

Just Intonation vs Twelve-Tone Equal Temperament Interval Comparison

Perfect Fifth

Just
3:2 (1.5)—701.95¢

Tempered
~1.49830—700¢

Perfect Fourth

Just
4:3 (1.33...)—498.04¢

Tempered
~1.33483—500¢



Major Third

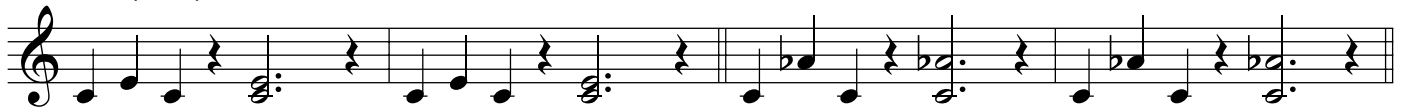
Just
5:4 (1.25)—386.31¢

Tempered
~1.25992—400¢

Minor Sixth

Just
8:5 (1.6)—813.69¢

Tempered
~1.58740—800¢



Minor Third

Just
6:5 (1.2)—315.64¢

Tempered
~1.18921—300¢

Major Sixth

Just
5:3 (1.66...)—884.36¢

Tempered
~1.68179—900¢



Harmonic Minor Seventh

Just
7:4 (1.75)—968.83¢

Tempered
~1.78180—1000¢

Septimal Diminished Fifth

Just
7:5 (1.4)—582.51¢

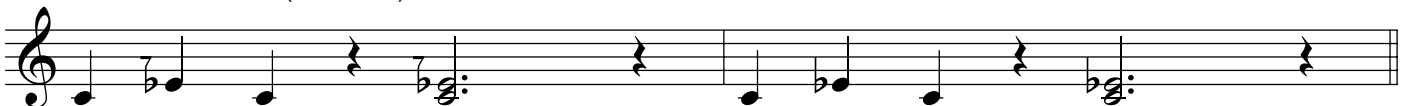
Tempered
1.41421—600¢



Subminor Third

Just
7:6 (1.166...)—266.87¢

Tempered
~1.18921—300¢



Notes:

The MP3 file associated with this document (intcomp.mp3) contrasts the consonant intervals narrower than the octave (2:1) in seven-limit Just Intonation with their nearest equivalents in twelve-tone equal temperament. The sounds were created using a Yamaha TX802 FM synthesizer, which has a tuning resolution of 1024 tones per octave, so neither the just nor the tempered pitches are exact: the maximum error is 0.58 cent (where 1 cent = $\frac{1}{100}$ 12TET semitone). This is as good or better than any human musician is likely to achieve on a sustained basis. The FM brass patch used was chosen not for its great beauty (it's admittedly a little cheesy), but because its sustained tone and strong harmonic partials provide the clearest distinction in interval quality when tones are sounded simultaneously. In some cases (especially the perfect fifth and fourth), the distinctions are rather subtle; for best results, listen with the best quality speakers or headphones available.

The last three intervals presented here, the harmonic minor seventh (7:4), the septimal diminished fifth (7:5), and the subminor third (7:6), deviate furthest from their 12TET "equivalents," and it is debatable whether they are represented in 12TET at all. The harmonic minor seventh and diminished fifth are consonances, whereas the tempered minor seventh and diminished fifth are not. (The 7:5 diminished fifth is only one of many tritone intervals available in Just Intonation—it, rather than the others, is included here because of its consonance.) 12TET does not distinguish between the minor and subminor thirds, hence the same tempered minor third is used for comparison in both cases. The symbol "♮" used to represent the just pitches in these intervals, is one of Ben Johnston's accidentals for extended Just Intonation, described in *The Just Intonation Primer*, among other publications.