**Noteguide for Basic Wave Principles (Videos 12A, B, C) Name**

**Video 12A - two important principles:**

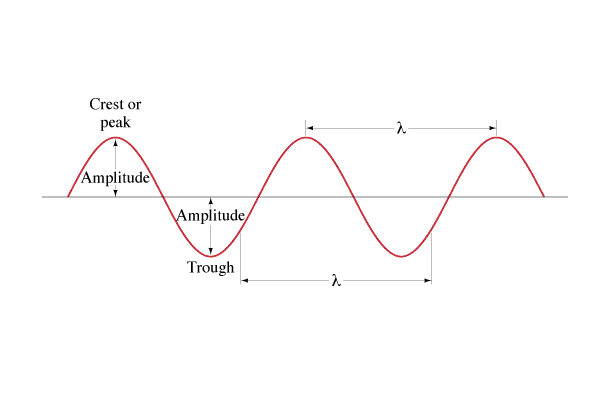
|  |  |
| --- | --- |
| Principle 1: | Principle 2: |

**Video 12B - Types of waves:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Wave moves** | **Particles move** | **Examples of** |
| **Transverse:** |  |  |  |
| **Longitudinal:** |  |  |  |

I have some demos and activities for this in class tomorrow

**Video 12C - Wave Calculations - Period, Frequency, Wavelength, and Wave speed**

****

|  |  |
| --- | --- |
| **Formula 1:** | **Formula 2:** |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Symbol | What it is | Units |
| Medium |  |  | N/A |
| Amplitude |  |  | Many answers |
| Wavelength |  |  |  |
| Wave speed |  |  |  |
| Period |  |  |  |
| Frequency |  |  |  |

Example 1: What is the frequency of a wave that takes 0.12 s for the whole wave to pass by?

Example 2: What is the wavelength of an A 440.0 Hz if the speed of sound is 343 m/s?

**Whiteboards:**

|  |  |
| --- | --- |
| 1. What is the period of a 60. Hz wave? | 2. What is the frequency of a wave with a period of 0.003906 s |
| 3. What is the velocity of a 1.12 m wave with a frequency of 32 Hz? | 4. What is the wavelength of a 89.1 MHz FM radio signal?  MHz = 106 Hz  v = c = 3.00 x 108 m/s (Speed of light) |
| 5. What is the frequency of a sound wave that has a wavelength of 45 cm, where the speed of sound is 335 m/s | 6. What is the period of a 12.0 m long radio wave?  v = c = 3.00 x 108 m/s (Speed of light) (These are EC on the test) |

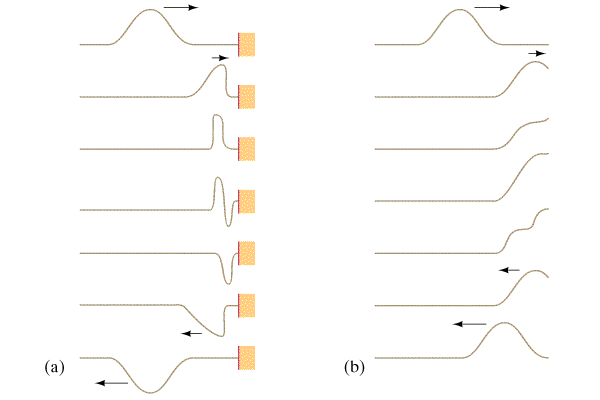
**Noteguide for Reflections (Video 12D) Name**

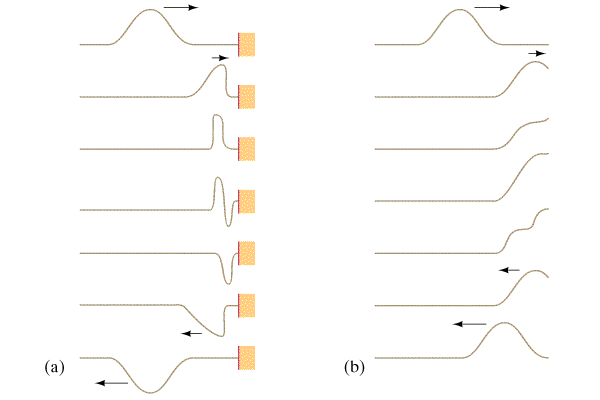
Occur when:

