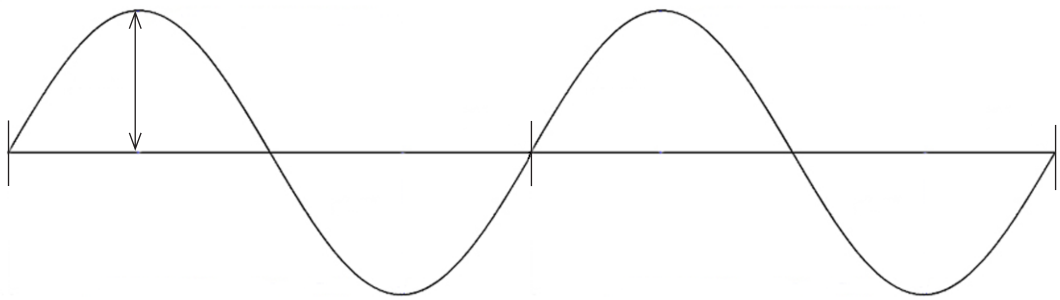
Intervals

SUPPLEMENTARY MATERIAL

Sound Waves and Intervals

The science of sound is known as "acoustics." All sound is created through the vibration of air. These vibrations are called sound waves. Here is a diagram of a sound wave.



A sound wave has two primary characteristics: amplitude and frequency. The number of vibrations of the waveform per second constitutes the frequency of the sound. Frequency is measured along the "x" (horizontal) axis. One vibration of the waveform includes movement above and below the "x" axis, as shown by the vertical hash marks on the diagram above. This aspect of sound is typically referenced in *hertz*, or vibrations per second. The more vibrations per second, the higher the pitch.

The amplitude of the sound is its loudness. It is measured along the "y" (vertical) axis, as demonstrated by the line with arrows in the diagram above. The farther away from the "x" axis that the waveform peaks, the louder the sound.

All pitch classes vibrate at a specific hertz. For example, the A above Middle C (A^4) is 440 hertz. The A that is an octave higher (A^5) is 880 hertz.

Perfect intervals are those whose constituent pitches form ratios of whole numbers. For example the ratio of vibrations between the two notes that form an octave is 1:2 (lower note:higher note).

The octave is the only "pure" interval that occurs in our equal-tempered tuning system. In this system, the octave is divided into 12 equal steps, and only the octaves are pure. The other perfect intervals are very slightly out of tune compared to mean-tempered tuning, where the intervals are pure.

In mean temperament, the ratio that forms a perfect 5th is 2:3. Therefore, if the lower note of a perfect 5th is A^4 at 440 hertz, the higher note of the interval is E^5 at 660 hertz. In equal temperament, this is adjusted to 440:659.2.

The ratio in mean temperament that forms a perfect 4th is 3:4. If the lower note of the perfect fourth is A^4 at 440 hertz, the higher note is D^5 at 586.7 hertz. In equal temperament, this is adjusted to 440:587.3.

The ratios of major and minor intervals involve larger whole numbers in mean temperament, however, in equal temperament, the ratios become much more complex. For example, the major 3rd is 4:5 in mean temperament, but it beomes 5:3.969 in equal temperament. There are many web sites that discuss tuning systems, interval ratios, and musical frequencies, if you are interested in additional study.

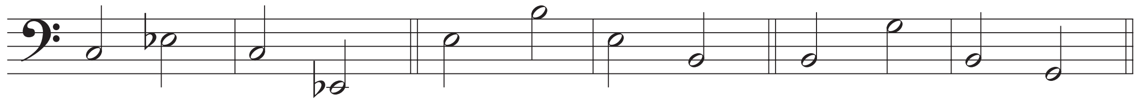
PRACTICE: Interval Inversion

An ascending interval is given to you in the first measure of every pair. Name it by size and quality. Then invert the interval in the following blank measure (the lower note becomes the higher note or vice versa) and name the new interval's size and quality. The first exercise is provided as an example.

ANSWERS: Interval Inversion

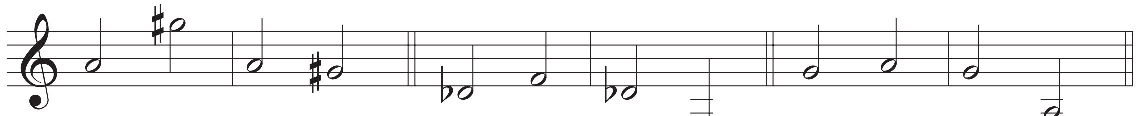
major 6th | minor 3rd | perf 4th | perf 5th | perf 5th | perf 4th

major 3rd | minor 6th | major 6th | minor 3rd | aug 4th | dim 5th



minor 3rd | major 6th | perf 5th | perf 4th | minor 6th | major 3rd

minor 7th | major 2nd | minor 2nd | major 7th | minor 6th | major 3rd



major 7th | minor 2nd | major 3rd | minor 6th | major 2nd | minor 7th

perf 4th | perf 5th | major 2nd | minor 7th | dim 7th | aug 2nd

minor 2nd | major 7th | minor 3rd | major 6th | aug 6th | dim 3rd

minor 3rd | major 6th | aug 6th | dim 3rd | major 3rd | minor 6th

PRACTICE: Compound Intervals

Name the following compound intervals. The blank measure provided after each interval allows you to rewrite the compound interval as a simple interval by lowering the top note down an octave. This may make it easier to name the compound interval, because you will add 7 to the size of the simpler interval. The quality remains the same in both versions.