SAMPLE PROBLEM B

Average Acceleration

PROBLEM

A shuttle bus slows down with an average acceleration of $-1.8\ \text{m/s}^2$. How long does it take the bus to slow from 9.0 m/s to a complete stop?

SOLUTION

Given: $v_i = 9.0\ \text{m/s}$
$v_f = 0\ \text{m/s}$
$a_{avg} = -1.8\ \text{m/s}^2$

Unknown: $\Delta t = ?$

> **TIP** *Watch for implied data in problem statements, such as "starts at rest" ($v_i = 0$ m/s) or "comes to rest" ($v_f = 0$ m/s).*

Rearrange the average acceleration equation to solve for the time interval.

$$a_{avg} = \frac{\Delta v}{\Delta t}$$

$$\Delta t = \frac{\Delta v}{a_{avg}} = \frac{v_f - v_i}{a_{avg}} = \frac{0\ \text{m/s} - 9.0\ \text{m/s}}{-1.8\ \text{m/s}^2}$$

$$\boxed{\Delta t = 5.0\ \text{s}}$$

PRACTICE B

Average Acceleration

1. As the shuttle bus comes to a sudden stop to avoid hitting a dog, it accelerates uniformly at $-4.1\ \text{m/s}^2$ as it slows from 9.0 m/s to 0.0 m/s. Find the time interval of acceleration for the bus.
2. A car traveling at 7.0 m/s accelerates uniformly at $2.5\ \text{m/s}^2$ to reach a speed of 12.0 m/s. How long does it take for this acceleration to occur?
3. With an average acceleration of $-1.2\ \text{m/s}^2$, how long will it take a cyclist to bring a bicycle with an initial speed of 6.5 m/s to a complete stop?
4. Turner's treadmill runs with a velocity of −1.2 m/s and speeds up at regular intervals during a half-hour workout. After 25 min, the treadmill has a velocity of −6.5 m/s. What is the average acceleration of the treadmill during this period?
5. Suppose a treadmill has an average acceleration of $4.7 \times 10^{-3}\ \text{m/s}^2$.
   a. How much does its speed change after 5.0 min?
   b. If the treadmill's initial speed is 1.7 m/s, what will its final speed be?