



Music Blocks Lesson Plan

Oscilloscope

Age:

7-12 years

Lesson duration:

60 minutes

- Introduction: What is an oscilloscope? (15m)
- Part 1: Exploring different instruments (15m)
- Break (5m)
- Part 2: Exploring different notes (20m)
- Discussion (5m)

Number of students:

Up to 10.

Rationale:

Students will explore the Oscilloscope Widget in order to get insight into the relationship between frequency and pitch.

Objectives:

Students will understand the connection between waves and sound, as well as the different waveforms (sine, triangle, sine, etc..

LESSON

Introduction:

Begin by asking students to sit in a circle and explain that in today's lesson they are going to use the Oscilloscope Widget.

Begin by discussing waves. Where have you seen a wave? Can you describe a wave? Does it have peaks and troughs? Does it move? Is it symmetric? Does it have texture? How else are waves similar or different? Where does a wave come from? Where else might there be waves?

Sound travels in waves through the air. How can we see them?

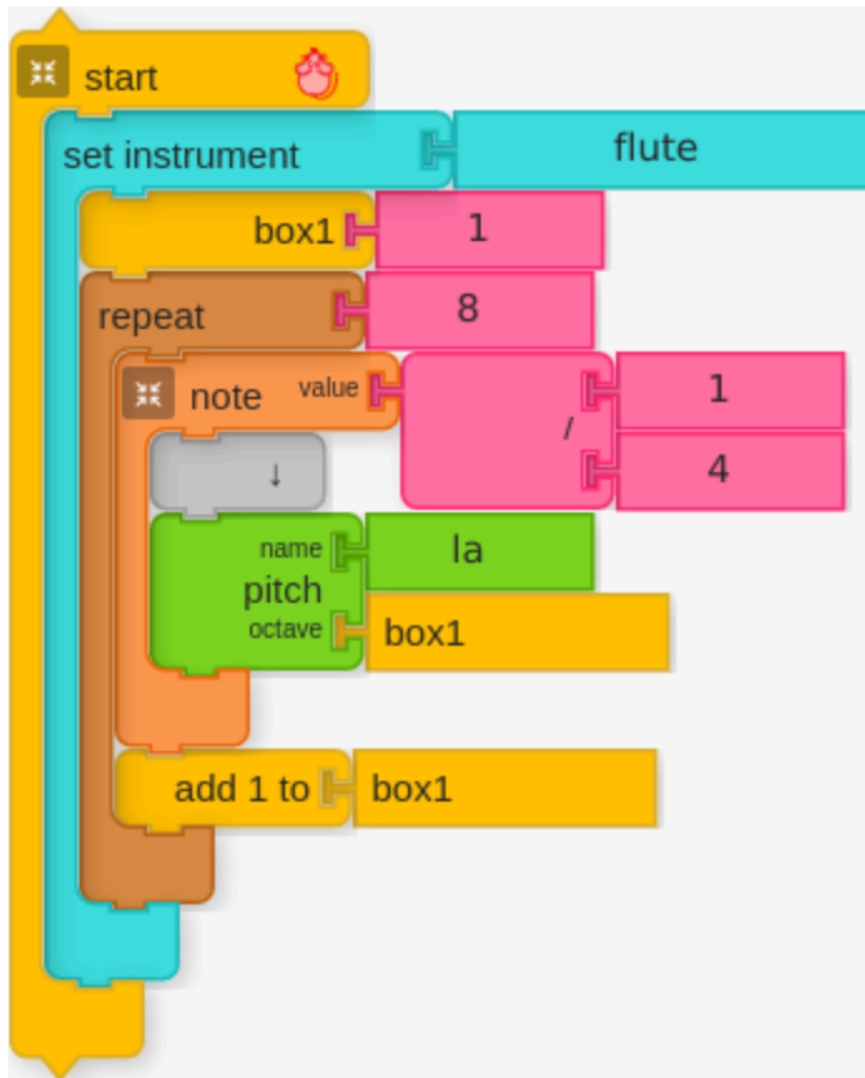
An oscilloscope is a device that displays a two-dimensional plot of one or more signals as a function of time.

