Introduction to Sound in Processing

in order to use sound we must use libraries
what are libraries?
they store information
libraries in a programming language store information and do things that the language itself can’t do
in Processing, we will be using Minim - we import minim into our program like this:

```java
import ddf.minim.*;
import ddf.minim.signals.*;
```

new Variable types:

AudioOutput - gives us a channel to send out audio out to
SineWave - a sine wave

lets make a program that plays a sine wave

for any oscillator we can set a bunch of values
frequency
gain
pan

```java
setBalance(float value)
getBalance()
setGain(float value)
getGain()
setPan(float value)
getPan()
setVolume(float value)
getVolume()
```

additive synthesis - make a complex tone out of simple tones
the harmonic series

what is it?
a harmonic series is a series of notes that are multiples of the same base frequency
for instance:
400 = 100*4
300 = 100*3
200 = 100*2
100 = 100*1

why is it important?
basically all pitched sounds are made of the harmonic series
the only difference between an oboe and a flute playing the same note is that they have different spectra
yet they sound completely different
it can be deduced that the timbre of a note has to do with the makeup of its harmonic spectrum (plus some noise)

12 tone tuning

each note is equally divided over the octave
formula for tuning is -

```java
rootPitch*pow(2,n/12)
```

can be manipulated

Stockhausen’s tuning for Study II (1954) - rootPitch*pow(5,n/25)
this creates a 25 note equal tempered scale over 2 octaves and a major 3rd