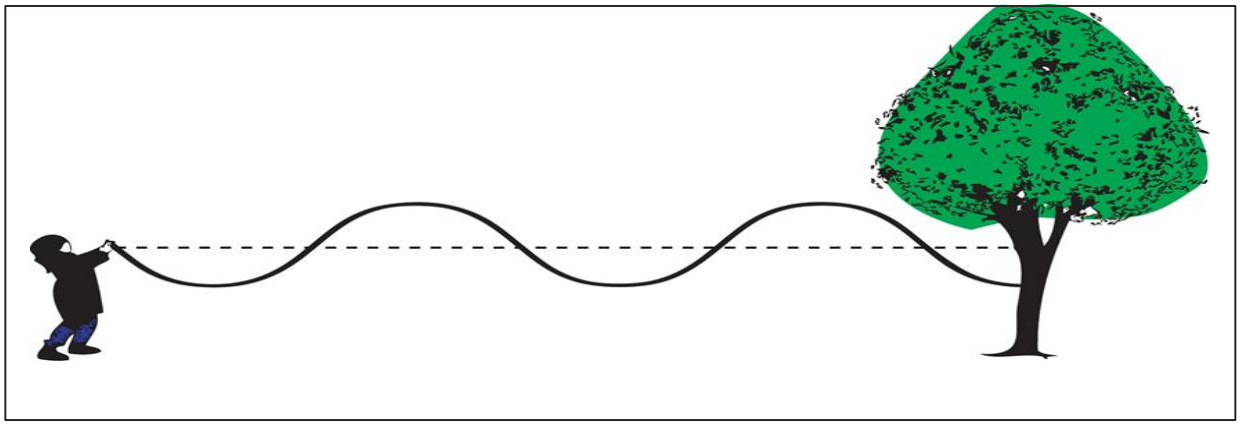
Wavelength and Amplitude

Reflect

Waves travel through materials as vibrations and transmit energy. All waves transmit energy, not matter. They travel through matter, also called the medium. 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?



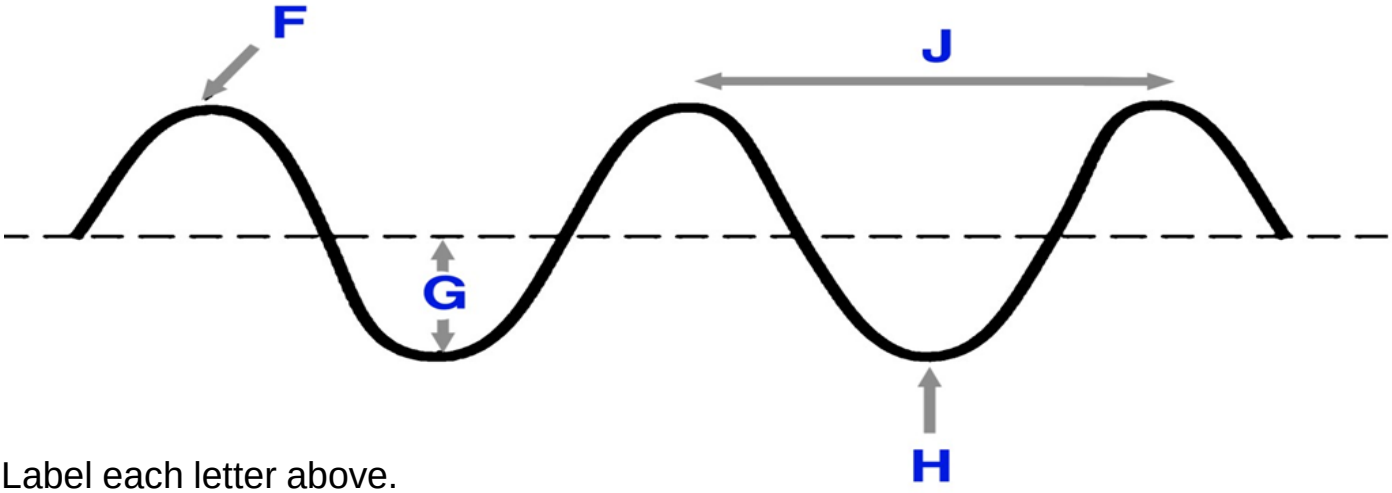
wavelength: the distance between the peaks of a wave	**frequency**: the number of peaks that pass a point per second	**amplitude**: the size of the peak of a wave

Waves can be compared by the way they behave. Waves have a repeating pattern, which gives it a shape and length. These characteristics allow us to describe wave behavior and categorize waves by description. Waves change their behavior as they travel through different types of matter. 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 number of peaks that pass a certain point per second (**frequency**). Sound and earthquake waves are examples. These and other waves move at different speeds in different materials.

Reflect

Below are a list of characteristics scientists use to describe and compare waves. Looking at the figure of a wave, match the term and its definition with the letter that shows its location on the wave.



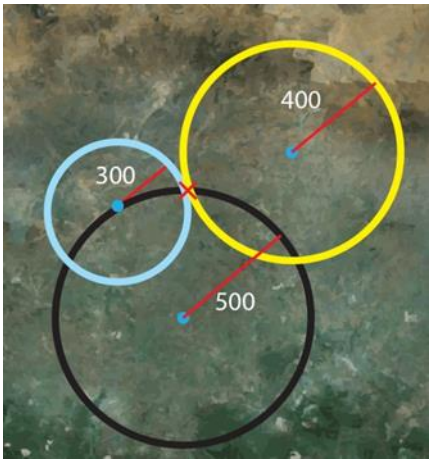
Label each letter above.

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

Look Out!

Waves are moving energy.

The type of matter that the wave travels through will determine the speed of the wave. As a source of energy begins, the vibration of the wave and the matter around it is disturbed. Each disturbance passes to the matter next to it. Thus energy flows away from the source in a wave.



Vibrations in the earth cause earthquakes. When a wave is created in solid material, like Earth's crust, the matter is already so tightly packed that the energy does not have to move very far to travel to the next particle. These more compact distances for particle disturbance allow waves of energy to move more quickly through solid materials.

Try Now

Now that you have learned about wave properties, let's practice drawing waves. In the space provided below, draw two different waves that have different wavelengths, amplitudes, and frequencies. Label these three properties on each of your waves.

Look Out!

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 particles that are moving. Longitudinal waves vibrate particles in the same direction as the direction of the wave (the direction in which the energy is moving). Surface waves travel along the surface and are made from the combination of transverse and longitudinal waves.

Light waves are a type of **transverse wave**. Light waves are unique because they do not need a material to travel through. They can 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 head under the water? Why would the sounds change?

Surface waves are made from the combination of transverse and longitudinal waves. Waves across water provide a good example 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 to the previous two such as computer cable, phone cord, slinky, or rope.

Procedure

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 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. Describe how crest and trough are used to explain amplitude.
4. Does the amplitude change when the wavelength is changed?