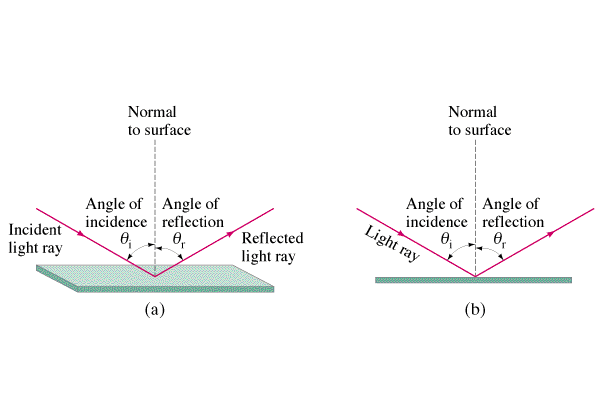
Examples of reflections:

How to prevent reflections:

Fixed vs. Free ends:





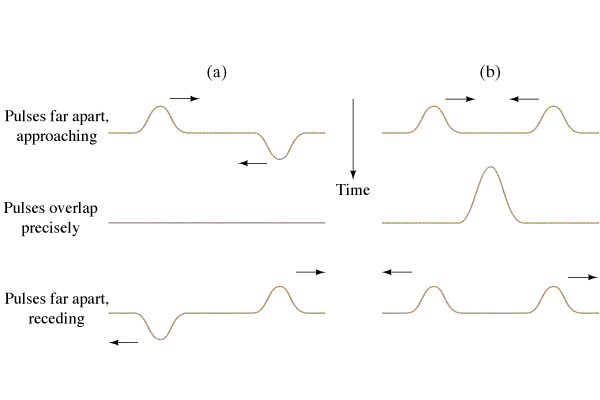
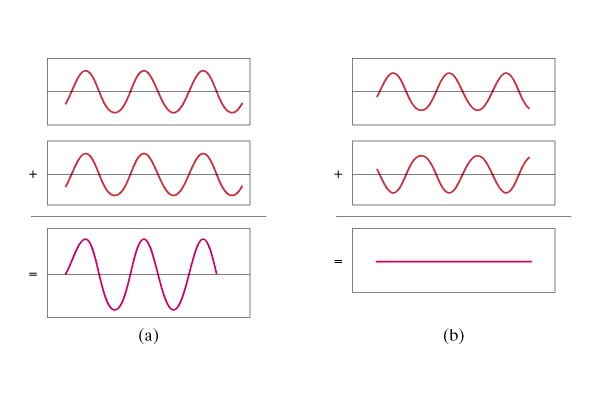
Mirrors:

**Noteguide for Superposition and Interference (Videos 12E) Name**

**Superposition:**  (Overlapping waves add)

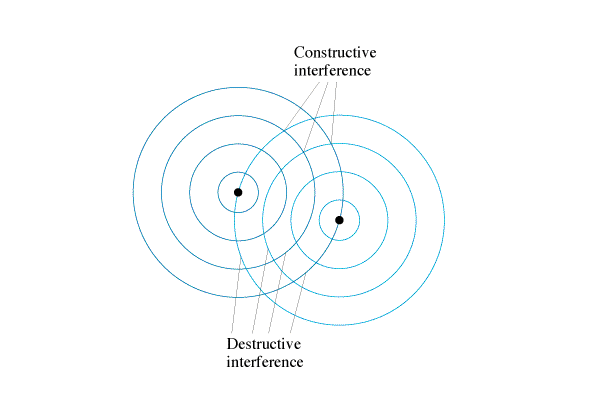
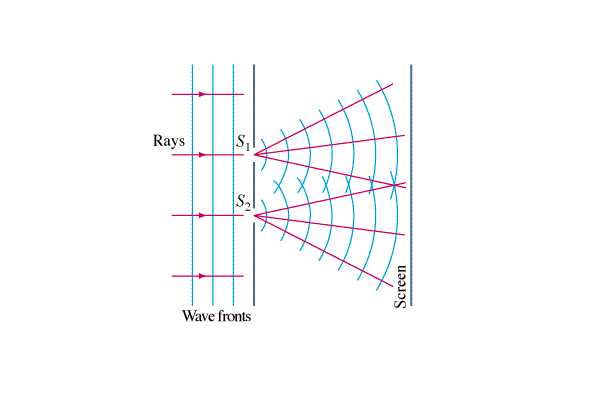
Examples:

