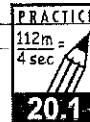


Name: Key

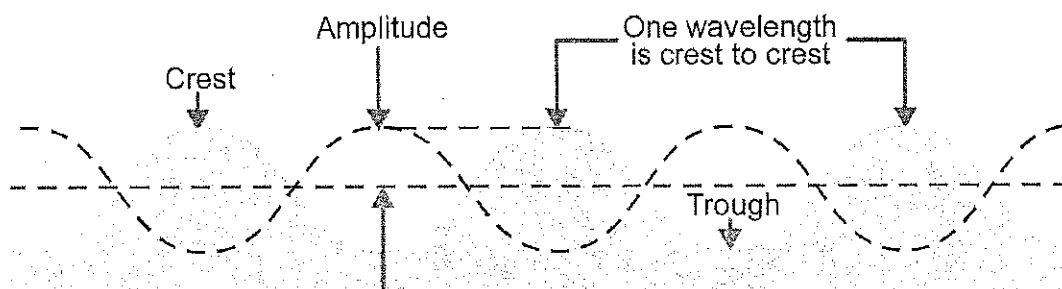
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# Waves

**READ**


A wave is a traveling oscillator that carries energy from one place to another. A high point of a wave is called a **crest**. A low point is called a **trough**. The amplitude of a wave is half the distance from a crest to a trough. The distance from one crest to the next is called the **wavelength**. Wavelength can also be measured from trough to trough or from any point on the wave to the next place where that point occurs.



## The speed of a wave

$$\text{Speed (m/sec)} \rightarrow v = f \lambda$$

← Frequency (hertz)
← Wavelength (meters)

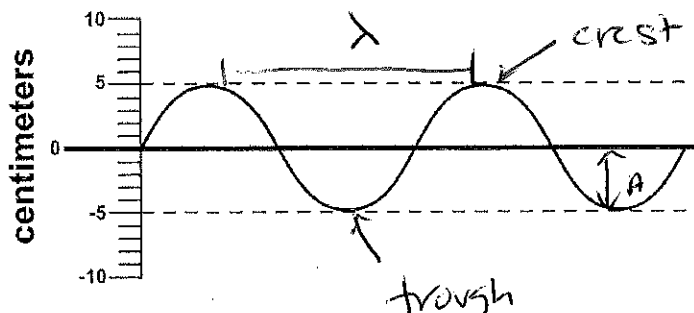
## EXAMPLE

The frequency of a wave is 40 Hz and its speed is 100 meters per second. What is the wavelength of this wave?

<b>Given</b> Frequency = 40 Hz; Speed = 100 m/sec	<b>Solution</b>  $\frac{100 \text{ m/sec}}{40 \text{ Hz}} = \frac{100 \text{ m/sec}}{40 \text{ cycles/sec}} = \text{Wavelength}$ $2.5 \text{ meters} = \text{Wavelength}$  The wavelength of this wave is 2.5 meters.
<b>Looking for</b> The wavelength	
<b>Relationships</b> Speed = Frequency × Wavelength, therefore Speed ÷ Frequency = Wavelength	

## PRACTICE

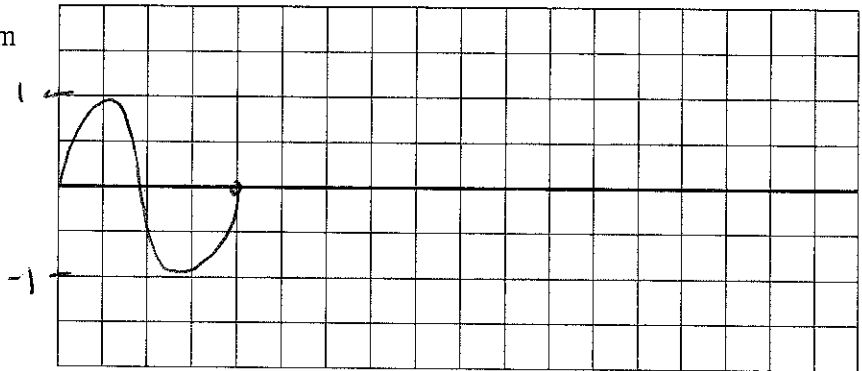
- On the graphic at right label the following parts of a wave: one wavelength, half of a wavelength, the amplitude, a crest, and a trough.
  - How many wavelengths are represented in the wave above? 2
  - What is the amplitude of the wave shown above? 5cm



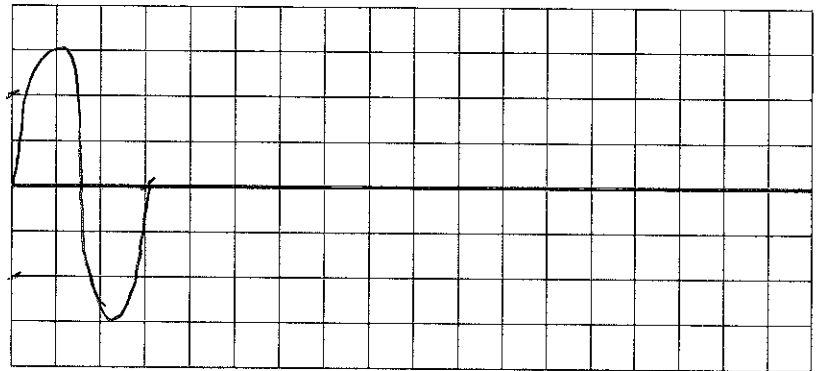


2. Use the grids below to draw the following waves. Be sure to label the y-axis to indicate the measurement scale.

a. A wave with an amplitude of 1 cm and a wavelength of 2 cm



b. A wave with an amplitude of 1.5 cm and a wavelength of 3 cm



3. A water wave has a frequency of 2 hertz and a wavelength of 5 meters. Calculate its speed.  $10\text{ m/s}$

4. A wave has a speed of 50 m/sec and a frequency of 10 Hz. Calculate its wavelength.  $5\text{ m}$

5. A wave has a speed of 30 m/sec and a wavelength of 3 meters. Calculate its frequency.  $10\text{ Hz}$

6. A wave has a period of 2 seconds and a wavelength of 4 meters. Calculate its frequency and speed.

*Note: Recall that the frequency of a wave equals 1/period and the period of a wave equals 1/frequency.*

$f = 0.5\text{ Hz}$        $v = 2\text{ m/s}$

7. A sound wave travels at 330 m/sec and has a wavelength of 2 meters. Calculate its frequency and period.

$f = 165\text{ Hz}$        $T = .006\text{ s}$

8. The frequency of wave A is 250 hertz and the wavelength is 30 centimeters. The frequency of wave B is 260 hertz and the wavelength is 25 centimeters. Which is the faster wave?

A  $v = 75\text{ m/s}$       B  $v = 65\text{ m/s}$

9. The period of a wave is equal to the time it takes for one wavelength to pass by a fixed point. You stand on a pier watching water waves and see 10 wavelengths pass by in a time of 40 seconds.

a. What is the period of the water waves?  $4\text{ s}$

b. What is the frequency of the water waves?  $0.25\text{ Hz}$

c. If the wavelength is 3 meters, what is the wave speed?  $0.75\text{ m/s}$