A semitone, also called a half step or a half tone,[1] is the smallest musical interval commonly used in Western tonal music[2] and is considered to be one of the most dissonant[3] when sounded harmonically. It is defined as the interval between two adjacent notes in a 12-tone scale (e.g., from C to C♯). This implies that its size is exactly or approximately equal to 100 cents, a twelfth of an octave.

Any other interval can be defined in terms of an appropriate number of semitones (e.g., a whole tone or major second is 2 semitones wide, a major third 4 semitones, and a perfect fifth 7 semitones).

In music theory, a distinction is made[4] between a diatonic semitone, or minor second (an interval encompassing two staff position, e.g., from C to D♭) and a chromatic semitone or augmented unison (an interval between two notes at the same staff position, e.g., from C to C♯). The diminished unison also exists, being the inversion of the augmented octave, though some theorists reject the term. See here for more details about this terminology.

In twelve-tone equal temperament all semitones are equal in size (100 cents). In other tuning systems, "semitone" refers to a family of intervals that may vary both in size and name. In Pythagorean tuning, seven semitones out of twelve are diatonic, with ratio 256:243 or 90.2 cents (Pythagorean limma), and the other five are chromatic, with ratio 2187:2048 or 113.7 cents (Pythagorean apotome); they differ by the Pythagorean comma, of ratio 531441:524288 or 23.5 cents. In quarter-comma meantone, seven of them are diatonic, and 117.1 cents wide, while the other five are chromatic, and 76.0 cents wide; they differ by the lesser diesis of ratio 128:125 or 41.1 cents.

12-tone scales tuned in just intonation typically define three or four kinds of semitones. Asymmetric five-limit tuning yields chromatic semitones with ratios 25:24 (70.7 cents) and 135:128 (92.2 cents), and diatonic semitones with ratios 16:15 (111.7 cents) and 27:25 (133.2 cents). The smaller chromatic and diatonic semitones differ from the larger by the syntonic comma (81:80 or 21.5 cents). The smaller and larger chromatic semitones differ from the respective diatonic semitones by the same 128:125 diesis as the above meantone semitones. Finally, while the inner semitones differ by the diaschisma (2048:2025 or 19.6 cents), the outer differ by the greater diesis (648:625 or 62.6 cents). In symmetric five-limit tuning the diatonic semitone with ratio 27:25 does not appear. In 17-limit just intonation, the major diatonic semitone is 15:14 or 119.4 cents, and the minor diatonic semitone is 17:16 or 105.0 cents.[8]

Listen to a minor second in equal temperament (help-info). Here, middle C is followed by D♭, (melodic semitone), which is a tone 100 cents sharper than C, and then by both tones together (harmonic semitone).

### Contents

1 Minor second
2 Augmented unison
3 History
4 Semitones in different tunings
   4.1 Meantone temperament
   4.2 Equal temperament
   4.3 Well temperament
   4.4 Pythagorean tuning
   4.5 Just intonation
   4.6 Other equal temperaments
5 See also
6 References
7 Further reading

---

**Minor second**

The minor second occurs in the major scale, between the third and fourth degree, (mi (E) and fa (F) in C major), and between the seventh and eighth degree (♭ (B) and do (C) in C major). It is also called the diatonic semitone because it occurs between steps in the diatonic scale. The minor second is abbreviated m2 (or −2). Its inversion is the major seventh (M7, or +7).

M melodically, this interval is very frequently used, and is of particular importance in cadences. In the perfect and deceptive
Augmented unison

The augmented unison does not occur between diatonic scale steps, but instead between a scale step and a chromatic alteration of the same step. It is also called a chromatic semitone. The augmented unison is abbreviated \( A_1 \), or \( \text{aug 1} \). Its inversion is the diminished octave \( \text{dim 8} \).

Melodically, an augmented unison very frequently occurs when proceeding to a chromatic chord, such as a secondary dominant, a diminished seventh chord, or an augmented sixth chord. Its use is also often the consequence of a melody proceeding in semitones, regardless of harmonic underpinning, e.g. \( D, D\flat, E, F, F\flat \). (Restricting the notation to only minor seconds is impractical, as the same example would have a rapidly increasing number of accidentals, written enharmonically as \( D, E\natural, F, G\flat, A\natural, A\flat \)).

