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Wave Properties

IB PHYSICS | WAVE RESONANCE

What is a Wave?

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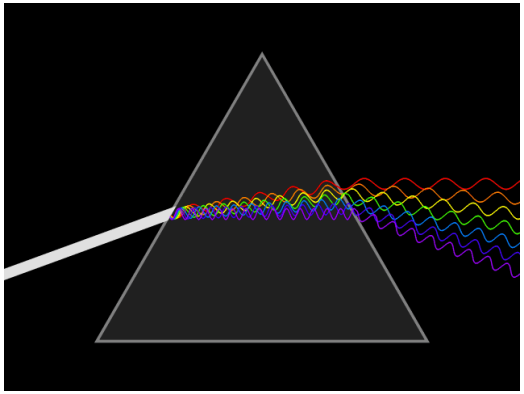

What is a Wave?

A wave is a disturbance that carries _____ through matter or space

matter through which a wave travels

Is the Medium Moving?

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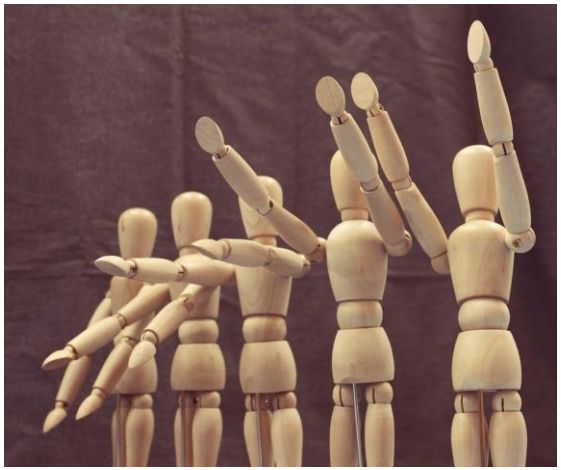
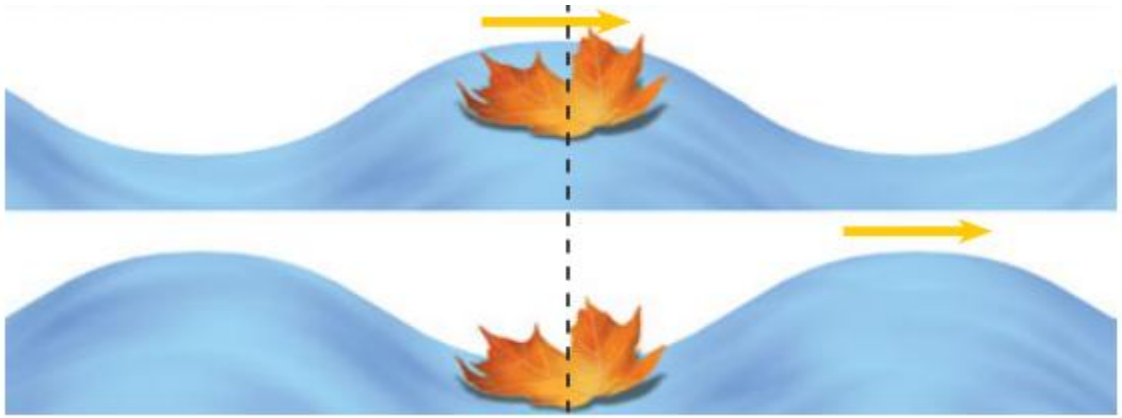
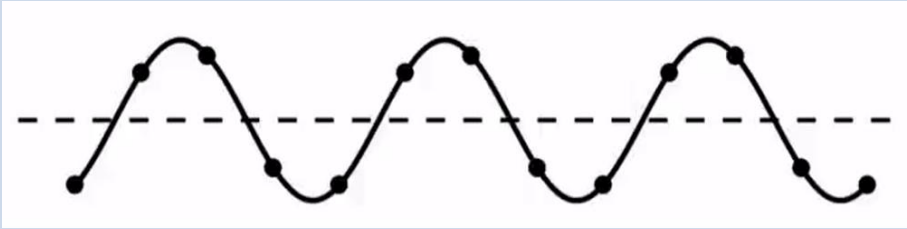




