

CHAPTER 10
PROBLEM SOLVING
BLM 10-5
Uniform Motion (continued)

3. A car starts from a position of 18 m at a time of 7.2 s. The velocity of the car is 17 m/s. Find the position of the car at a time of 9.8 s.

4. A student is walking with a constant velocity along a straight sidewalk. At a time of 1.4 s, his position is 31.4 m.
 → Later, at a time of 6.1 s, his position is 9.6 m.

(a) What is the student's velocity? ^(vector)

$$\begin{aligned}
 t_i &= 1.4 \text{ s} \\
 t_f &= 6.1 \text{ s} \\
 \vec{d}_i &= 31.4 \text{ m} \\
 \vec{d}_f &= 9.6 \text{ m} \\
 \vec{v} &= ?
 \end{aligned}$$

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t} = \frac{\vec{d}_f - \vec{d}_i}{t_f - t_i} = \frac{(9.6 \text{ m} - 31.4 \text{ m})}{(6.1 \text{ s} - 1.4 \text{ s})} = \frac{-21.8 \text{ m}}{4.7 \text{ s}} = -4.6 \text{ m/s}$$

(b) What is his position at 4.4 s? ^(\vec{d}_f)

$$\begin{aligned}
 t_i &= 1.4 \\
 t_f &= 4.4 \text{ s} \\
 d_i &= 31.4 \\
 d_f &= ?
 \end{aligned}$$

$$\Delta \vec{d} = (\Delta v)(\Delta t) \rightarrow \vec{d}_f - \vec{d}_i = (v_f - v_i)(t_f - t_i)$$

$$\vec{d}_f - 31.4 \text{ m} = (-4.6 \text{ m/s})(4.4 \text{ s} - 1.4 \text{ s})$$

$$\vec{d}_f - 31.4 \text{ m} = (-4.6 \text{ m/s})(3.0 \text{ s})$$

$$\vec{d}_f - 31.4 \text{ m} = -13.8 \text{ m}$$

$$\begin{array}{r}
 \vec{d}_f - 31.4 \text{ m} = -13.8 \text{ m} \\
 + 31.4 \text{ m} \quad + 31.4 \text{ m} \\
 \hline
 \vec{d}_f = 17.6 \text{ m. straight}
 \end{array}$$

(c) At what time is the student's position 12.0 m?

$$\begin{aligned}
 d_i &= 31.4 \text{ m} \\
 \vec{d}_f &= 12.0 \text{ m} \\
 t_i &= 1.4 \text{ s} \\
 t_f &= ? \\
 v &= -4.6 \text{ m/s}
 \end{aligned}$$

$$\Delta t = \frac{\Delta d}{\Delta v} \Rightarrow t_f - t_i = \frac{(d_f - d_i)}{(v)}$$

$$t_f - 1.4 \text{ s} = \frac{(12 \text{ m} - 31.4)}{-4.6 \text{ m/s}}$$

$$t_f - 1.4 \text{ s} = \frac{(-19.4 \text{ m})}{-4.6 \text{ m/s}}$$

$$\begin{array}{r}
 t_f - 1.4 \text{ s} = 4.2 \text{ s} \\
 + 1.4 \text{ s} \quad + 1.4 \text{ s} \\
 \hline
 t_f = 5.6 \text{ s}
 \end{array}$$