

From Notes to Frequencies

Western music, and the music you'll be programming, is based on a clear 12 note pattern that repeats itself over and over at higher and higher pitches. This repetition produces a standard set of notes from which all music is written. You can find their names and the wave frequencies that go with them here: [Note Names to Wave Frequency](#). At the top of the chart is C0, a very low note. The 12 note pattern starting at C0 continues down the chart to B0 and then begins the pattern again at C1. We tend to like notes around C4 and place this note in the middle of a piano or keyboard. For this reason it's called *middle C*.

Scales, Intervals, and Resonant Tones

The difference between C0 and C1, or any note and the next higher numbered form of that note, is called an *octave*. The numbers you see on note names are their octave numbers. From a frequency perspective, moving up an octave means to double the frequency. For example, notice A0 is 27.5, A1 is 55.0, A2 is 110.0, A3 is 220.0, and so on. There is also a set of fixed multiples between a note and the other 11 notes within the octave. Here you see an octave starting on C.

Note	Frequency (Ratio)	Frequency (Decimal)
C	f	f
C#	$(256/243)f$	1.053f
D	$(9/8)f$	1.125f
D#	$(32/27)f$	1.185f
E	$(81/64)f$	1.266f
F	$(4/3)f$	1.333f
F#	$(729/512)f$	1.424f
G	$(3/2)f$	1.5f
G#	$(128/81)f$	1.58f
A	$(27/16)f$	1.687f
A#	$(16/9)f$	1.778f
B	$(243/128)f$	1.898f
C	2f	2f

While the chart above starts on C, it actually doesn't matter where you start. If you start at a G and call its frequency f, then the 12 note sequence up to the next G follows this same pattern of multiples as moving from C to C.

Where this becomes useful is in mixing in related notes to a target dominant tone of a voice. Let's say your voice is meant to produce some note with frequency *f* (maybe 440). You might mix in just a little bit the fourth (5 steps up) or fifth above that note (6 steps up). You just take your dominant frequency *f* and multiply by $(4/3)$ and/or $(3/2)$ to get the right note for you mix. These notes tend to be very resonant with your dominant frequency and work well in combination with that note. On our C-based chart this is the equivalent of mixing F and G with C.