**Interference:**

|  |  |
| --- | --- |
| Wavelength rule for constructive interference: | Wavelength rule for destructive interference: |

Other Examples:

**Noteguide for Standing Waves (Videos 12F, 12G Part 1) Name**

**Video F - Intro to standing waves**

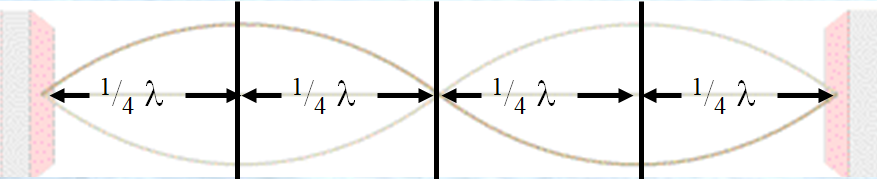
**Watch the demos of all three kinds first**

Draw the next two modes: (from the video)

|  |  |  |  |
| --- | --- | --- | --- |
| **Harmonic** | **Both ends fixed** | **Both ends free** | **One end fixed** |
| **1** | **4Antinodes** | **4Antinodes** | **4Antinodes** |
| **2** |  |  |  |
| **3** |  |  |  |

Haha - we will talk in class **why** they happen. (I try to explain it on the video)

**Video G - Part 1 - Calculations**

One whole wavelength: 

So a quarter wavelength is either:

** OR  Formulas:**  

So count the quarter wavelengths:

|  |  |
| --- | --- |
| 4Antinodes | 4Antinodes |
| 4Antinodes | 4Antinodes |

  **Formulas:**  

Example: This waveform is 8.45 m long. What is the wavelength of the standing wave? If it has a frequency of 30.4 Hz, what is the wave speed?

What is meant by the **waveform**: What is meant by the **wavelength**:

Do **all** of the examples

|  |  |
| --- | --- |
| 4Antinodes  This **waveform** is 45 cm long. What is the wavelength? | 4Antinodes  The **wavelength** is 0.80 m long. What is the length of the standing wave? (The waveform) |
| 4Antinodes  This **waveform** is 2.42 m long. What is the wavelength? If it is a sound wave (v = 343 m/s), what is the frequency? | 4Antinodes  The **wavelength** is 124 cm long. What is the length of the waveform?  If it is a sound wave (v = 343 m/s), what is its frequency |

**Noteguide for Standing Waves (Videos 12G, Part 2) Name**

**Video G Part 2 - First three modes of vibration**

This string is 32.0 cm long, and has a wave speed of 281.6 m/s. Find the wavelength and frequency for each mode:

|  |  |  |
| --- | --- | --- |
|  | Wavelength | Frequency |
| FG12_08 |  |  |
|  |  |
|  |  |

What is the pattern of frequencies:

This pipe is 1.715 m long, sound travels at 343 m/s along the pipe. Find the wavelength and frequency for each mode:

|  |  |  |
| --- | --- | --- |
|  | Wavelength | Frequency |
| FG12_12A |  |  |
|  |  |
|  |  |

What is the pattern of frequencies:

This pipe is 1.715 m long, sound travels at 343 m/s along the pipe. Find the wavelength and frequency for each mode:

|  |  |  |
| --- | --- | --- |
|  | Wavelength | Frequency |
| FG12_13A |  |  |
|  |  |
|  |  |

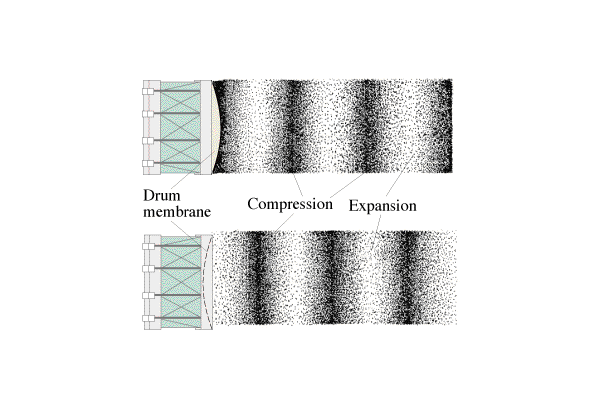
What is the pattern of frequencies:

