

## Chapter 29 Reflection and Refraction

**Reflective Sounds**

If you shout down a long hallway, and hear the echo 0.25 second later, how long is the hallway? The speed of sound in air at 20°C is about 343 m/s.

**1. Read and Understand**

*What information are you given?*

time for sound to travel down the hallway and back = 0.25 s

time for sound to travel the length of the hallway =  $0.25 \text{ s} / 2 = 0.125 \text{ s}$

$v = 343 \text{ m/s}$

**2. Plan and Solve**

*What unknown are you trying to calculate?*

length of hallway = ?

*What mathematical expression can you use to calculate the unknown?*

$$d = v \times t$$

$$d = (343 \text{ m/s})(0.125 \text{ s}) = 43 \text{ m}$$

**3. Look Back and Check**

*Is your answer reasonable?*

Yes, the length is reasonable and the units indicate distance.

**Math Practice**

*On a separate sheet of paper, solve the following problems.*

1. If you shout across a canyon, and you hear the echo 3.00 seconds later, how wide is the canyon? The speed of sound in the air is 343 m/s.
2. A boat captain sounds the ship's horn and you hear it 2.25 seconds later. How far away from the boat are you? The speed of sound in the air is 343 m/s.
3. A boat emits a sonar signal and it strikes an underwater object 4.67 seconds later. How far is the underwater object from the boat? The speed of sound in the seawater is 1533 m/s.