Unit 1 Mechanical Systems

CHAPTER 1 Motion and Forces

1.1 *Extension Exercise*

Speed and Velocity—Additional Practice

Complete this worksheet to help you learn key information in section 1.1.

1. Explain the difference between each of the following quantities:
   (a) average speed and instantaneous speed

   (b) average velocity and instantaneous velocity

   (c) average speed and average velocity

2. Helen starts from home and walks in a straight line 140 m west to a friend's house in 39 s. The two friends then walk 65 m east on the same sidewalk in 19 s to arrive at school on time.
   (a) Draw a sketch of the motion and find the position of the friend's house and the school, relative to Helen's house.

   (b) Determine Helen's average speed for the entire walk.

   (c) Determine Helen's average velocity for the entire walk.

   (d) Explain why the answers are different.

3. The speed of a car on a street where the speed limit is 60 km/h is measured by a motion detector (radar) held by a police officer at the side of the road. **Table 1** shows the position of the car, as measured from the officer.

Time (s)	Position (m [W])
0.00	49
0.50	41
1.00	35
1.50	29
2.00	23

(a) Plot a position-time graph of the motion and draw a line of best fit.

(b) Determine the slope of the line on the position-time graph.

(c) Plot a velocity-time graph of the motion.

(d) Will the officer pull over the car for speeding? Explain. (Hint: Convert the speed limit to m/s.)

(e) Use the velocity-time graph to determine the total displacement of the car. Check your answer using **Table 1.**