Harmonically, augmented unisons are quite rare in tonal repertoire. In the example to the right, Liszt had written an \( E\flat \) against an \( E \) in the bass. Here \( E\flat \) was preferred to a \( D\flat \) to make the tone’s function clear as part of an \( F \) dominant seventh chord, and the augmented unison is the result of superimposing this harmony upon an \( E \) pedal point.

In addition to this kind of usage, harmonic augmented unisons are frequently written in modern works involving tone clusters, such as Xenakis’ Evryali for piano solo.

The same spelling can also be referred to as a diminished unison in certain contexts.[53]

History

The semitone appeared in the music theory of Greek antiquity as part of a diatonic tetrachord, and it has always had a place in the diatonic scales of Western music since. The various modal scales of medieval music theory were all based upon this diatonic pattern of tones and semitones.

Though it would later become an integral part of the musical cadence, in the early polyphony of the 11th century this was not the case. Guido of Arezzo, suggested instead his Micrologue other alternatives: either proceeding by whole tone from a major second to a unison, or an occursus having two notes at a major third move by contrary motion toward a unison, each having moved a whole tone.

"As late as the 13th century the half step was experienced as a problematic interval not easily understood, as the irrational [ sic] remainder between the perfect fourth and the ditone \( \frac{4}{3}/\left(\frac{9}{8}\right)^2 = 256/243 \)." In a melodic half step, no "tendency was perceived of the lower tone toward the upper, or of the upper toward the lower. The second tone was not taken to be the ‘goal’ of the first. Instead, the half step was avoided in clausulas because it lacked clarity as an interval."[8]

However, beginning in the 13th century cadences begin to require motion in one voice by half step and the other a whole step in contrary motion.[9] These cadences would become a fundamental part of the musical language, even to the point where the usual accidental accompanying the minor second in a cadence was often omitted from the written score (a practice known as musica ficta). By the 16th century, the semitone had become a more versatile interval, sometimes even appearing as an augmented unison in very chromatic passages.

By the Baroque era, the tonal harmonic framework was fully formed, and the various musical functions of the semitone were rigorously understood. Later in this period the adoption of well temperaments for instrumental tuning and the more frequent use of enharmonic equivalences increased the ease with which a semitone could be applied. Its function remained
similar through the Classical period, and though it was used more frequently as the language of tonality became more chromatic in the Romantic period, the musical function of the semitone did not change.

In the 20th century, however, composers such as Arnold Schoenberg, Béla Bartók, and Igor Stravinsky sought alternatives or extensions of tonal harmony, and found other uses for the semitone. Often the semitone was exploited harmonically as a caustic dissonance, having no resolution. Some composers would even use large collections of harmonic semitones (tone clusters) as a source of cacophony in their music (e.g. the early piano works of Henry Cowell). By now, enharmonic equivalence was a commonplace property of equal temperament, and instrumental use of the semitone was not at all problematic for the performer. The composer was free to write semitones wherever he wished.

This excerpt from the first of Arnold Schoenberg’s Three Piano Pieces, Op. 11 (m. 40) demonstrates completely unrestrained use of the semitone and related intervals.

Semitones in different tunings

The exact size of a semitone depends on the tuning system used. Meantone temperaments have two distinct types of semitones, but in the exceptional case of Equal temperament, there is only one. The unevenly distributed well temperaments contain many different semitones. Pythagorean tuning, similar to meantone tuning, has two, but in other systems of just intonation there are many more possibilities.

Meantone temperament

In meantone systems, there are two different semitones. This results because of the break in the circle of fifths that occurs in the tuning system: diatonic semitones derive from a chain of five fifths that does not cross the break, and chromatic semitones come from one that does.

The chromatic semitone is usually smaller than the diatonic. In the common quarter-comma meantone, tuned as a cycle of tempered fifths from E♭ to G♯, the chromatic and diatonic semitones are 76.0 and 117.1 cents wide respectively.