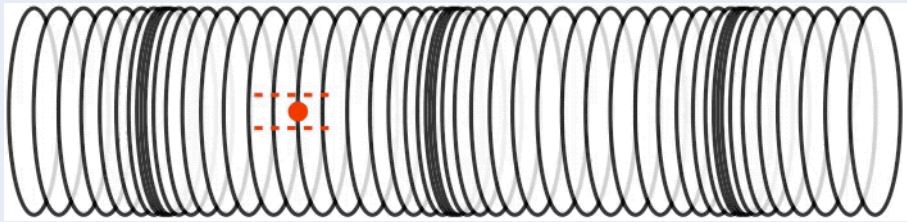
Two Types of Waves

Particles move **perpendicular** to the wave's motion



Examples:
- Ripples in a pond
- Light Waves

Particles move **parallel** to the wave's motion



Examples:
- Sound Waves
- Earthquake Waves

Properties of a Wave

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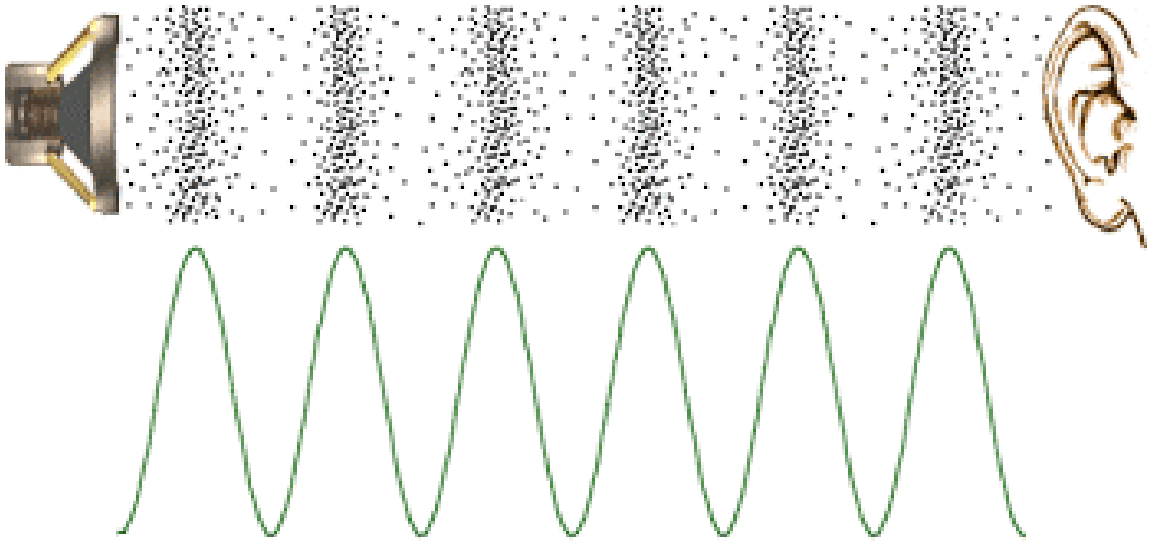

