Transverse and Longitudinal Waves
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Waves come in many different forms but they all transfer energy from one place to another. For example:

**Seismic waves** carry energy from earthquakes through the Earth, which shake the ground.

**Sound waves** are emitted from vibrating loudspeakers making our eardrums vibrate.

All types of wave are caused by a vibrating source, and transfer energy without transferring matter. All waves can be reflected, refracted and diffracted.
When a group of people in a stadium decide to start a Mexican wave, the wave travels around the stadium.

Mexican waves are an example of **transverse waves**, as are waves on a water surface.

In a transverse wave, the particles **move up and down**, so the direction of their movement is at **right angles** to the direction of the wave. It is the **wave** that travels, not the **medium** the wave is moving through.

Think about the people standing up and down in the same place as the wave moves around the stadium.
A water wave is an example of a transverse wave.

As a water wave moves through water, particles in the water move up and down, at right angles to the direction of the wave. The particles do not travel with the wave, but move about a fixed position.

This can be shown by the behaviour of a duck floating on a water surface. As a wave moves through the water below the duck, the water, and therefore the duck, moves up and down.

The duck and the water do not travel; only the wave travels.
A Slinky can be used to model transverse waves, by moving one end of the Slinky up and down.

The wave travels away from the source. The direction of the wave makes a right angle with the movement of the source.

In a transverse wave, the coils do not travel horizontally; each coil of the Slinky just vibrates up and down.
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What are longitudinal waves?

Sound travels as waves made by vibrating air particles.

Sound waves are an example of **longitudinal waves**.

In a longitudinal wave, the particles vibrate back and forth, so the direction of their movement is **parallel** to the direction of the wave.

Think about the hairs on this fluffy cat vibrating backwards and forwards, as sound waves from the speaker pass by.
A Slinky can be used to model longitudinal waves, by moving one end of the Slinky **left and right**.

The wave travels away from the source. The direction of the wave is **parallel** to the movement of the source.

In a longitudinal wave, the coils do not travel horizontally; each coil of the Slinky just **vibrates left and right**.
Certain parts of a longitudinal wave have special names.

Sections that are pushed together are called **compressions**, and those that are stretched out are called **rarefactions**.

Sound waves are longitudinal waves. When someone speaks, the air particles vibrate as a longitudinal wave and so compressions and rarefactions are formed in the air.

**P waves**, the primary waves produced by earthquakes, are also longitudinal waves, which push and pull the Earth.
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Transverse or longitudinal waves?
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