Reminders 03-10-08:
-Next Exam Wed March 12.
-POW 5 Due Today by 5PM

Outline:
-Standing Waves and Resonance
-Beats
-Complex Waves
-Nature of Light
-Reflection and Refraction

- Based on the range of human hearing, what are the lengths of the longest and shortest pipes (open at both ends and producing sound at their fundamental frequencies) that you would expect to find in a pipe organ ? Use v_{sound}=343m/s.

20 Hz $\quad v = f\lambda \quad \lambda = \frac{v}{f}$

$\lambda = \frac{343\,m/s}{20\,Hz} = 17.2\,m \quad L = \frac{\lambda}{2} = \frac{17.2}{2}$

$L = 8.6\,m$ @ 20 Hz

$L = \frac{8.6\,m}{1000} = .0086\,m$ @ 20 kHz

A person hums into the top of a well and finds that standing waves are established at frequencies of 42, 70, and 98 Hz. The frequency of 42 Hz is not necessarily the fundamental frequency. How deep is the well ? Use v_{sound}=343m/s.

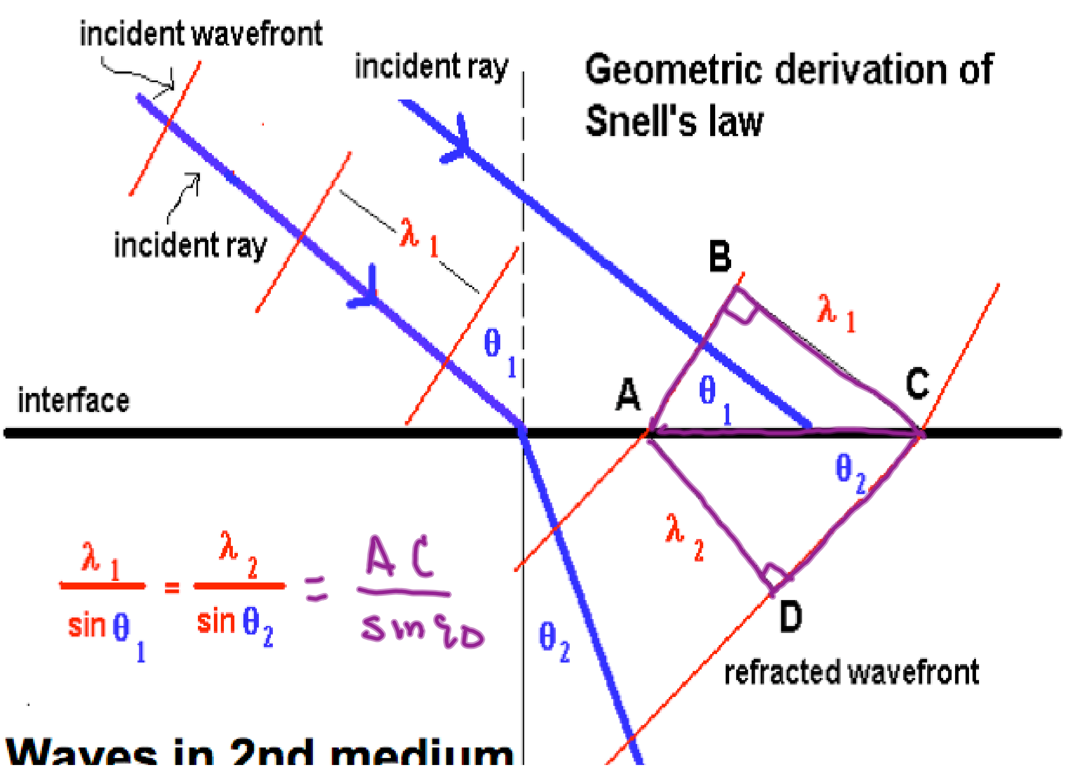
$$\frac{70}{42} = \frac{14 \times 5}{14 \times 3} = \frac{5}{3}$$

fundamental f = 14 Hz

42 Hz n = 3 ; 70 Hz ; n = 5

$$\lambda = \frac{343}{14\text{ Hz}} = 4L$$

$$L = \underline{6.1\text{ m}}$$



$$\frac{\lambda_1}{\sin\theta_1} = \frac{\lambda_2}{\sin\theta_2} = \frac{AC}{\sin \angle D}$$

Waves in 2nd medium

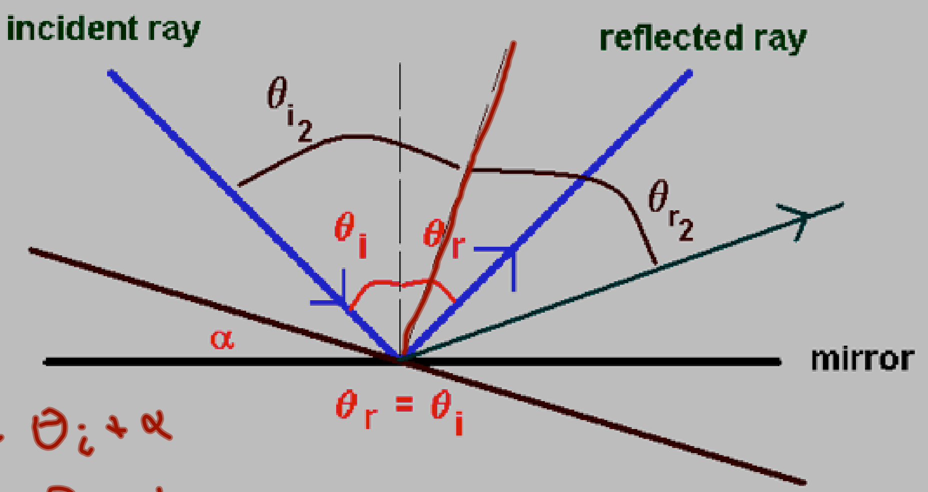
$$\lambda = \frac{v}{f}$$

$$\frac{v_1}{f}\frac{1}{\sin\theta_1} = \frac{v_2}{f}\frac{1}{\sin\theta_2}$$

$$\frac{v_1}{\sin\theta_1} = \frac{v_2}{\sin\theta_2} \qquad n = \frac{c}{v} \quad v = \frac{c}{n}$$

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

$$\Rightarrow \underline{n_1\sin\theta_1 = n_2\sin\theta_2}$$



$\theta_{i_2} = \theta_i + \alpha$

$\theta_{r_2} = \theta_r + \alpha$

$\theta_{i_2} + \theta_{r_2} = \theta_i + \theta_r + 2\alpha$

Law of Reflection

$\theta_{r_2} = \theta_r + 2\alpha$

A ray of light strikes a plane mirror at an angle θ. If the mirror is rotated by a, while the indent ray is kept fixed, the angle reflected ray rotates by 2α. Prove this.