PRACTICE E

Final Velocity After Any Displacement

1. Find the velocity after the stroller in Sample Problem E has traveled 6.32 m.

2. A car traveling initially at +7.0 m/s accelerates uniformly at the rate of +0.80 m/s^2 for a distance of 245 m.
   a. What is its velocity at the end of the acceleration?
   b. What is its velocity after it accelerates for 125 m?
   c. What is its velocity after it accelerates for 67 m?

3. A car accelerates uniformly in a straight line from rest at the rate of 2.3 m/s^2.
   a. What is the speed of the car after it has traveled 55 m?
   b. How long does it take the car to travel 55 m?

4. A motorboat accelerates uniformly from a velocity of 6.5 m/s to the west to a velocity of 1.5 m/s to the west. If its acceleration was 2.7 m/s^2 to the east, how far did it travel during the acceleration?

5. An aircraft has a liftoff speed of 33 m/s. What minimum constant acceleration does this require if the aircraft is to be airborne after a take-off run of 240 m?

6. A certain car is capable of accelerating at a uniform rate of 0.85 m/s^2. What is the magnitude of the car's displacement as it accelerates uniformly from a speed of 83 km/h to one of 94 km/h?

With the four equations presented in this section, it is possible to solve any problem involving one-dimensional motion with uniform acceleration. For your convenience, the equations that are used most often are listed in **Table 4.** The first column of the table gives the equations in their standard form. For an object initially at rest, $v_i = 0$. Using this value for v_i in the equations in the first column will result in the equations in the second column. It is not necessary to memorize the equations in the second column. If $v_i = 0$ in any problem, you will naturally derive this form of the equation. Referring back to the sample problems in this chapter will guide you through using these equations to solve many problems.

Table 4
Equations for Constantly Accelerated Straight-Line Motion

Form to use when accelerating object has an initial velocity	Form to use when accelerating object starts from rest
$\Delta x = \frac{1}{2}(v_i + v_f)\Delta t$	$\Delta x = \frac{1}{2}v_f\Delta t$
$v_f = v_i + a\Delta t$	$v_f = a\Delta t$
$\Delta x = v_i\Delta t + \frac{1}{2}a(\Delta t)^2$	$\Delta x = \frac{1}{2}a(\Delta t)^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$v_f^2 = 2a\Delta x$