

Intervals and Harmonic Ratios

Here are some visuals to help you to see how the ratios of intervals work, and how they tie into the harmonics lining up. Beats are what we hear as dissonance, and this occurs when the harmonics of one pitch are too close to the harmonics of the other pitch in an interval.

Harmonics of C and octave higher – all harmonics line up, with the octave lining up initially at the 2nd harmonic of the fundamental -- 2:1.



Harmonics of C and G a fifth higher – every other harmonic lines up, while the ones that do not line up are not close enough to create beats. The 2nd harmonic of the fifth lines up with the 3rd harmonic of the fundamental – 3:2.



Harmonics of C and E a third higher – many harmonics line up, and most are not close enough to create beats. The 4th harmonic of the third lines up with the 5th harmonic of the fundamental – 5:4.

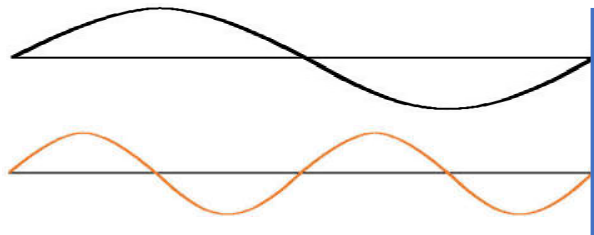


Harmonics of C and F# a tritone higher – no harmonics line up, and many are close enough to create beats. You'd need to reach the 45th harmonic of the fundamental before the 32nd harmonic of the tritone lines up – 45:32.

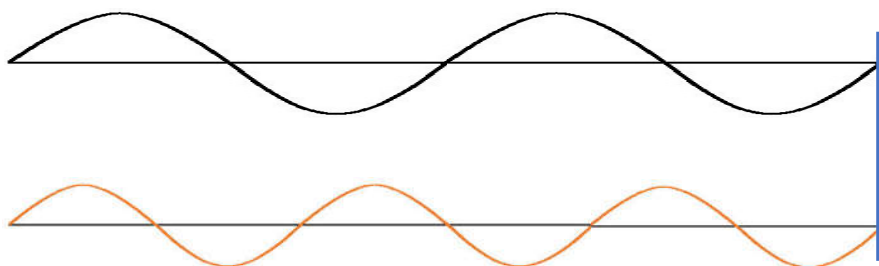


Here is another visual description of each:

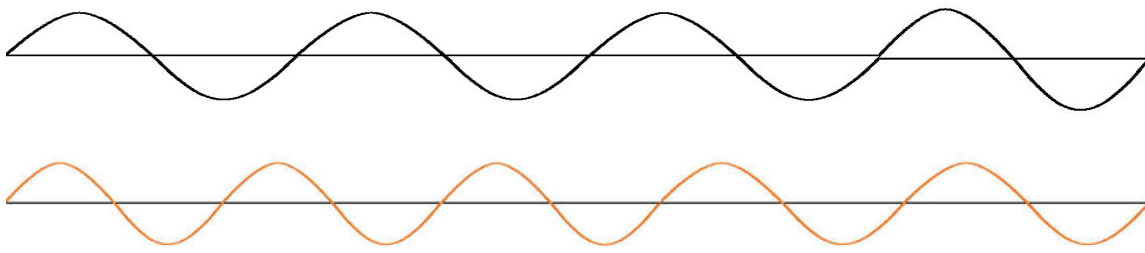
The interval of a perfect octave is a 2:1 ratio -- the lower note has a wave that is twice the length of the octave above. It takes 2 cycles for the octave and the fundamental to meet in a "node." The octave is in amber and the blue line at the end shows when the two line up:



The interval of a perfect fifth is a 3:2 ratio -- it takes 2 cycles for the fundamental and 3 cycles for the fifth to meet in a node. The fifth is in amber and the blue line at the end shows when the two line up:



The interval of a major 3rd is a 5:4 ratio -- it takes 4 cycles for the fundamental and 5 cycles for the third to meet in a node. The third is in amber and the blue line at the end shows when the two line up:



The tritone is a 45:32 ratio -- it takes 45 cycles for the fundamental and 32 cycles for the tritone to meet in a node. The tritone is in amber, and the blue line at the end shows when the two line up:

