Beating

If you have two sources of waves of slightly different wavelength, the following cool effect happens:

\[ f_1 \quad \lambda = 2 \text{ spaces} \]
\[ f_2 \quad \lambda = 2.4 \text{ spaces} \]

\[ \text{Amplitude Varies!} \]

\[ \therefore 2 \text{ notes, slightly out of tune, will create a resulting waveform with a varying amplitude.} \]

This sounds like beating.

With a little calculus, you can prove that the frequency of the beating is \( f_2 - f_1 \).

Doppler Effect

Imagine the sound of a racecar at the speedway. It goes "Eeeeeee.... uuuhhh!" Why?

Doppler Effect!
Doppler Effect - The shift in received frequency of a wave due to relative motion of the source or of the observer.

Received waves spaced far apart:
This person hears a lower frequency.

\[ f_0 = f_s \left( \frac{v \pm v_s}{v \mp v_s} \right) \]

- \( f_s \) = frequency of source
- \( f_0 \) = frequency received by observer
- \( v \) = speed of the traveling wave
- \( v_0 \) = speed of the observer
- \( v_s \) = speed of the source

→ Use upper signs for source/observer moving closer together.

→ Use lower signs for source/observer moving farther apart.