Name: _____

Period: _____

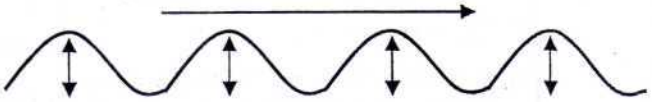
Waves

If you were to drop a rock in water you would make ***waves***. You know that the waves move away from where you dropped the rock (linear motion), but when the waves pass, the water moves up and down (harmonic motion).

Restoring force: To be harmonic motion, the waves have to have a restoring force. In water waves it is the water molecules. The water is compressed and expanded to cause the up and down (oscillating) motion. All waves do this with molecules they travel through.

Waves combine harmonic motion and linear motion.

Ocean waves *travel:* this is *Linear Motion*



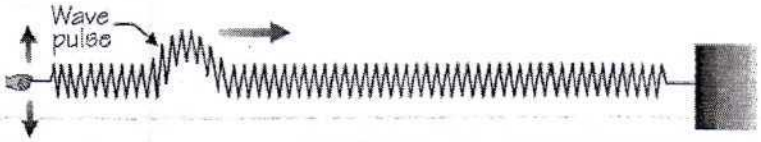
Ocean waves *oscillate* (move up and down): this is *Harmonic Motion*

Waves can go through things: waves go through water; light waves can go through your skin; sound waves can goes through walls. If it can go through something, it is a wave.

Two Types of Waves

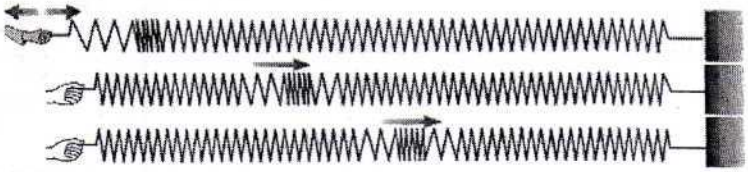
Transverse waves (slinky moving side to side or up and down) – moves perpendicular to the direction of the wave. Ocean waves are transverse waves, moving forward, but the oscillating up and down.

Transverse Wave (*Perpendicular* to direction of wave)



Longitudinal waves (also called *compression waves* – a slinky pushed and pulled) – moves parallel (same direction) to the wave motion. Sound waves are longitudinal waves – the sound moves forward and the oscillations move back and forth.

Longitudinal Wave (*Parallel* to direction of wave)



Earthquakes are made up of both transverse and longitudinal waves. The transverse waves do the most damage.

Speed and Wavelength

Different waves have different speeds and different wavelengths.

New Terms: ***Wavelength (λ)*** — the length of one cycle of the wave.
Crest—top peak
Trough—bottom peak

The Speed (velocity) of a Wave

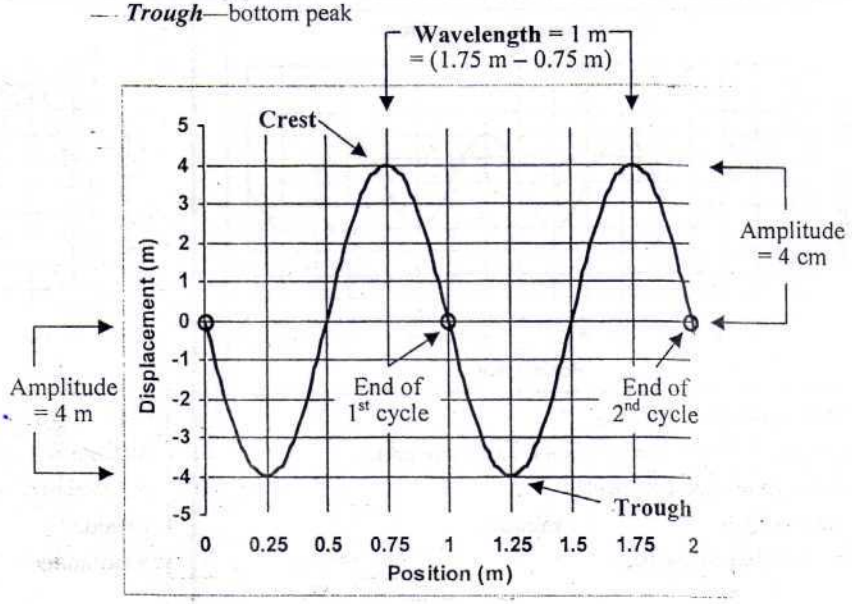
velocity (m/sec)

$v = \frac{\lambda}{T}$ ← wavelength (m), ← period (sec)

$v = f\lambda$ ← wavelength (m), ← frequency (Hz)

Ex. Find the speed of a 20 Hz wave that has a 5 meter wavelength.

f = 20 Hz λ = 5 m v = ?	v = fλ v = (20 Hz) x (5 m) v = 100 m/s



Name: _____

Period: _____

1. Transverse wave	A. A wave where the oscillation is perpendicular to the direction of motion.
2. Longitudinal wave	B. The bottom of a wave.
3. Crest	C. The top of a wave.
4. Trough	D. A wave where the oscillation is in the same direction (parallel) as the motion.
5. Wavelength	E. The length of one wave cycle.

