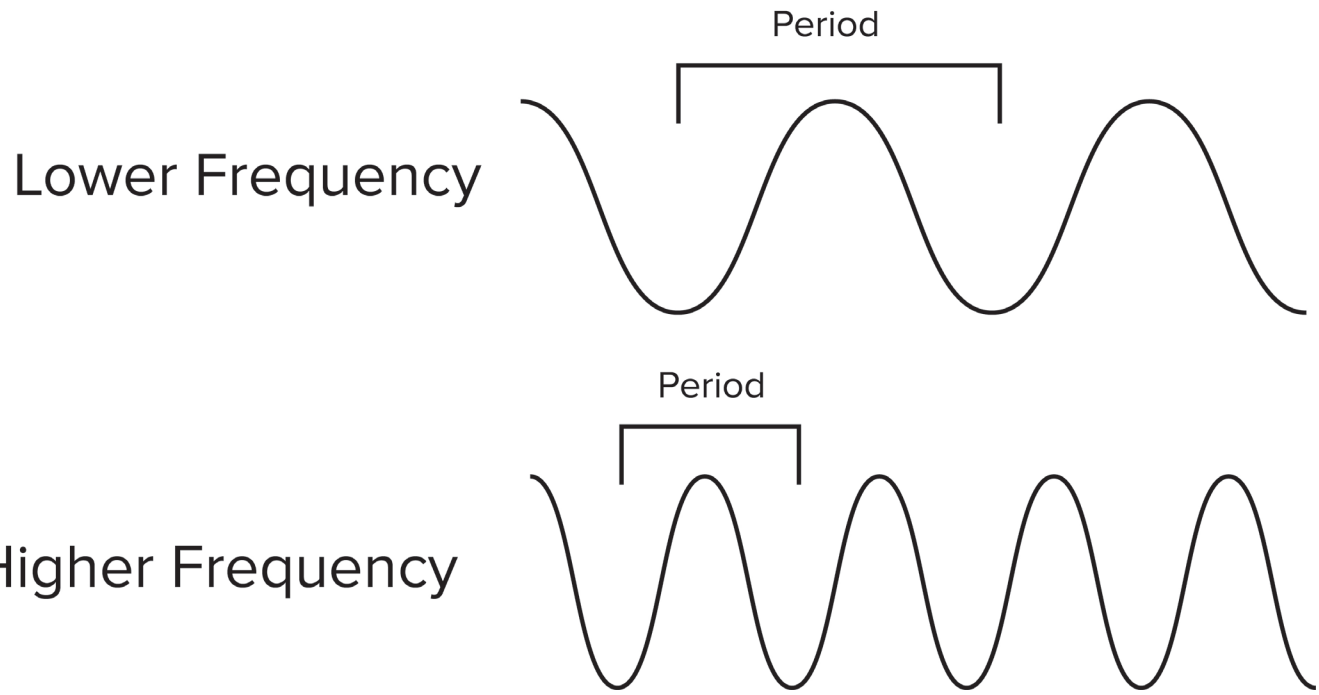
Handout - Frequency (Teacher's Guide)



Frequency measures the "highness" or "lowness" of a sound. In musical terminology, this is known as pitch. The tool often used to display frequency is called an **oscilloscope**.

Frequency is calculated in **hertz**, which measures how many cycles occur in one second. A cycle, or period, is the time it takes for air molecules to cycle between compression and rarefaction. 1 hertz equals 1 cycle per second. Generally, humans are capable of hearing sounds between 20 and 20,000 hertz, though other animals can perceive a greater range of frequencies. A dolphin, for instance, can hear between 75 and 150,000 hertz.

The equation to determine a sound's frequency is $f = V / \lambda$, where f = frequency (in Hertz), V = the velocity or speed the wave moves (in meters per second), and λ= the length of the wave (in meters).

MATH AND MUSIC

Algebra Featuring Mickey Hart

Activity

Using the formula f = V / λ, fill out the chart below. Note that in a normal environment in room temperature, sound always moves at a speed (V) of 343 meters/second. Round to the nearest hundredth.

Instrument	Frequency in Hertz (f)	Wave Length in meters (λ)
Cymbals	2868	.12
Piano	1760	.2
Saxophone	155	2.21
Bass Guitar	80	4.29

Workspace:

Cymbals:

$2868 = \frac{343}{\lambda}$

$2868\lambda = 343$

$\lambda = \frac{343}{2868}$

$\lambda = .1195 = .12$

Piano:

$1760 = \frac{343}{\lambda}$

$1760\lambda = 343$

$\lambda = \frac{343}{1760}$

$\lambda = .1948 = .2$

Saxophone:

$155 = \frac{343}{\lambda}$

$155\lambda = 343$

$\lambda = \frac{343}{155}$

$\lambda = 2.2129 = 2.21$

Bass Guitar:

$80 = \frac{343}{\lambda}$

$80\lambda = 343$

$\lambda = \frac{343}{80}$

$\lambda = .4.2875 = 4.29$