Concepts that we covered:
amplitude- refers to the distance from the mid-point to the crest of a wave.
frequency- how often a vibration occurs
hertz- the unit of frequency
wavelength- distance from the top of the crest to the top of the next one.
period- the time required
wave- a wiggle in space and time
transverse wave- motion at right angles to the direction in which a wave travels.
longitudinal wave- the particles move along the direction of the eave rather than it at right angles.
inference (constructive)- wave's increase in amplitude
inference (destructive)- the high part of one wave simply fills in the low part of another.
nodes- in a standing wave certain parts of the rope, called nodes, remain stationary.
antinodes- the position on a standing wave with the largest amplitudes.
velocity (wave speed)- wave speed=wavelength x frequency

How do the instruments work?

We decided to make two wind instruments. We made a pan flute and a standard flute.

For the pan flute we used bamboo, and for the standard flute we used a 1/2inch PVC pipe. To close off the bottom of each piece, we used clay to make sure that the sound wouldn't escape. The clay helps the sound to reverse properly. By using different lengths of pipes, we were able to create different pitches. The differences in different pitches that we hear are known as frequencies. Frequency is how often a vibration occurs. As the frequency increases, the pitch becomes higher, and as the frequency decreases, the pitch becomes lower. Our panflute is based off of a C5 scale. Since it's a quarter of the original wave length, we divided all of the wavelengths of notes on a 5 scale by 4. When the air molecules are blown from your lips at the top of the tube, they travel through the tube and are reflected back up when they reach the end. This creates the note because after the air has traveled down and back up the tube, it is half of a wavelength for the desired note depending on how long the tube is cut.

Notes	Frequency (hz)	¼ Wave length (cm)
C5	130.8	16.5
D5	146.84	14.6
E5	164.81	13
F5	174.62	12
G5	195.9	11
A5	220	9.8
B5	246.94	8.7
C6	261.63	8.25

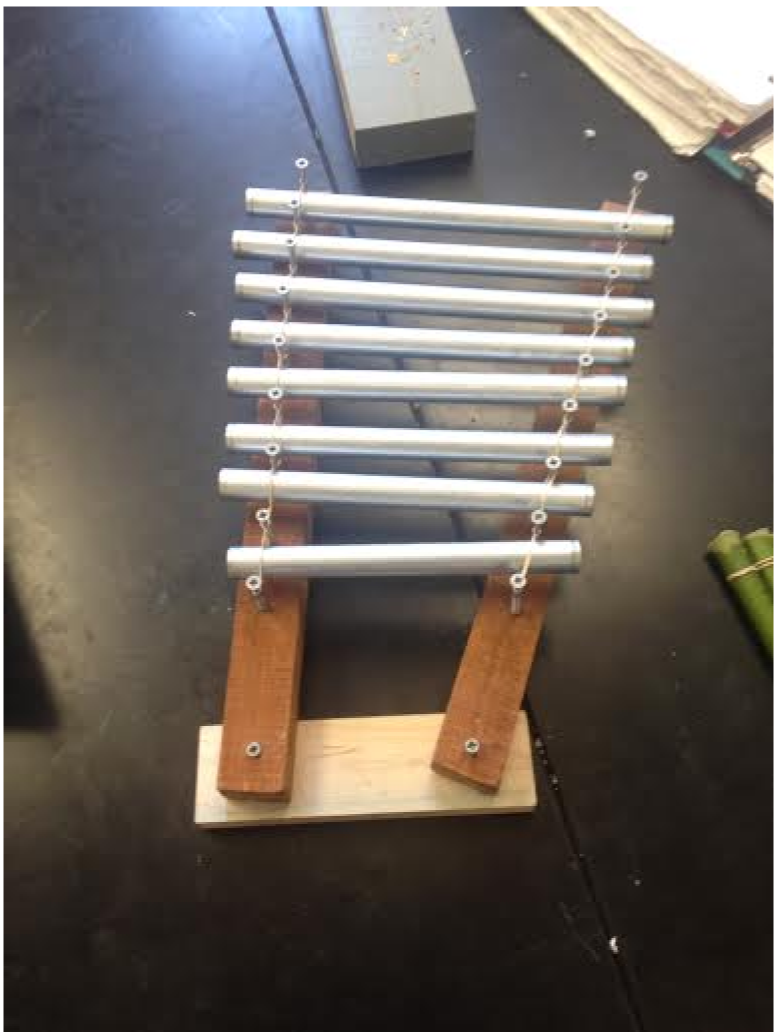
Our flute is 66cm long, so it is exactly a quarter of a wavelength. Our flute is based off of a C5 scale. The flute also has a “sharp” mouth piece so that the sound would resonate longer. We adjusted the holes because they were big enough to let the air out, but not big enough to change the note. We made the holes slightly larger, allowing them to make different notes. Since we closed off both sides of the flute, the pitch goes from high to low to high again, creating a full wavelength.

notes	Frequency (Hz)	Wavelength (cm)
C5	523.25	65.93
D5	587.33	58.74
E5	659.25	52.33
F5	698.46	49.39
G5	783.99	44.01

A5	880.00	39.20
B5	987.77	34.93

We made a xylophone as our chimes instrument. We used ¾ in metal piping. The longest pipe creates the lowest pitch, and the shortest pipe creates the highest pitch. The wavelength in the longer pipe is also much longer than the wavelength in the shorter pipe. We used metal pipes because they are more rigid than PVC pipe and the wood doesn't resonate as long as the metal.

We used the chart below to find out how long each chime should be.



Interval Multiply Longest

	Chime Length by
Unison	1.0000
Minor Second	0.9798
Major Second	0.9428
Minor Third	0.9129
Major Third	0.8944
Fourth	0.8660
Diminished Fifth	0.8433
Fifth	0.8165
Minor Sixth	0.7906
Major Sixth	0.7746
Minor Seventh	0.7454
Major Seventh	0.7303
Octave	0.7071

Note	Length of metal pipe
C	28cm
D	27cm
E	26cm
F	24cm
G	23.5 cm

A	22cm
B	21cm
C	19cm

We made a ukulele for our string instrument. The ukulele has four strings. The length of the strings on the ukulele were 77 cm long. We were able to tune it properly, but it wasn’t loud enough. To make it louder, we shortened the string by an octave. We changed the octave by “cutting” the wavelength in half. So now our ukulele’s strings are 38.5cm long. We used a piece of a metal pipe and some string to split the octave in half. When you strum the string, it vibrates creating a frequency, which then creates the note and pitch that we hear. We were able to change the note by tensioning each string differently. The more tension, the tighter the string, the higher the note. Less tension means a looser the string, creating a lower note. Our ukulele doesn’t have a hole in the front, but it does have an open back. The thin piece of wood is close to the string and amplifies the sound that the string’s vibration make. Our G, C, E, and A all have the same string lengths, but create different notes because that have different tensions.

Notes	Frequency (Hz)	Wavelength (cm)
G5	880.00	38.5
C5	880.00	38.5
E5	880.00	38.5
A5	880.00	38.5
B5	987.77	34.93

D6	1174.66	29.37
F6	1396.91	24.70