Whiteboards:

|  |  |
| --- | --- |
| 1. The third harmonic on a flute (both ends open pipe) has a frequency of 480. Hz. How long is the waveform if the speed of sound inside the flute is 335 m/s? | 2. What is the frequency of the 2nd harmonic on a 0.31 m long pan pipe (One end open, one end closed) where the speed of sound is 343 m/s |
| 3. What is the wave speed on a 0.34m long violin string if the first harmonic has a frequency of 440 Hz? | 4. What is the frequency of the 3rd harmonic on a violin string that is 0.34 m long where the wave speed is 299.2 m/s |

**Noteguide for Sound (Videos 12H) Name**

What type of wave is sound:

Range of human hearing:

Most sound is:

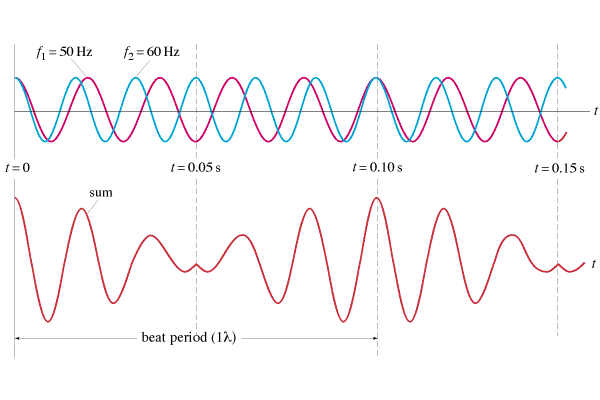
**v = (331 + 0.60T) m/s, T = temperature in oC**

Example 1 – What is the speed of sound at 20 oC? 42 oC?

Whiteboards:

|  |  |
| --- | --- |
| 1. What is the speed of sound in air at 80 oC?  (379 m/s) | 2. At what temperature in Celsius is the speed of sound 318 m/s? (-21.7 oC) |

**Noteguide for Beats (Videos 12I) Name**



***f*beat = |*f*1 - *f*2|**

Examples:

1. I play a pitch of 256 Hz (C) on my Pennywhistle, and you play a pitch of 384 Hz (G) on your whistle. What is the beat frequency?

2. If I am playing a pitch of 384 Hz, and I hear a beat frequency of 10.0 Hz, what are the possible other frequencies that are playing?

Whiteboards:

|  |  |
| --- | --- |
| 1. What beats do you hear if you play an e 640 Hz with a c 1024 Hz?  (384 Hz, G in octave below the E ) | 2. If you are playing an A 440 Hz, and you hear a beat frequency of 20 Hz, what are the other possible frequencies that could be playing?  (460 Hz or 420 Hz ) |
| 3. The concertmaster is playing an A 440.0 Hz. Another violin hears a beat every 0.20 seconds. What frequency are they playing?  (445.0 Hz or 435.0 Hz ) | |

**Noteguide for Doppler (Videos 12K, 12L) Name**

**Video K - Introduction to Doppler (Watch all three videos)**

**Receding source/observer Approaching source/observer**

**Frequency is Frequency is**

**Video L -** Feel free to skip the derivation if it does not interest you, but write down what all the variables are in the formulas:

|  |  |
| --- | --- |
| **Moving Source**    *f ':*  *f:*  *v:*  *u­s:* | **Moving Observer**    *f ':*  *f:*  *v:*  *u­o:* |

**Do Examples 1 and 3.** We will not be solving for source or observer speed, but it is extra credit on the test if you want to learn how to do it

|  |  |
| --- | --- |
| **Example 1** **-** A car with a 256 Hz horn approaches you at 40.0 m/s. What frequency do you hear? (3)  (use v sound = 343 m/s) | **Example 3** - You run at 8.50 m/s toward a violinist playing 660. Hz. What frequency do you hear? (Use 343 m/s as the speed of sound) |