<table>
<thead>
<tr>
<th>Chromatic semitone</th>
<th>76.0</th>
<th>76.0</th>
<th>76.0</th>
<th>76.0</th>
<th>76.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch</td>
<td>C</td>
<td>C♭</td>
<td>D</td>
<td>E♭</td>
<td>E</td>
</tr>
<tr>
<td>Cents</td>
<td>0.0</td>
<td>76.0</td>
<td>193.2</td>
<td>310.3</td>
<td>386.3</td>
</tr>
<tr>
<td>Diatonic semitone</td>
<td>117.1</td>
<td>117.1</td>
<td>117.1</td>
<td>117.1</td>
<td>117.1</td>
</tr>
</tbody>
</table>

Extended meantone temperaments with more than 12 notes still retain the same two semitone sizes, but there is more flexibility for the musician about whether to use an augmented unison or minor second. 31-tone equal temperament is the most flexible of these, which makes an unbroken circle of 31 fifths, allowing the choice of semitone to be made for any pitch.

Equal temperament

12-tone equal temperament is a form of meantone tuning in which the diatonic and chromatic semitones are exactly the same, because its circle of fifths has no break. Each semitone is equal to one twelfth of an octave. This is a ratio of $2^{1/12}$ (approximately 1.05946), or 100 cents, and is 11.7 cents narrower than the 16:15 ratio (its most common form in just intonation, discussed below).

All diatonic intervals can be expressed as an equivalent number of semitones. For instance a whole tone equals two semitones.

There are many approximations, rational or otherwise, to the equal tempered semitone. To cite a few:

- $18/17 \approx 99.0$ cents, suggested by Vincenzo Galilei and used by luthiers of the Renaissance.
- $\sqrt[8]{\frac{2}{3 - \sqrt{2}}} \approx 100.4$ cents, suggested by Marin Mersenne as a constructible and more accurate alternative.
- $(139/138)^8 \approx 99.9995$ cents, used by Julián Carrillo as part of a sixteenth-tone system.

For more examples, see Pythagorean and Just systems of tuning below.

Well temperament

There are many forms of well temperament, but the characteristic they all share is that their semitones are of an uneven size. Every semitone in a well temperament has its own interval (usually close to the equal tempered version of 100 cents), and there is no clear distinction between a diatonic and chromatic semitone in the tuning. Well temperament was constructed so that enharmonic equivalence could be assumed between all of these semitones, and whether they were written as a minor second or augmented unison did not affect a different sound. Instead, in these systems, each key had a slightly different sonic color or character, beyond the limitations of conventional notation.

Pythagorean tuning
Like meantone temperament, **Pythagorean tuning** is a broken **circle of fifths**. This creates two distinct semitones, but because Pythagorean tuning is also a form of 3-limit **just intonation**, these semitones are rational. Also, unlike most meantone temperaments, the chromatic semitone is larger than the diatonic.

The **Pythagorean diatonic semitone** has a ratio of 256/243 (play (help-info)), and is often called the **Pythagorean limma**. It is also sometimes called the **Pythagorean minor semitone**.

\[
\frac{256}{243} = 2^3 \div 3^3 \approx 90.2 \text{ cents}
\]

The **Pythagorean chromatic semitone** has a ratio of 2187/2048 (play (help-info)). It may also be called the **Pythagorean apotome** or the **Pythagorean major semitone**. (See **Pythagorean interval**)

\[
\frac{2187}{2048} = \frac{3^7}{2^{11}} \approx 113.7 \text{ cents}
\]

**Just intonation**

A minor second in **just intonation** most often corresponds to a pitch **ratio** of 16:15 (play (help-info)) or 1.0686... (approximately 111.7 cents), called the **just diatonic semitone**. This is the most practical just semitone, as it is the difference between a **perfect fourth** and **major third** \(\frac{4}{3} \div \frac{5}{4} = \frac{16}{15}\). In 5-limit just intonation, there is another semitone of 25:24 (play (help-info)) or 1.04166... (approximately 70.672 cents) available between two major thirds (25:16) and a **perfect fifth** (3:2), sometimes called a **just chromatic semitone**, but it is less common. Composer Ben Johnston uses a sharp an accidental to indicate a note is raised 70.6 cents, or a flat to indicate a note is lowered 7.6 cents.

