

JUST INTONATION

JUST INTONATION is also called PURE INTONATION.

In JUST INTONATION, the frequencies of the notes correspond to those that occur naturally in the harmonic series. When notes are sounded together in harmony, the finely tuned pitch of each note will vary. The pitch will be different depending on the relationship to the harmonic series created by the “fundamental” note. This is determined by the mathematical properties of sound vibrations.

EQUAL TEMPERAMENT

This is a system of western tuning created so all adjacent notes are separated equally. Notes are adjusted or “tempered” to divide each octave into 12 equal semitones. These frequencies are fixed, not in a state of variation as in JUST INTONATION.

Among other things, Equal Temperament allows fixed pitched instruments (such as keyboard instruments) to play successfully in all keys. However, for instruments to sound in tune when harmonising together, the properties of JUST INTONATION need to be taken into account.

ENSEMBLE INTONATION

Mathematics and acoustic theory aside, how does an ensemble play “in tune” together?

Being aware of the basic principles is a starting point, then it is essential to develop the aural ability to listen and play each note to sound in tune. Each note will need to be adjusted to “sit” exactly right in the chord, depending on the function of that note within the chord. 3rds of the chord (major or minor) need particular attention and skill.

EXAMPLES

In an ensemble, if you are playing the “E” of a C Major chord (the 3rd of that chord), it will need to be played slightly lower than its EQUAL TEMPERED pitch to sound in tune. To be exact, it should be played 14 cents lower. If you are playing the “E \flat ” of a C minor chord (the 3rd of that chord), it will need to be played slightly higher than its EQUAL TEMPERED pitch to sound in tune. To be exact, it should be played 16 cents higher.

1 cent = 1/100th of a semitone

THE HARMONIC SERIES

	4th Harmonic (3rd Overtone)	5th Harmonic (4th Overtone)	6th Harmonic (5th Overtone)	7th Harmonic (6th Overtone)	8th Harmonic (7th Overtone)
* 0	0	+2	0	-14	+2
	0	-14	+2	-31	0

*the numbers show the difference in cents that the pitch in JUST INTONATION varies from the EQUAL TEMPERED pitch

1st Harmonic "Fundamental" 2nd Harmonic (1st Overtone) 3rd Harmonic (2nd Overtone)

CHORDS WITH JUST INTONATION

9

Major triad	minor triad	Dominant 7th chord	Major 7th chord	minor 7th chord

suggested reference:
Music, Physics and Engineering
 by Harry F. Olson

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