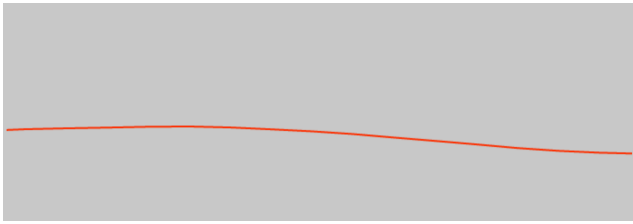
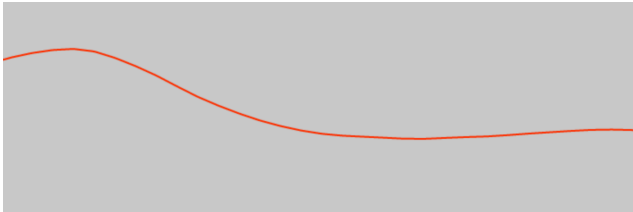
The Oscilloscope Widget shows time on the horizontal axis and amplitude of the wave on the vertical axis.

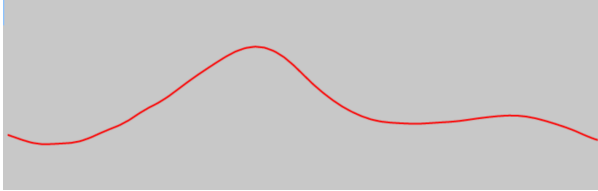
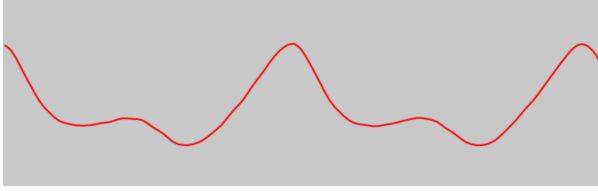
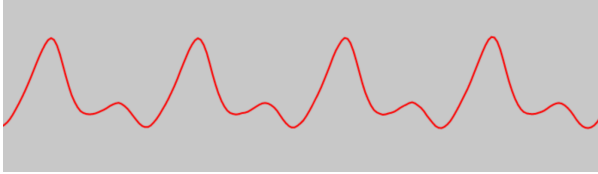
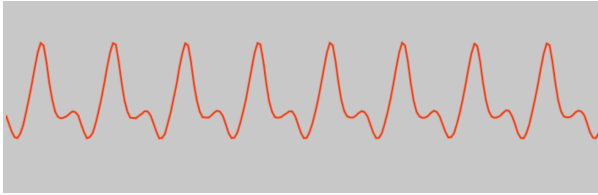
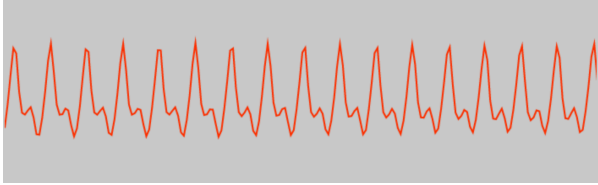
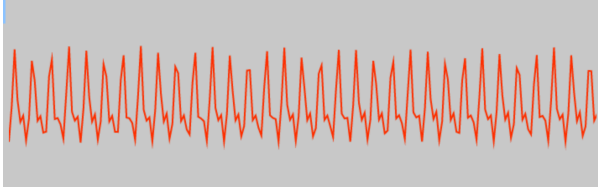


Part 1:

When you increase pitch by octave, the frequency doubles.