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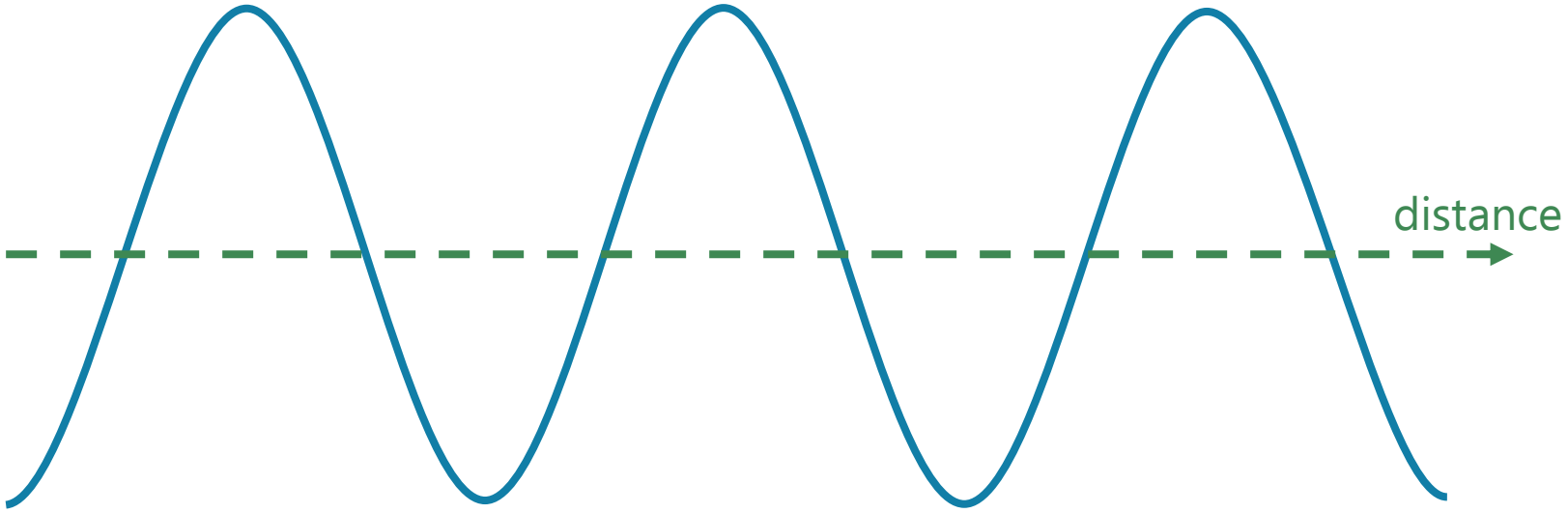
Properties of a Wave



Property	Symbol	Unit
Amplitude		
Wavelength		

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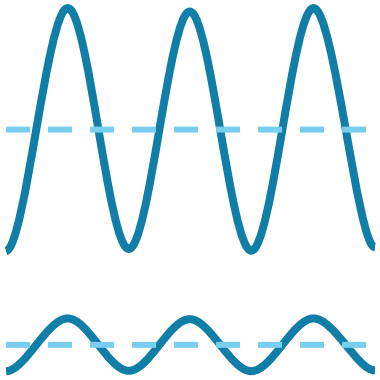
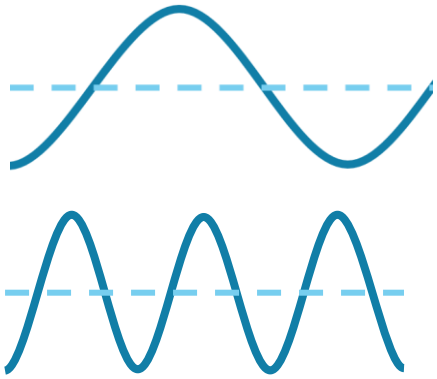
Waves and Energy