Two other kinds of semitones are produced by 5-limit tuning. A **chromatic scale** defines 12 semitones as the 12 intervals between the 13 adjacent notes forming a full octave (e.g. from C4 to C5). The 12 semitones produced by a **commonly used version** of 5-limit tuning have four different sizes, and can be classified as follows:

- \(S_1 = \frac{25}{24} \approx 70.7 \text{ cents}\)
  - (Just **augmented unison**, or just chromatic semitone, e.g. between E↓ and E)
- \(S_2 = \frac{135}{128} \approx 92.2 \text{ cents}\)
  - (Augmented unison, or chromatic semitone, e.g. between D↓ and D)
- \(S_3 = \frac{16}{15} \approx 111.7 \text{ cents}\)
  - (Just **minor second**, or just diatonic semitone, e.g. between C and D↑)
- \(S_4 = \frac{27}{25} \approx 133.2 \text{ cents}\)
  - (Minor second, or diatonic semitone, e.g. between A and B↑)

The most frequently occurring semitones are the just ones (\(S_3\) and \(S_1\)): \(S_3\) occurs 6 times out of 12, \(S_1\) three times, \(S_2\) twice, and \(S_4\) only once.

Other ratios may function as a minor second. In 7-limit there is the **septimal diatonic semitone** of 15:14 (play (help-info)) available between the 5-limit **major seventh** (15:8) and the 7-limit **minor seventh** (7:4). There is also a smaller **septimal chromatic semitone** of 21:20 (play (help-info)) between a septimal minor seventh and a fifth (21:8) and an octave and a major third (5:2). Both are more rarely used than their 5-limit neighbours, although the former was often implemented by theorist Henry Cowell, while Harry Partch used the latter as part of his **43-tone scale**.

Under 11-limit tuning, there is a fairly common **undecimal neutral second** (12:11) (play (help-info)), but it lies on the boundary between the minor and **major second** (150.6 cents). In just intonation there are infinitely many possibilities for intervals that fall within the range of the semitone (e.g. the Pythagorean semitones mentioned above), but most of them are impractical.

Though the names **diatonic** and **chromatic** are often used for these intervals, their musical function is not the same as the two meantone semitones. For instance, 15:14 would usually be written as an augmented unison, functioning as the chromatic counterpart to a diatonic 16:15. These distinctions are highly dependent on the musical context, and just intonation is not particularly well suited to chromatic usage (diatonic semitone function is more prevalent).

**Other equal temperaments**

**13-tone equal temperament** distinguishes between the chromatic and diatonic semitones; in this tuning, the chromatic semitone is one step of the scale (play 63.2 cents (help-info)), and the diatonic semitone is two (play 126.3 cents (help-info)). **31-tone equal temperament** also distinguishes between these two intervals, which become 2 and 3 steps of the scale, respectively. **53-ET** has an even closer match to the two semitones with 3 and 5 steps of its scale while **72-ET** uses 4 (play 66.7 cents (help-info)) and 7 (play 116.7 cents (help-info)) steps of its scale.

In general, because the two semitones can be viewed as the difference between major and minor thirds, and the difference between major thirds and perfect fourths, tuning systems that match these just intervals closely will also distinguish between the two types of semitones and match their just intervals closely.

**See also**

- List of meantone intervals
- List of musical intervals
- Approach chord
- Major second
- Neutral second
- Pythagorean interval
This article is licensed under the GNU Free Documentation License. It uses material from the Wikipedia article "Semitone". Although most Wikipedia articles provide accurate information accuracy can not be guaranteed.

Our dream: to make the world's treasury of classical music accessible for everyone. Help us with donations or by making music available!
The sheet music catalogue of MusicaNeo is the starting point for your journey through our online collection of 282920 music compositions that have been gathered, uploaded and organized for your most convenient usage. Before starting your search have a look the sections into which we’ve classified all the music scores available at our platform. The five main categories will help to make your search as precise as much as possible and quickly lead you to the piece of interest. Explore the whole collection by composer, genre, instrument, epoch, or, if you are not sure what exactly you are looking Sheet music is being extensively used nowadays. It is a form of musical notation that employs music symbols that have rhythms, chords of the song etc. If you know how to read music, you can simply play the instrument just by reading the music notes. There are many music notes websites that allow you to download free sheet music or supply you the sheet music for a fee. In this post, we have researched the music notes websites for the steady supply of paid and free sheet music. Sheetmusicplus offers sheet music at an affordable price for their users. The best thing is that you can bank upon the music sheets provided by sheetmusicplus.com. MuseScore. MuseScore. There are many suggestions that directed our research to musescore.com. A-TEEN OST Motte ’ Piano Sheet Music. piano. $1.5. TWICE ‘YES or YES’ Easy Piano Sheet Music. piano. $1.5.