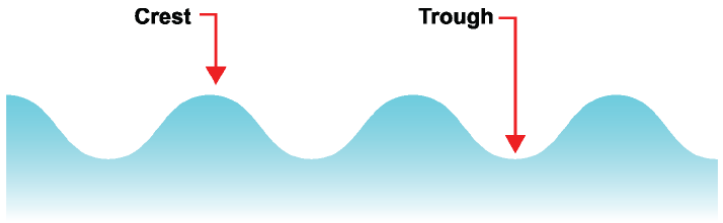
24.2 What is a wave?

- A wave is an oscillation that travels from one place to another.
- If you poke a floating ball, it oscillates up and down.
- The oscillation spreads outward from where it started.

24.2 Parts of a wave

- You can think of a wave as a moving series of high points and low points.
- A crest is the high point of the wave.
- A trough is the low point.

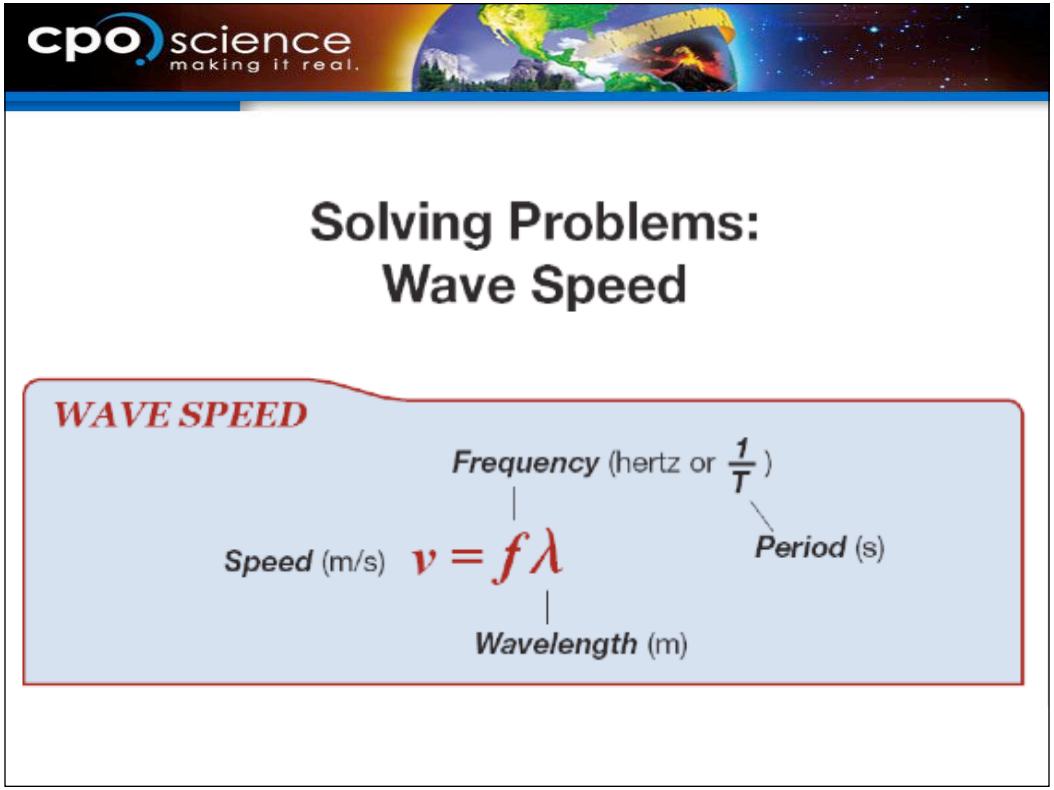


24.2 The speed of waves

- The speed is the distance traveled (one wavelength) divided by the time it takes (one period).
- We usually calculate the speed of a wave by multiplying wavelength by frequency.

$$Speed = \frac{\text{Distance traveled}}{\text{Time taken}} = \frac{\text{Wavelength}}{\text{Period}} = \left(\frac{1}{\text{Period}}\right) \times \text{Wavelength}$$

$$Speed = Frequency \times Wavelength$$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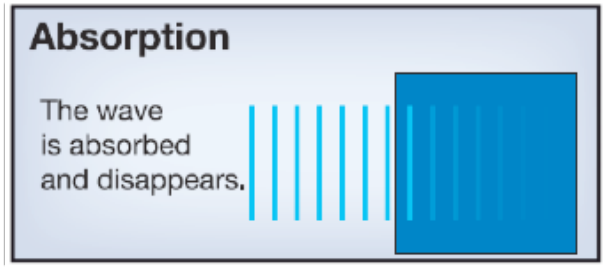
Solving Problems:
Wave Speed
WAVE SPEED
Frequency (hertz or 1/T)
Speed (m/s) v = fλ
Period (s)
Wavelength (m)

24.2 Four wave interactions

- When a wave encounters a surface, four interactions can occur:

1. reflection,
2. refraction,
3. diffraction, or
4. absorption.



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Wave Interactions

Reflection

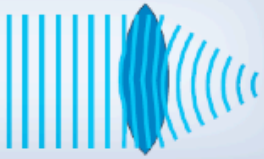
The wave bounces and goes in a new direction.

Diffraction

The wave bends around an object or through holes in the object.

Refraction

The wave bends as it passes into and through an object.