↑ Amplitude = ◯ Energy

↓ Amplitude = ◯ Energy



↑ Wavelength = ◯ Energy

↓ Wavelength = ◯ Energy

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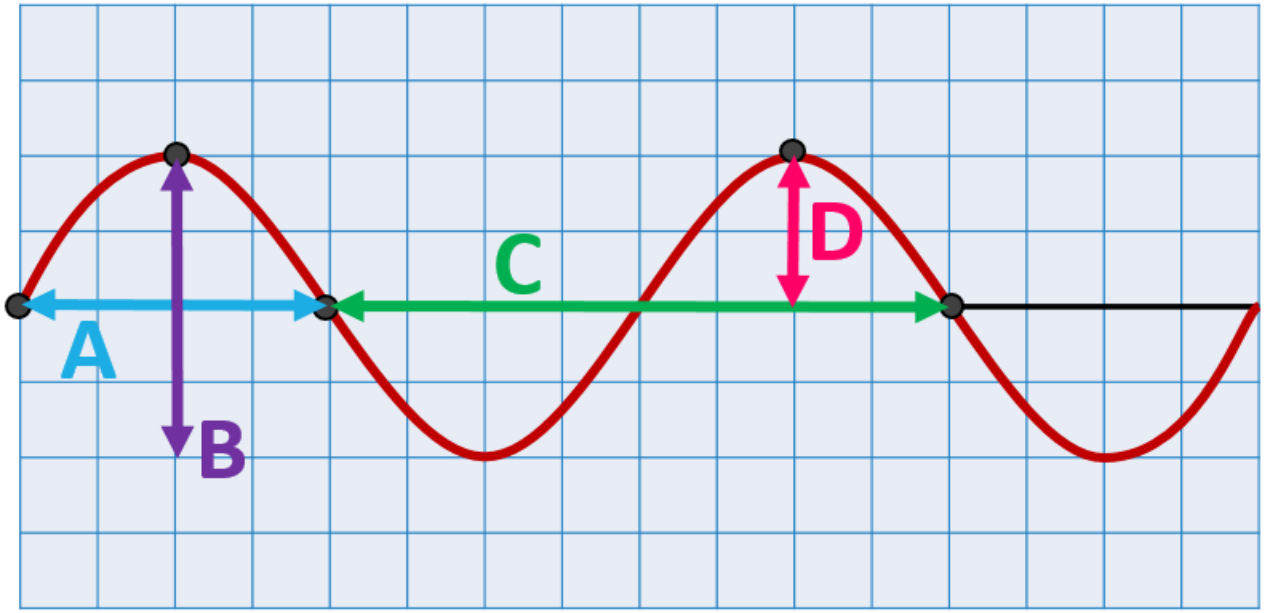
Label this wave

Can you identify the wave properties from this diagram?



Amplitude?

Wavelength?

How Many Wavelengths?

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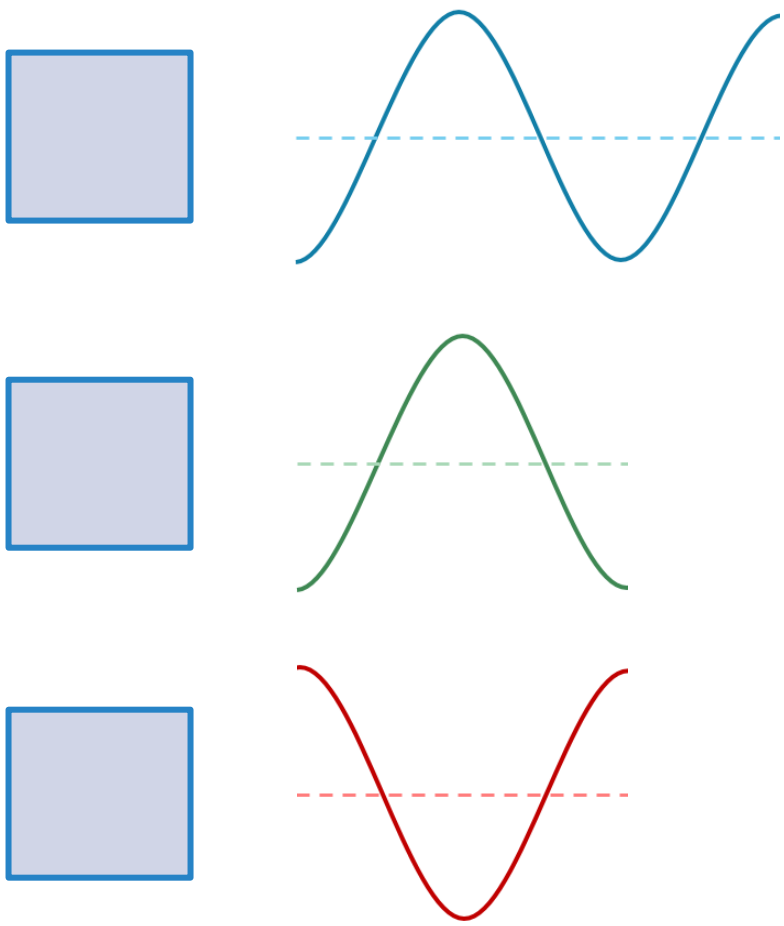

Review: What is Frequency?

