Wavelength and Amplitude

Reflect

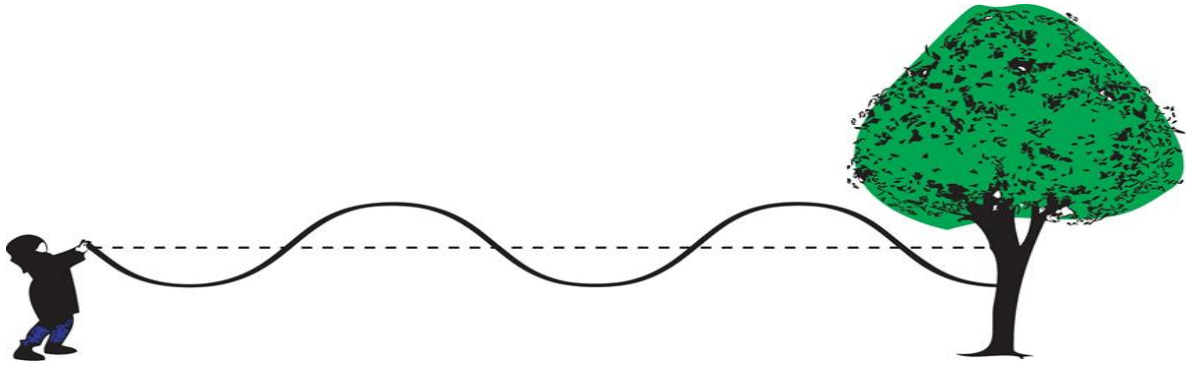
Waves transmit energy and travel through materials as vibrations. All waves transmit energy, not matter. Nearly all waves travel through matter. Waves are created when a source (force) creates a vibration. Vibrations in materials set up wave-like disturbances that spread away from the source of the disturbance. This means, of course, that every wave starts somewhere.

Where is the source of the wave below? Can you explain why the rope is creating a wave form?

wavelength: the distance between the peaks of a wave

Waves can be compared by the way they behave. Waves have a repeating pattern that gives them a shape and length. These characteristics allow us to describe wave behavior and, therefore, categorize waves with our descriptions. Waves change their behavior as they travel through different types of matter. To be able to use these wave properties, we must first understand how each wave is measured. Do you see any characteristics in the waving rope above that might help us describe a wave?

Wave behavior can be measured by the distance between peaks (**wavelength**), the size of the peak (**amplitude**), or the speed of the peaks (**frequency**). Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.

