

## Chapter 17 Mechanical Waves and Sound

**Calculating Wave Properties**

A transverse wave in a rope is traveling at a speed of 3.0 m/s. The period of this mechanical wave is 0.25 s. What is the wavelength?

**1. Read and Understand**

*What information are you given?*

$$\text{Speed} = 3.0 \text{ m/s}$$

$$\text{Period} = 0.25 \text{ s}$$

**2. Plan and Solve**

*What unknown are you trying to calculate?*

$$\text{Wavelength} = ?$$

*What formula contains the given quantities and the unknown?*

$$\text{Speed} = \text{Wavelength} \times \text{Frequency} = \frac{\text{Wavelength}}{\text{Period}}$$

$$\text{Wavelength} = \text{Period} \times \text{Speed}$$

*Replace each variable with its known value.*

$$\text{Speed} = 3.0 \text{ m/s}$$

$$\text{Period} = 0.25 \text{ s}$$

$$\text{Wavelength} = 0.25 \text{ s} \times 3.0 \text{ m/s} = 0.75 \text{ m}$$

**3. Look Back and Check**

*Is your answer reasonable?*

$$\text{Speed} = \text{Wavelength} \times \text{Frequency} = \text{Wavelength} \times \frac{1}{\text{Period}}$$

$$\text{Speed} = 0.75 \text{ m} \times \frac{1}{0.25 \text{ s}} = 3.0 \text{ m/s.}$$

Substituting the calculated wavelength into the equation yields the original speed of 3.0 m/s.

**Math Practice**

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

1. What is the speed, in m/s, of a wave on a cord if it has a wavelength of 4 m and a period of 0.5 s?
2. What is the period of a wave traveling 5 m/s if its wavelength is 20 m?
3. Calculate the frequency, in Hz, of a wave in a string traveling 1.25 m/s, with a wavelength of 0.50 m.

**Math Skill:  
Formulas and  
Equations**

You may want to read more about this **Math Skill** in the **Skills and Reference Handbook** at the end of your textbook.

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**WordWise**

Test your knowledge of vocabulary terms from Chapter 17 by completing this crossword puzzle.

**Clues across:**

1. Maximum displacement of a wave
3. The time required for one complete wave cycle
6. An apparent change in frequency of a sound source that moves relative to an observer
8. A point of no displacement in a standing wave
9. Area where particles in a medium are spread out as a longitudinal wave travels through it
10. Distance from one point to the next identical point on a wave

**Clues down:**

2. Type of mechanical wave whose direction of vibration is perpendicular to its direction of travel
4. A unit used to compare sound intensity levels
5. Occurs when waves overlap
6. Occurs when a wave encounters an object or opening that is close in size to its wavelength
7. Lowest point of a wave below the rest position

