

Reflection & Refraction

<http://www.schulphysik.de/suren/Applets/Waves/TwaveRefTran/TwaveRefTranApplet.html>

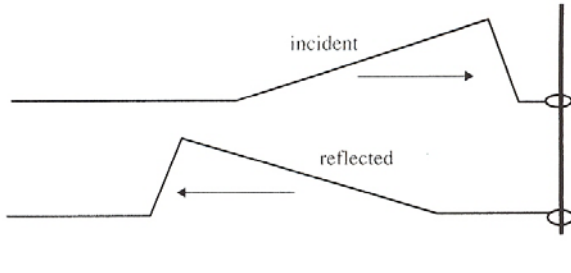
Reflection from a Fixed End

- Wave pulse is inverted

The diagram shows a wave pulse on a string moving towards a fixed end. The incident pulse is labeled 'incident' and has an arrow pointing right. The reflected pulse is labeled 'reflected' and has an arrow pointing left. The pulse is inverted upon reflection.

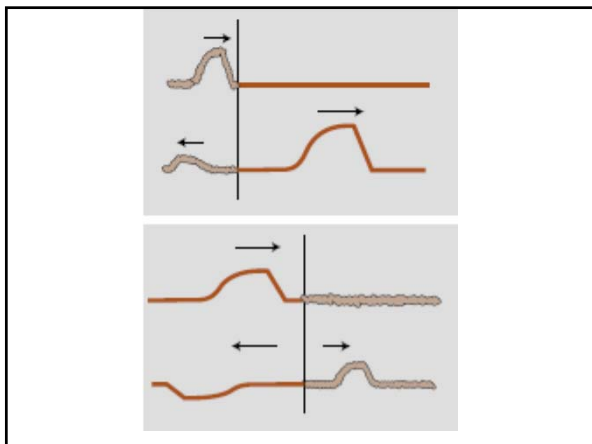
Reflection from a Free End

- Wave pulse is not inverted



Refraction

- When a wave travels from one medium to another
 - Frequency of the wave remains constant
 - Velocity of the wave changes
 - Some of the wave is reflected



Superposition

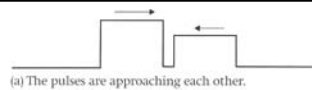
When two waves meet....

- They pass through each other and continue on their path as if nothing happened.

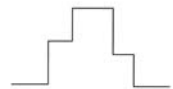
Principle of Superposition

- When two (or more) waves meet at some point in space the displacement at that point is the algebraic sum of the individual displacements
- This is also known as interference

<https://www.geogebra.org/m/dJrTcxYd>



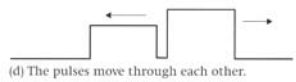
(a) The pulses are approaching each other.



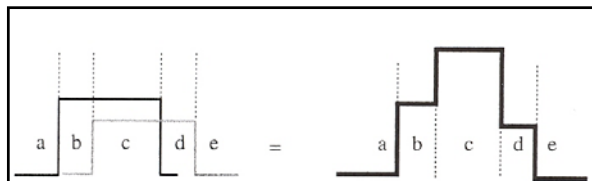
(b) The pulses are beginning to overlap.



(c) The overlap is complete; the pulses are on top of each other.

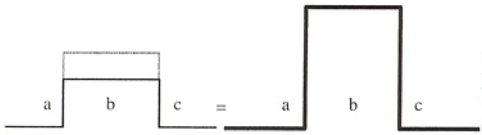


(d) The pulses move through each other.



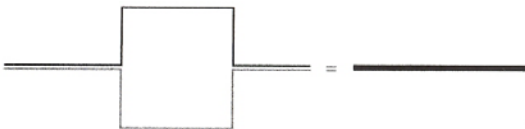
Constructive Interference

- When the waves add together to produce a wave with amplitude greater than the original waves



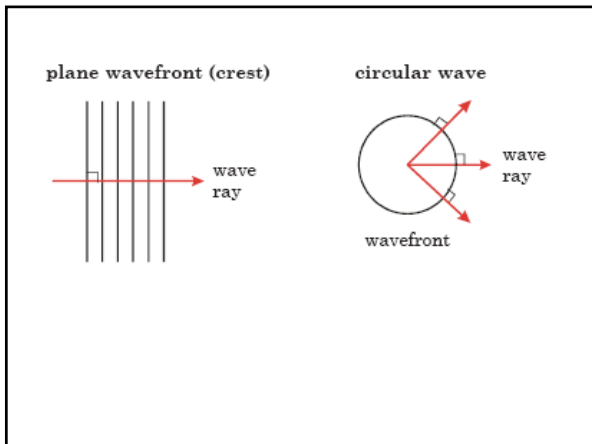
Destructive Interference

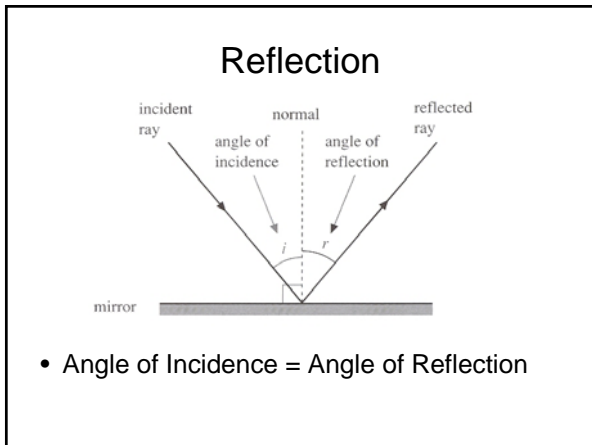
- When the waves add together to produce a wave with amplitude less than the original waves