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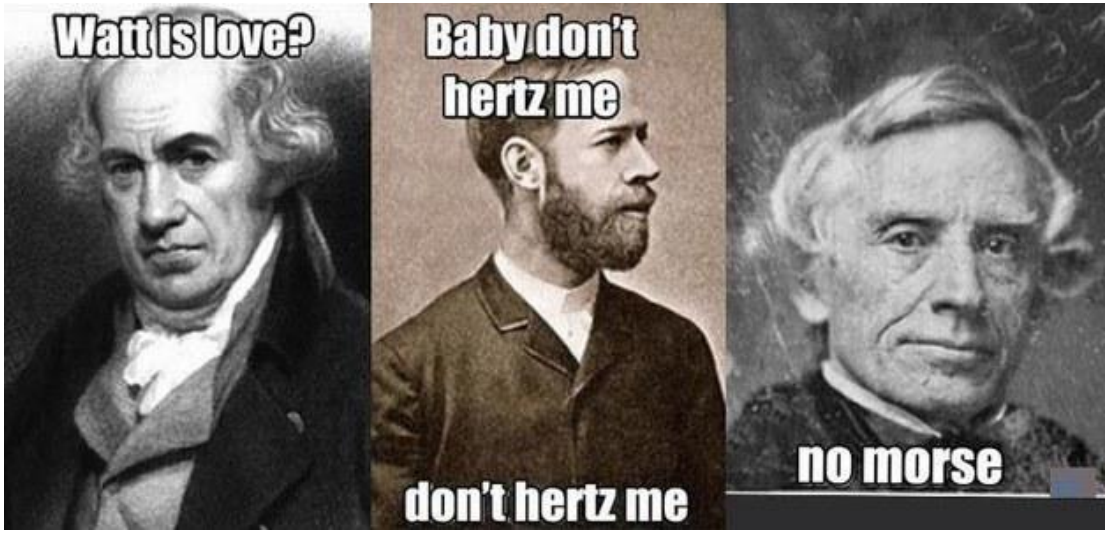
Property	What is it?	Symbol	Unit
Frequency	Cycles per second	f	[Hz]



Wavelength is related to frequency

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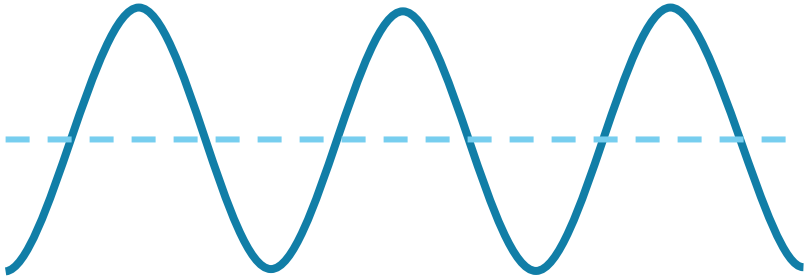
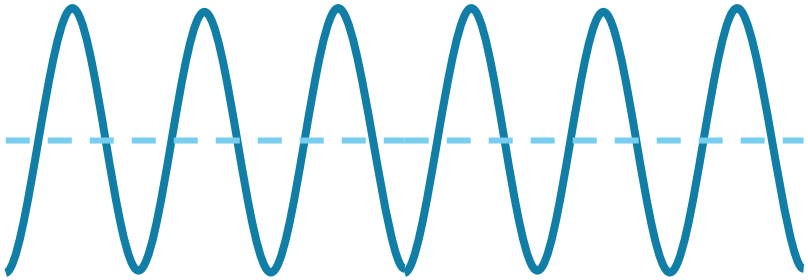