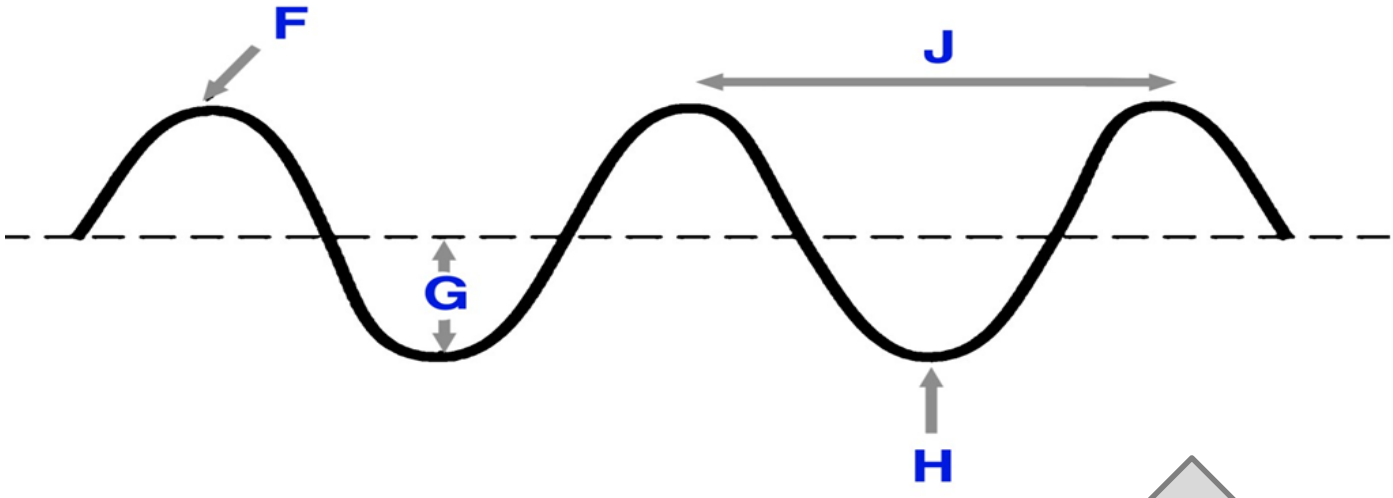


frequency: the rate at which a vibration occurs that constitutes a wave

amplitude: the size of the peak of a wave

Wavelength and Amplitude

Reflect



Amplitude: The height of a wave

Wavelength: The distance between adjacent crests

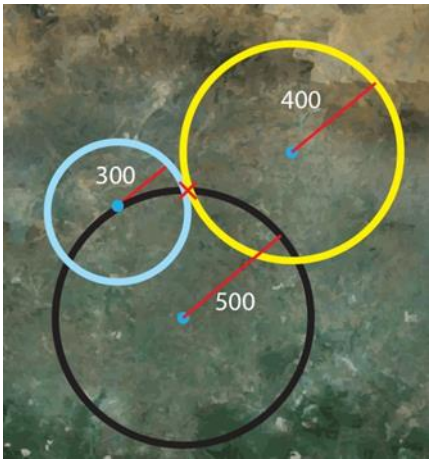
Trough: The lowest point of a wave

Crest: The highest point of a wave

Label each letter above

Look Out!

Waves are moving energy. The type of matter the wave travels through will determine the frequency (speed) of the wave. As a source of energy begins the vibration of the wave, the matter around it is disturbed. Each disturbance passes the disturbance to the matter next to it, and thus energy flows away from the source in a wave.

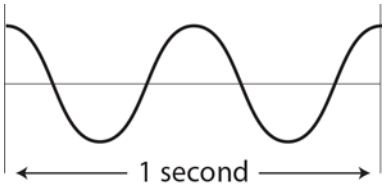


Earthquakes are caused by vibrations in Earth. When a wave is created in a solid, like in Earth's crust, the matter is already so tightly packed that the energy doesn't have to move very far to travel. These more compact distances for particle disturbance allow waves of energy to move more quickly through solid materials. For example, in an earthquake that is created by movement of rock in Earth's crust, the molecules don't have a large area to move in, so the amplitude of the wave is very low, but the frequency can be very high.

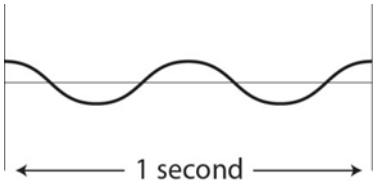
Look Out!

Apply What You Have Learned

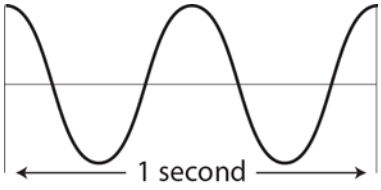
Can you hypothesize about which one of the waves below could be part of the seismic wave graph from an earthquake? What information from the waveform supports your conclusion?



Wave A



Wave B



Wave C

Three types of waves exist: transverse waves, longitudinal waves, and surface waves. The way the wave moves can help you identify what kind of wave it is. **Transverse waves** transfer energy at right angles to the direction of the wave. **Longitudinal waves** vibrate parallel to the direction to the wave. **Surface waves** travel along the surface and are made from the combination of transverse and longitudinal waves.

Try Now

Real World Finds

Use the table below to compile examples of waves that you encounter in the real world.

Longitudinal Waves	Transverse Waves	Surface Waves

Look Out!

Light waves are a type of transverse wave. Light waves are unique because they do not need a material to travel through. Light waves are unique in their ability to travel through a vacuum (space). You see this happen everyday when you walk outside and see sunlight.

Sound waves are a type of longitudinal (compressional) wave. Sound is a form of energy that results when vibrating materials produce waves that move through matter.

Sound waves require a medium to travel through. Think back to the last time you were in the bath tub. Did the sounds in the room sound different when you had your ears under the water? Why would the sounds change?

Surface waves are made from the combination of transverse and longitudinal waves. Waves across water are good examples of surface waves. Can you see the wave characteristics in the waves made by a water drop?

Connecting With Your Child

Wavelength and Amplitude at Home

This activity will help you explore the different properties of waves with your child. The only materials you will need are a jump rope, a water hose, and a third material similar in length as the previous two, such as computer cable, phone cord, or rope.

1. Start by holding one end of each material and either tape one end to the wall or have a second person hold the end.
2. Move the rope/material up and down to create waves.
3. Move closer together and farther away and repeat step 2. Make sure to look and compare the wavelength, amplitude, crest, and trough of each wave.
4. Record your findings and observations.

Think about the different materials you used in the demonstration to answer and discuss wave properties.

Here are some questions to discuss with your child:

1. Does the material waves travel through affect the wavelength?
2. What is the difference between amplitude and wavelength?
3. Explain how earthquakes and wavelength are related.
4. Describe how crest and trough are used to explain amplitude.
5. How does the amplitude change when the wavelength is changed?