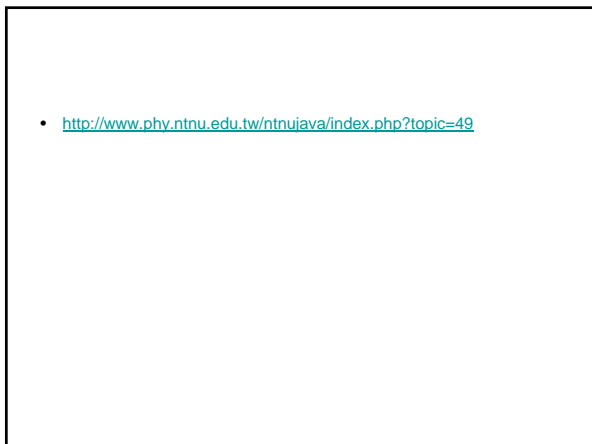


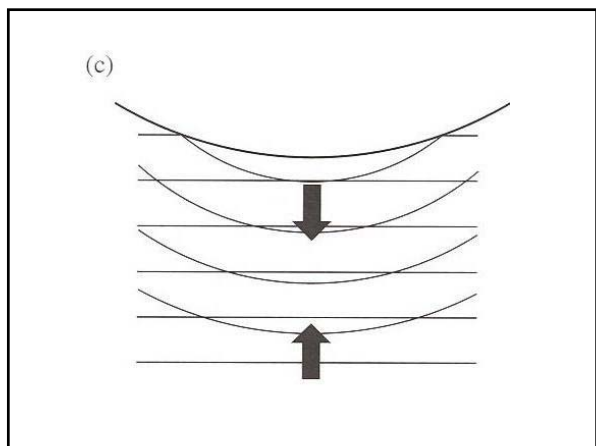
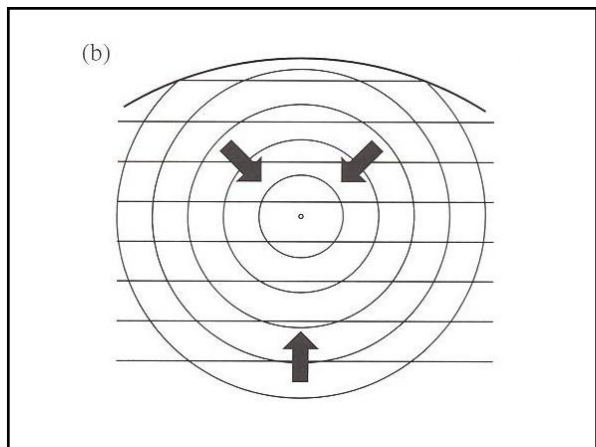
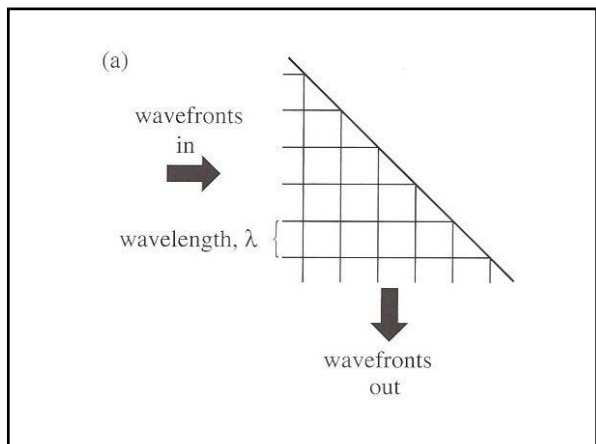
Two Dimensional Waves

- Wavefront
 - A series of connected particles moving in phase with one another
- Wave Ray
 - Represents the direction of motion of a point on the wavefront
 - The direction of motion is perpendicular to the wavefront

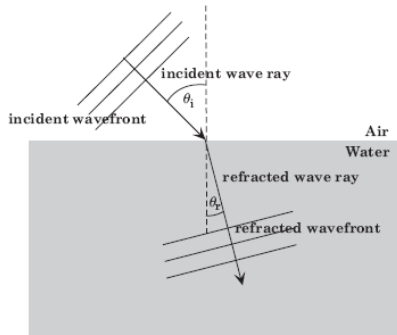








Refraction



Snell's Law

- Relates the incident wave to the refracted wave

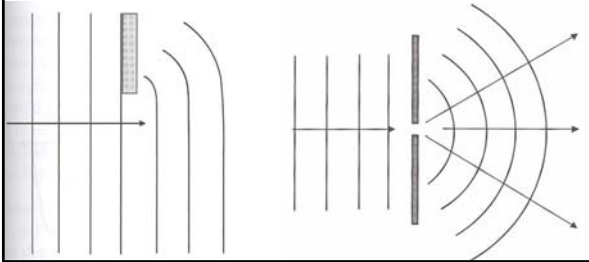
$$\frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1}$$

$$\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1}$$

- n is the index of refraction (only used with light)

Diffraction

- Diffraction is the (apparent) bending of waves around obstacles in its path and the spreading out of waves past small openings.



- Waves will only diffract if the wavelength is larger than the barrier or opening.