Longer wavelength

_____ frequency



Shorter wavelength

_____ frequency

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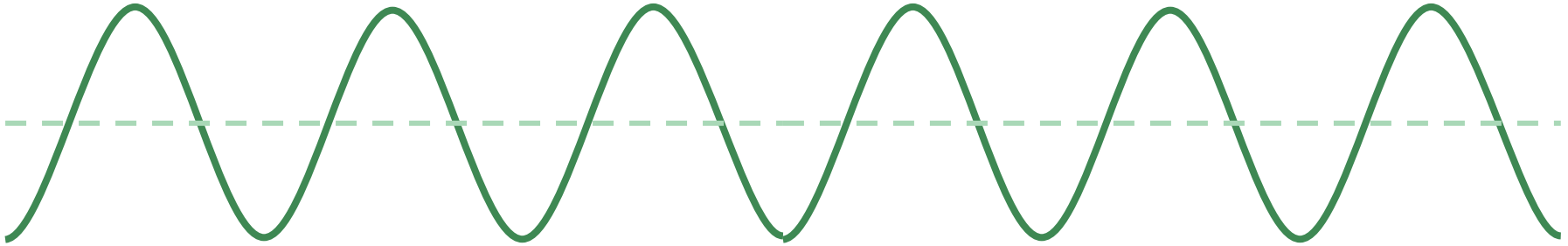
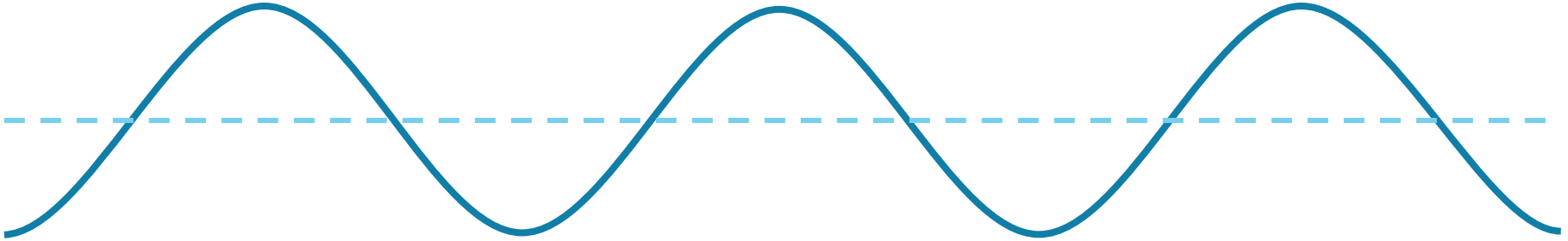
Pitch is Related to Frequency

High pitched sounds have _____ frequencies



Low pitched sounds have _____ frequencies



Sensing Pitch

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Sadly, the range of frequencies that we can hear diminishes with age…

Frequency
8,000 Hz
10,000 Hz
12,000 Hz
14,000 Hz
16,000 Hz
18,000 Hz
20,000 Hz

Wave Speed Equation

Speed = Frequency × Wavelength

Symbols	=	×	
Units	=	×	

IB Physics Data Booklet

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C.1 Simple harmonic motion	$a = -\omega^2 x$ $T = \frac{1}{f} = \frac{2\pi}{\omega}$ $T = 2\pi\sqrt{\frac{m}{k}}$ $T = 2\pi\sqrt{\frac{l}{g}}$
C.2 Wave model	$v = f\lambda = \frac{\lambda}{T}$

