 ft/s (about 35 mi/h or 56 km/h).

d) Repeat the calculation for *Step 8.c*) for 70 ft/s (about 48 mi/h or 77 km/h).

e) Imagine a driver in an automobile in traffic moving at 40 ft/s (about 28 mi/h or 45 km/h). The driver ahead has collided with another vehicle and has stopped suddenly. How far behind the preceding automobile should a driver be to avoid hitting it, if the reaction time is 0.5 s?

f) An automobile is traveling at 60 ft/s (about 40 mi/h or 65 km/h). How many automobile lengths does it travel per second? A typical automobile is 15 ft (about 5 m long).