

Wave Speed Equation Practice Problems

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

$$\text{wave speed} = \text{wavelength} \cdot \text{frequency}$$

$$v = \lambda f$$

Variables, units, and symbols:

Quantity Symbol	Quantity Term	Unit	Unit Symbol
v	wave speed	meters/second	m/s
λ	wavelength	meter	m
f	frequency	Hertz	Hz

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 its 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?