Try this…

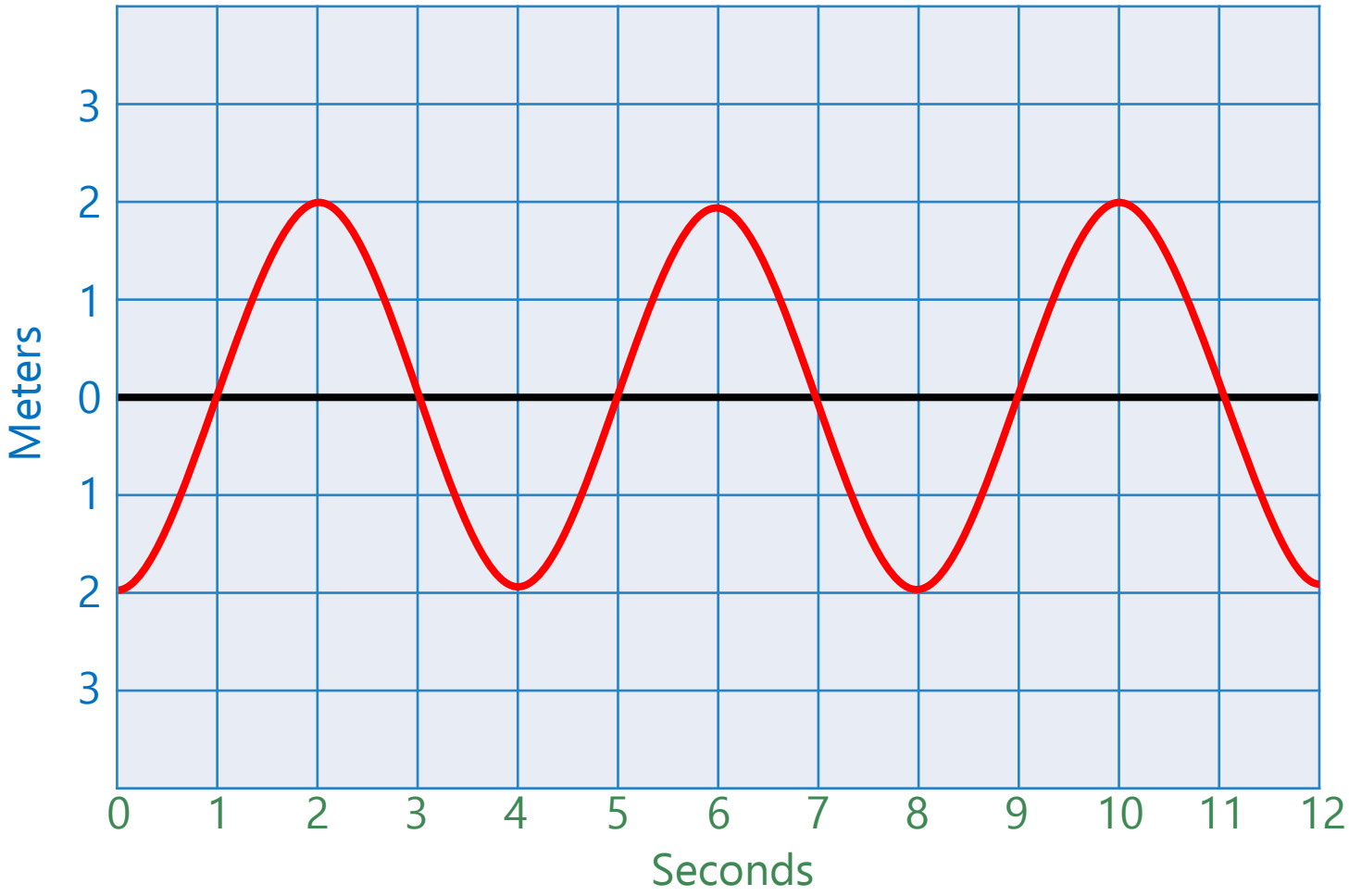
A piano string vibrates with a frequency of 262 Hz. If these sound waves have a wavelength in the air of 1.30 m, what is the speed of sound?