Note	Oscilloscope image
A Octave 1 55Hz	
A Octave 2 110Hz	


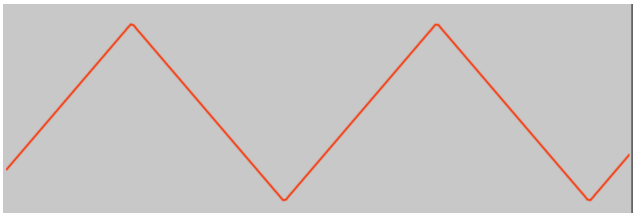
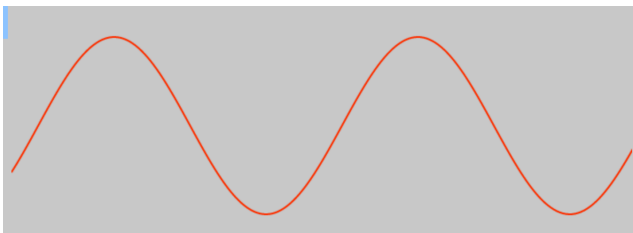
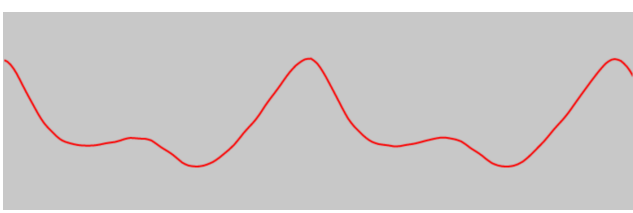
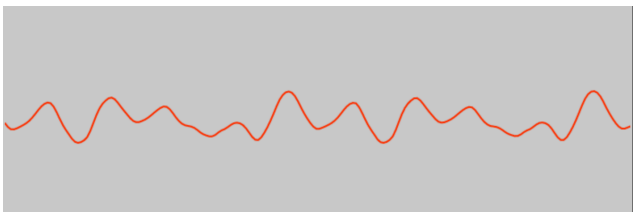
A Octave 3 220Hz	
A Octave 4 440Hz	
A Octave 5 880Hz	
A Octave 6 1760Hz	
A Octave 7 3520Hz	
A Octave 8 7040Hz	

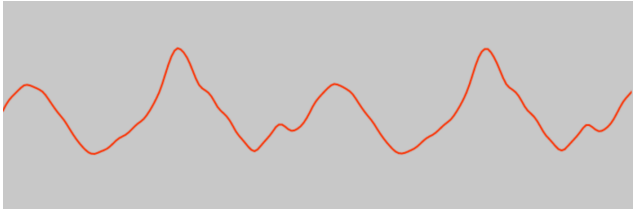
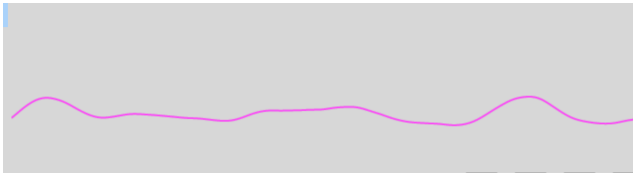
How does the shape of the waveform change as the octave changes?
Can you guess the octave based on the shape of the plot?

Part 2

Variations of A in Octave 4 -- 440Hz

Different instruments (and synths) create waves of different shapes.

Instrument	Oscilloscope image
square wave	 An oscilloscope image showing a square wave. The wave is red and consists of horizontal segments at two different levels, connected by vertical lines. There are small, irregular spikes at the transitions between levels.
triangle wave	 An oscilloscope image showing a triangle wave. The wave is red and consists of linear ramps up and down, forming a continuous series of peaks and valleys.
sine wave	 An oscilloscope image showing a sine wave. The wave is red and has a smooth, periodic, sinusoidal shape.
flute	 An oscilloscope image showing a waveform for a flute. The wave is red and has a periodic, wavy shape with smooth curves and some small irregularities, characteristic of a complex periodic sound.
violin	 An oscilloscope image showing a waveform for a violin. The wave is red and has a periodic, wavy shape with many small, frequent oscillations (harmonics) superimposed on the main periodic wave.

saxophone	
dog	

Can you tell which instrument is playing based on the shape of the plot?

Performance/Critique:

1. Have each student explore some musical ideas while the Oscilloscope Widget is opened.
2. Engage in a discussion about what they see. How is a flute different from a violin? Are string instruments similar? What about drums? And of course, check out the “duck” synth.
3. How else can we represent the “shape” of the sounds we hear?

Key events:

- Introduction of key concepts: the oscilloscope, plotting amplitude over time

Materials:

- Music Blocks software

Assessment:

- Observe participation.
- Are the students able to distinguish between different pitches and timbres by looking at the waveform?



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