Wave Speed Equation Practice Problems

The formula we are going to practice today is the wave speed equation:

\[ \text{wave speed} = \text{wavelength} \times \text{frequency} \]

\[ v = \lambda f \]

Variables, units, and symbols:

<table>
<thead>
<tr>
<th>Quantity Symbol</th>
<th>Quantity Term</th>
<th>Unit</th>
<th>Unit Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>(v)</td>
<td>wave speed</td>
<td>meters/second</td>
<td>m/s</td>
</tr>
<tr>
<td>(\lambda)</td>
<td>wavelength</td>
<td>meter</td>
<td>m</td>
</tr>
<tr>
<td>(f)</td>
<td>frequency</td>
<td>Hertz</td>
<td>Hz</td>
</tr>
</tbody>
</table>

Remember:

- **frequency**: number of complete waves passing a point in a given time
  \[ f = \frac{\text{number of cycles}}{t} \]
  - If 10 waves pass in 1 second, the frequency is 10 Hz
  - If 6 waves pass in 2 seconds, the frequency is 3 Hz

Sample Problems:

Sample Problem 1) A wave has frequency of 50 Hz and a wavelength of 10 m. What is the speed of the wave?

\[ f = 50 \text{ Hz} \]
\[ \lambda = 10 \text{ m} \]
\[ v = ? \]
\[ v = \lambda \cdot f = (10 \text{ m}) \cdot (50 \text{ Hz}) = 500 \frac{\text{m}}{\text{s}} \]

Sample Problem 2) A wave has frequency of 5 Hz and a speed of 25 m/s. What is the wavelength of the wave?

\[ f = 5 \text{ Hz} \]
\[ v = 25 \frac{\text{m}}{\text{s}} \]
\[ \lambda = ? \]
\[ v = \lambda \cdot f \Rightarrow \lambda = \frac{v}{f} = \frac{25 \text{ m/s}}{5 \text{ Hz}} = 5 \text{ m} \]

Sample Problem 3) A wave has wavelength of 10 m and a speed of 340 m/s. What is the frequency of the wave?

\[ \lambda = 10 \text{ m} \]
\[ v = 340 \frac{\text{m}}{\text{s}} \]
\[ f = ? \]
\[ v = \lambda \cdot f \Rightarrow f = \frac{v}{\lambda} = \frac{340 \text{ m/s}}{10 \text{ m}} = 34 \text{ Hz} \]
Problems for you to try: Complete the following practice problems. You MUST show ALL the work outlined in the steps in the example problems.

1. A wave with a frequency of 14 Hz has a wavelength of 3 meters. At what speed will this wave travel?

2. The speed of a wave is 65 m/sec. If the wavelength of the wave is 0.8 meters, what is the frequency of the wave?

3. A wave has a frequency of 46 Hz and a wavelength of 1.7 meters. What is the speed of this wave?

4. A wave traveling at 230 m/sec has a wavelength of 2.1 meters. What is the frequency of this wave?

5. A wave with a frequency of 500 Hz is traveling at a speed of 200 m/s. What is the wavelength?
6. A wave has a frequency of 540 Hz and is traveling at 340 m/s. What is its wavelength?

7. A wave has a wavelength of 125 meters is moving at a speed of 20 m/s. What is it’s frequency?

8. A wave has a frequency of 900 Hz and a wavelength of 200 m. At what speed is this wave traveling?

9. A wave has a wavelength of 0.5 meters and a frequency of 120 Hz. What is the wave’s speed?

10. Radio waves travel at a speed of 300,000,000 m/s. WFNX broadcasts radio waves at a frequency of 101,700,000 Hertz. What is the wavelength of WFNX’s radio waves?