$f = \frac{1}{T}$

Read a Wave #1

$T = \frac{1}{f}$

C.2



# of Waves

Period

Amplitude

Frequency

$f = \frac{1}{T}$

Read a Wave #2

$T = \frac{1}{f}$

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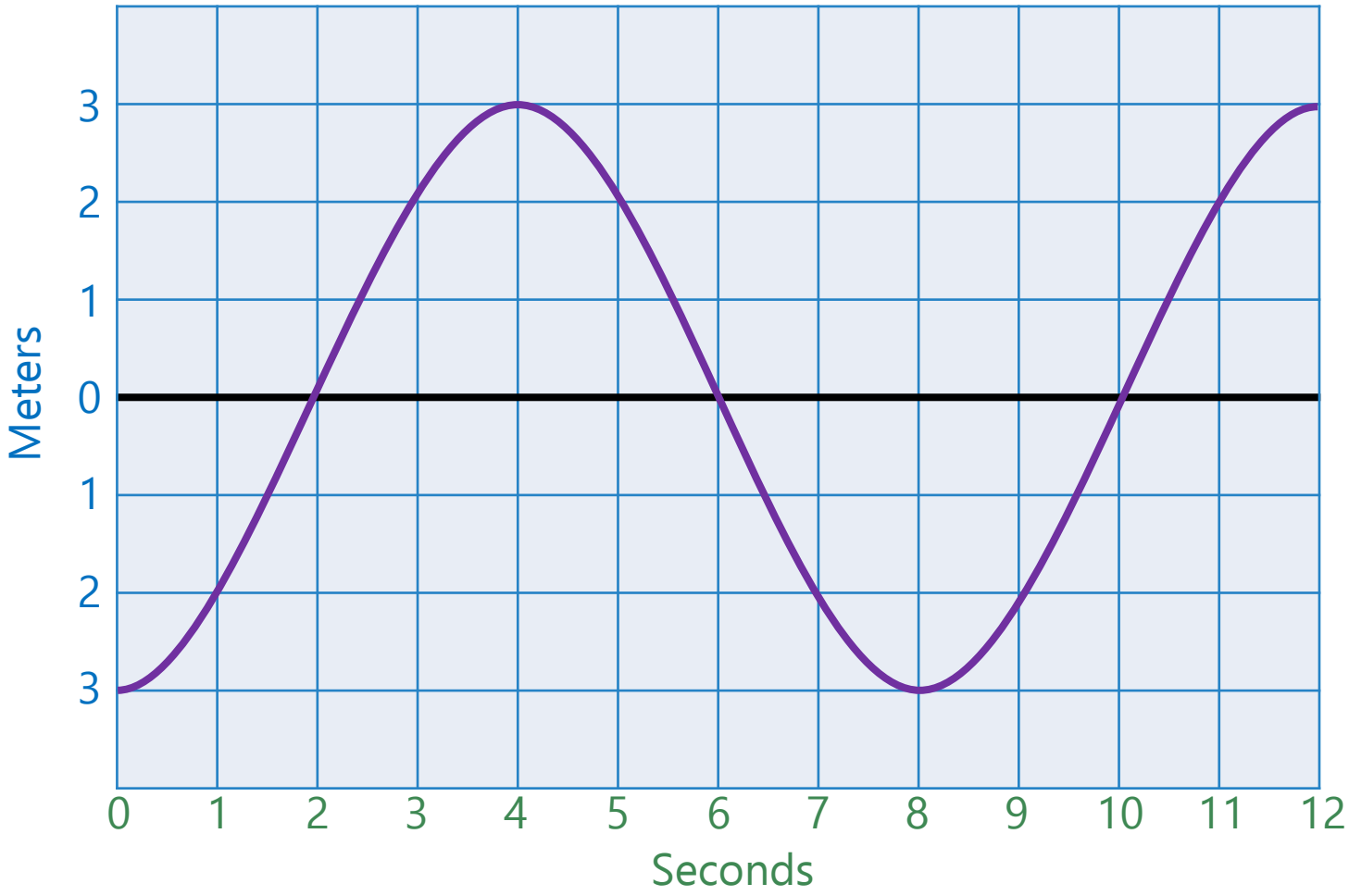

# of Waves

Period

Amplitude

Frequency

One Final Question…

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The crests of waves passing into a harbor are 2.1 m apart and have an amplitude of 60 cm. 12 waves pass an observer every minute.

What is their frequency?	What is their speed?

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Lesson Takeaways

- ❑ I can describe how waves carry energy through a medium
- ❑ I can compare the properties of transverse and longitudinal waves
- ❑ I can read a wave's amplitude, wavelength, period, and frequency from a graph
- ❑ I can describe the number of complete wavelengths represented in a picture
- ❑ I can use the wave speed equation to mathematically relate speed, wavelength, and frequency