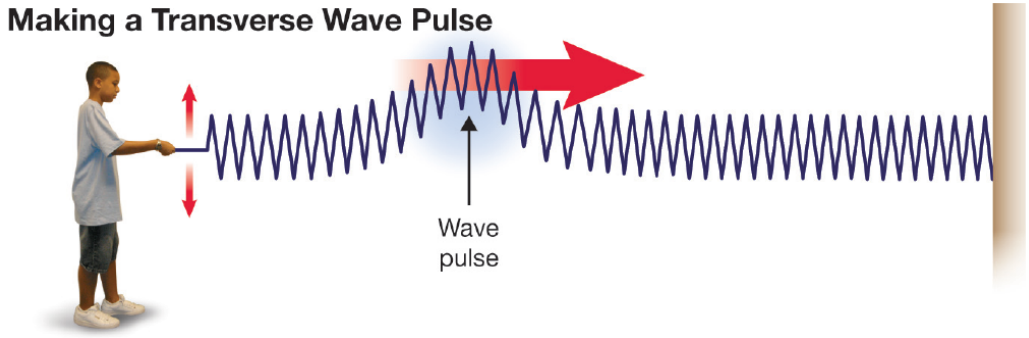


Absorption

The wave is absorbed and disappears.

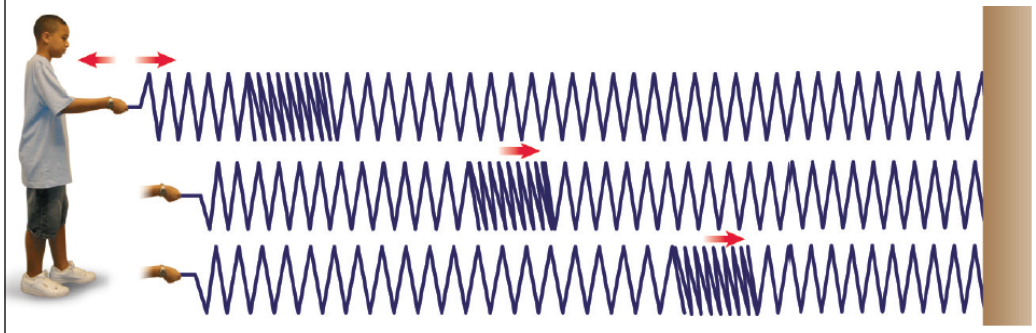
24.2 Transverse waves

- The oscillations of a transverse wave are not in the direction the wave moves.



24.2 Longitudinal waves

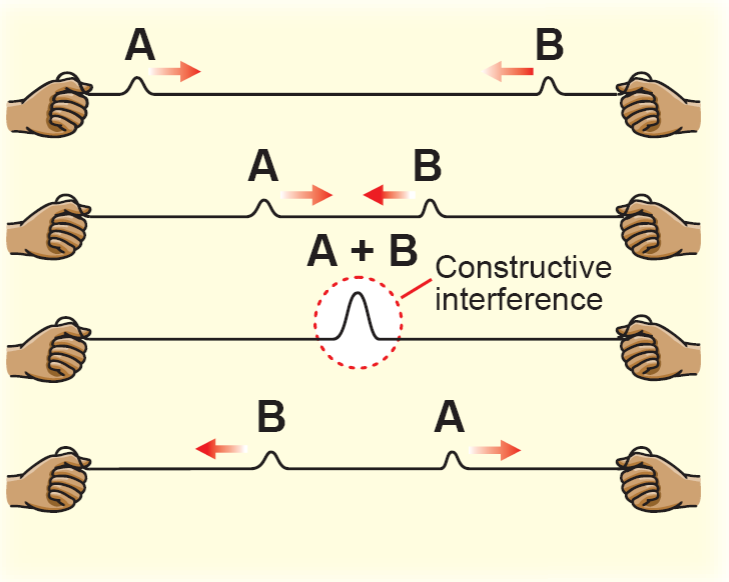
- The oscillations of a longitudinal wave are in the same direction that the wave moves.



24.2 Constructive interference

- Constructive interference happens when waves add up to make a larger amplitude.
- Suppose you make two wave pulses on a stretched string.
- One comes from the left and the other comes from the right.
- When the waves meet, they combine to make a single large pulse.

Constructive Interference

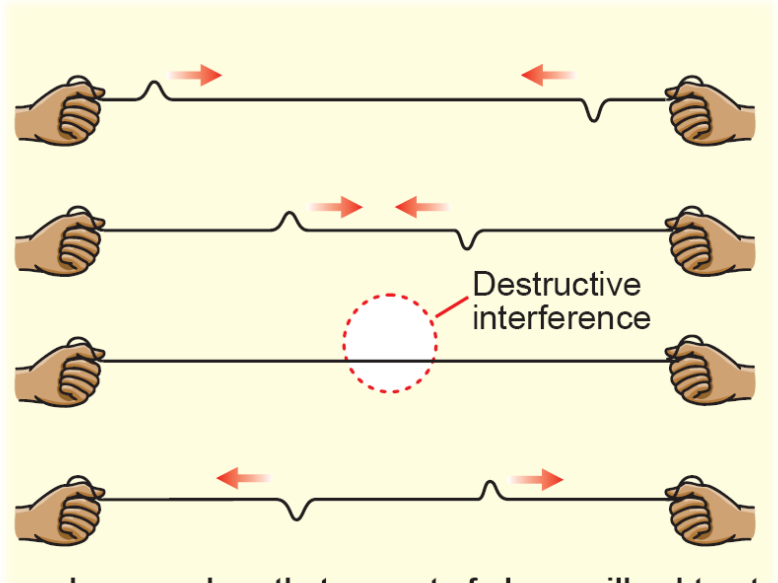


Two wave pulses that are in phase can add up to make a single, bigger pulse when they meet.

24.2 Destructive interference

- What happens when one pulse is on top of the string and the other is on the bottom?
- When the pulses meet in the middle, they cancel each other out.
- During destructive interference, waves add up to make a wave with smaller or zero amplitude.

Destructive Interference



Two equal wave pulses that are out of phase will subtract when they meet. The upward movement of one pulse can exactly cancel the downward movement of the other.