

MATH SKILLS● **Wave Speed**

The musical note A above middle C has a frequency of 440 Hz. If the speed of sound is known to be 350 m/s, what is the wavelength of this note?

- List the given and unknown values.

Given: frequency, $f = 440$ Hz
wave speed, $v = 350$ m/s

Unknown: wavelength, $\lambda = ?$ m

- Write the equation for wave speed, and rearrange it to solve for wavelength.

$$v = f \times \lambda \qquad \lambda = \frac{v}{f}$$

- Insert the known values into the equation, and solve.

$$\lambda = \frac{350 \text{ m/s}}{440 \text{ Hz}}$$

$$\lambda = 0.80 \text{ m}$$

Your Turn to Think

- A certain FM radio station broadcasts electromagnetic waves at a frequency of 9.05×10^7 Hz. These radio waves travel at a speed of 3.00×10^8 m/s. What is the wavelength of these radio waves?
- A dog whistle is designed to produce a sound with a frequency beyond that which can be heard by humans (between 20 000 Hz and 27 000 Hz). If a particular whistle produces a sound with a frequency of 2.5×10^4 Hz, what is the sound's wavelength? Assume the speed of sound in air is 331 m/s.
- The lowest pitch that the average human can hear has a frequency of 20.0 Hz. If sound with this frequency travels through air with a speed of 331 m/s, what is its wavelength?
- A 10.0 m wire is hung from a high ceiling and held tightly below by a large mass. Standing waves are created in the wire by air currents that pass over the wire, setting it in motion. If the speed of the standing wave is 335 m/s and its frequency is 67 Hz, what is its wavelength?
- Sonar is a device that uses reflected sound waves to measure underwater depths. If a sonar signal has a frequency of 288 Hz and the speed of sound in water is 1.45×10^3 m/s, what is the wavelength of the sonar signal?