Wave Motion, Yes or No?

FM radio: _____ Music: _____

A car going 70 m/s: _____ A bulldozer: _____

Clock pendulum: _____ Earthquakes: _____

Ocean waves: _____ Cellphones: _____

A wave has a wavelength of 2 meters and a frequency of 1.5 Hz. What is its speed?

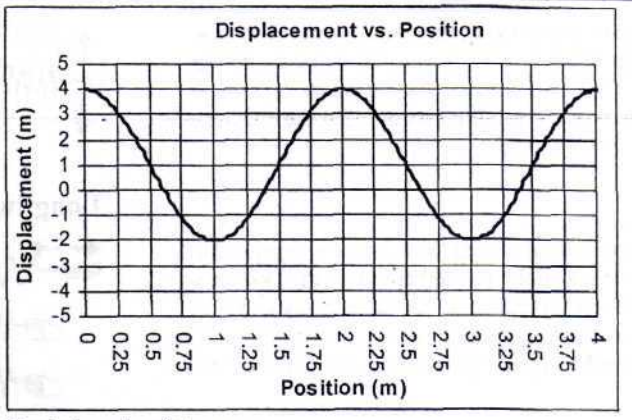
A wave is 8 meters long and has a frequency of 3 Hz. Find speed.

A wave has a period of 4 seconds. Find its frequency.

A wave has a frequency of 2 Hz. Find its period.

A wave has a speed of 50 m/sec. If its frequency is 100 Hz, what is its wavelength?

Pendulum A is 20 cm long and has a 5 g mass on it. Pendulum B is 30 cm long and has a 10 g mass on it. Which one has a faster period?



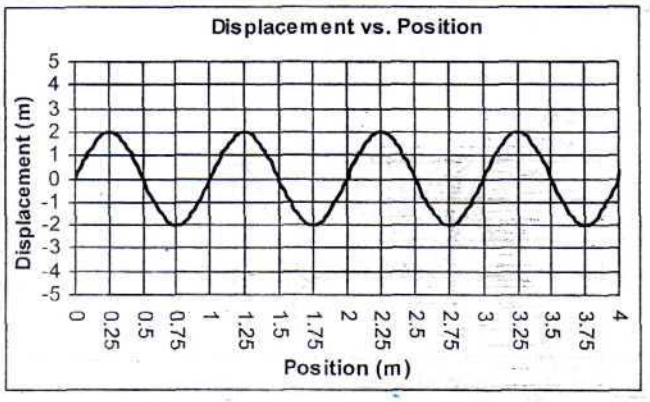
Mark 1 cycle of the wave.

Starting at 1 m, where does the next cycle end:

How many wavelengths long is the graph?

Wavelength: Amplitude:

If f = 0.5 Hz, find speed:



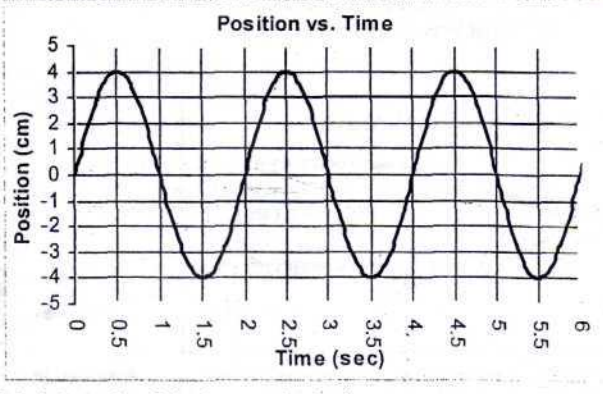
Mark 1 cycle of the wave.

Starting at 0.75 m, where does the 2nd cycle end:

Number of complete cycles:

Wavelength: Amplitude:

If f = 4 Hz, find speed:



Mark 1 cycle of the harmonic motion.

Starting at 1.5 secs, when does half a cycle end:

Number of complete cycles:

Period: Frequency:

Amplitude: