Intervals and Transposition

**TOPICS**

- Interval
- Octave
- Unison
- Perfect, Major, and Minor Intervals
- Consonance and Dissonance
- Augmented and Diminished Intervals
- Enharmonic Intervals
- Tritone
- Inversion of Intervals
- Compound Intervals
- Simple Intervals
- Tuning Systems
- Melodic Intervals
- Harmonic Intervals
- Transposition

**IMPORTANT CONCEPTS**

Tone combinations are classified in music with names that identify the pitch relationships. Learning to recognize these combinations by both eye and ear is a skill fundamental to basic musicianship. Although many different tone combinations occur in music, the most basic pairing of pitches is the interval.

An interval is the relationship in pitch between two tones. Intervals are named by the number of diatonic notes (notes with different letter names) that can be contained within them. For example, the whole step G to A contains only two diatonic notes (G and A) and is called a second.

**Figure 3.1**

![Second interval diagram](image)

The following figure shows all the numbers within an octave used to identify intervals:

**Figure 3.2**

![Octave interval diagram](image)

Notice that the interval numbers shown in Figure 3.2 correspond to the scale degree numbers for the major scale.
The term *octave* refers to the number 8, its interval number.

**Figure 3.3**

Octave = 1 2 3 4 5 6 7 8 = 8

The interval numbered “1” (two notes of the same pitch) is called a *unison*.

**Figure 3.4**

1 = Unison

**Perfect, Major, and Minor Intervals**

The intervals that include the tonic (keynote) and the fourth and fifth scale degrees of a major scale are called *perfect*.

**Figure 3.5**

In addition, the unison and the octave are called *perfect*.

**Figure 3.6**

The intervals from the tonic (keynote) in an upward direction to the second, to the third, to the sixth, and to the seventh scale degrees of a major scale are called *major*.
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Figure 3.7

<table>
<thead>
<tr>
<th>Major second</th>
<th>Major third</th>
<th>Major sixth</th>
<th>Major seventh</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2</td>
<td>M3</td>
<td>M6</td>
<td>M7</td>
</tr>
</tbody>
</table>

Notice the standard abbreviations for intervals in Figures 3.5, 3.6, and 3.7. For example, P1 = perfect unison, M2 = major second.

When a major interval is made one half step smaller, it becomes minor. This can be done either by raising the bottom note or lowering the top note.

Figure 3.8

M3  m3 or m3

Notice the standard abbreviation for minor intervals: a lower case “m” followed by an interval number.

Major, minor, and perfect intervals are illustrated in Figure 3.9.

Figure 3.9

<table>
<thead>
<tr>
<th>Name</th>
<th>Abbreviation</th>
<th>Illustration</th>
<th>Number of Half Steps</th>
<th>Convenient Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect Unison (also Prime)</td>
<td>P1</td>
<td><img src="image" alt="Perfect Unison Illustration" /></td>
<td>0</td>
<td>7–8 of Major Scale</td>
</tr>
<tr>
<td>Minor 2nd</td>
<td>m2</td>
<td><img src="image" alt="Minor 2nd Illustration" /></td>
<td>1</td>
<td>1–2 of Major Scale</td>
</tr>
<tr>
<td>Major 2nd</td>
<td>M2</td>
<td><img src="image" alt="Major 2nd Illustration" /></td>
<td>2</td>
<td>1–2 of Major Scale</td>
</tr>
<tr>
<td>Minor 3rd</td>
<td>m3</td>
<td><img src="image" alt="Minor 3rd Illustration" /></td>
<td>3</td>
<td>1–3 of Minor Scale</td>
</tr>
<tr>
<td>Major 3rd</td>
<td>M3</td>
<td><img src="image" alt="Major 3rd Illustration" /></td>
<td>4</td>
<td>1–3 of Major Scale</td>
</tr>
<tr>
<td>Name</td>
<td>Abbreviation</td>
<td>Illustration</td>
<td>Number of Half Steps</td>
<td>Convenient Example</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------</td>
<td>--------------</td>
<td>----------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Perfect 4th</td>
<td>P4</td>
<td><img src="image" alt="Perfect 4th Illustration" /></td>
<td>5</td>
<td>1-4 of Major or Minor Scale</td>
</tr>
<tr>
<td>Perfect 5th</td>
<td>P5</td>
<td><img src="image" alt="Perfect 5th Illustration" /></td>
<td>7</td>
<td>1-5 of Major or Minor Scale</td>
</tr>
<tr>
<td>Minor 6th</td>
<td>m6</td>
<td><img src="image" alt="Minor 6th Illustration" /></td>
<td>8</td>
<td>1-6 of Harmonic Minor Scale</td>
</tr>
<tr>
<td>Major 6th</td>
<td>M6</td>
<td><img src="image" alt="Major 6th Illustration" /></td>
<td>9</td>
<td>1-6 of Major Scale</td>
</tr>
<tr>
<td>Minor 7th</td>
<td>m7</td>
<td><img src="image" alt="Minor 7th Illustration" /></td>
<td>10</td>
<td>1-7 of Natural Minor Scale</td>
</tr>
<tr>
<td>Major 7th</td>
<td>M7</td>
<td><img src="image" alt="Major 7th Illustration" /></td>
<td>11</td>
<td>1-7 of Major Scale</td>
</tr>
<tr>
<td>Perfect Octave</td>
<td>P8</td>
<td><img src="image" alt="Perfect Octave Illustration" /></td>
<td>12</td>
<td>1-8 of Major or Minor Scale</td>
</tr>
</tbody>
</table>

Consonance and Dissonance

The terms *consonance* and *dissonance* are defined in a variety of ways, depending on the context. In acoustics, the consonances are those intervals that are found as the lower members of the harmonic series (see page xv). We will define the term consonance in a musical sense as intervals that are treated as stable and not requiring resolution. The consonant intervals are the P1, m3, M3, P5, m6, M6, and P8. All other intervals within the octave are considered dissonant.

Augmented and Diminished Intervals

If a perfect or major interval is made one half step larger (without changing its interval number) it becomes *augmented*. If a perfect or minor interval is made one half step smaller (without changing its interval number) it becomes *diminished*.

**Figure 3.10**

- **Diminished**: d3, d5
- **Minor**: m3, P5
- **Major**: M3, A3
- **Augmented**: A3, A5
Notice the standard abbreviations for augmented and diminished intervals. For example, d3 = diminished third and A3 = augmented third.

*Enharmonic intervals* are intervals with the same sound that are spelled differently. Such intervals result, of course, from enharmonic tones (see “Enharmonic Equivalents,” page 8). All of the following intervals sound identical but are spelled differently.

### Figure 3.11

<table>
<thead>
<tr>
<th>Minor Sixth</th>
<th>Minor Sixth</th>
<th>Augmented Fifth</th>
</tr>
</thead>
<tbody>
<tr>
<td>m6</td>
<td>m6</td>
<td>A5</td>
</tr>
</tbody>
</table>

You must take care in spelling intervals. If a specific interval is requested, the enharmonic equivalent spelling is not correct. Thus, if a major third above E is called for, A-flat is not correct, even though it sounds the same as G-sharp. If a perfect fifth above F is called for, B-sharp is not correct, even though it sounds the same as C.

### Figure 3.12

<table>
<thead>
<tr>
<th>Right</th>
<th>Wrong</th>
<th>Right</th>
<th>Wrong</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>P5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The most common enharmonic intervals are the augmented fourth and the diminished fifth, which divide the octave into two equal parts.

### Figure 3.13

A4 or d5

These intervals are usually referred to as the *tritone*, since they contain three whole steps.

### Figure 3.14

Tritone contains three whole steps: Enharmonic

The *inversion of an interval* means that the lower tone of an interval becomes the higher tone, or the higher tone becomes the lower tone.
**Figure 3.15**

![Figure 3.15]

The following table shows various intervals and their inversions:

<table>
<thead>
<tr>
<th>Interval Name</th>
<th>When Inverted Becomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perfect</td>
<td>Perfect</td>
</tr>
<tr>
<td>Major</td>
<td>Minor</td>
</tr>
<tr>
<td>Minor</td>
<td>Major</td>
</tr>
<tr>
<td>Diminished</td>
<td>Augmented</td>
</tr>
<tr>
<td>Augmented</td>
<td>Diminished</td>
</tr>
<tr>
<td>Unison</td>
<td>Octave</td>
</tr>
<tr>
<td>2nd</td>
<td>7th</td>
</tr>
<tr>
<td>3rd</td>
<td>6th</td>
</tr>
<tr>
<td>4th</td>
<td>5th</td>
</tr>
<tr>
<td>5th</td>
<td>4th</td>
</tr>
<tr>
<td>6th</td>
<td>3rd</td>
</tr>
<tr>
<td>7th</td>
<td>2nd</td>
</tr>
<tr>
<td>Octave</td>
<td>Unison</td>
</tr>
</tbody>
</table>

Figure 3.16 shows some typical intervals and their inversions.

**Figure 3.16**

1. M6 inverted becomes m3
2. P5 inverted becomes P4
3. d7 inverted becomes A2
4. M3 inverted becomes m6
5. d5 inverted becomes A4
Intervals greater than an octave are called compound intervals. These intervals are named in a similar manner to the intervals within an octave (simple intervals).

**Figure 3.17**

**Compound Intervals**

![Diagram of compound intervals](image)

Their simple equivalents:

![Diagram of simple intervals](image)

Compound intervals are often labeled as their simple equivalents—as if an octave were removed from the interval. The compound names are used only if it is important to stress the exact interval size.

**History**

Not all intervals are exactly the same size today as they were in earlier times, and in fact, the size differences in many cases are audible. Various tuning systems throughout the centuries have dictated specific distances between interval pitches.

**Tuning Systems**

In modern times the equal temperament system of tuning has been accepted as the standard for nearly all music written in the Western world. Nevertheless, the history of music reveals a variety of methods that preceded equal temperament. Many are still in use throughout the world.

**Pythagorean Tuning**

Attributed to the sixth-century B.C. philosopher Pythagoras, Pythagorean tuning is a system of tuning that uses only the pure fifth found in the harmonic series. The Pythagorean system would appear to be ideal because of the purity of the fifths, but other intervals, particularly the seconds and thirds, are compromised. Major seconds and thirds in Pythagorean tuning are larger than their equal-temperament counterparts, whereas minor seconds and thirds are smaller.

**Just Intonation**

Just intonation, which flourished in the fifteenth century, solved the problem of out-of-tune major chords by tuning a few major thirds according to the harmonic series. The result of this method was that the majority of thirds and some of the fifths were pure, but the remaining fifths were smaller.

**Unequal Temperaments**

By 1650, musicians had found a number of unequal temperaments that met their needs for playing in a variety of keys. These temperaments gave up the purity of the thirds and fifths, but distributed the error over enough intervals that most chords were acceptable. Many systems were used, but the best known are those of Andreas Werckmeister (1645–1706), whose treatise *Musikalische Temperatur* (1691) gave a number of unequal temperaments that are still in use today, particularly in pipe organs. It is certain that Bach’s *Well-Tempered Clavier* (1722–1742) was composed for an instrument tuned to one of the unequal temperaments rather than equal temperament, as has sometimes been supposed.

**Equal Temperament**

Equal temperament divides the octave into 12 equal half steps, thus further compromising both pure fifths and pure thirds. Fretted string instruments were responsible for much of the early interest in equal temperament, since the frets passed under all the strings, and
this required that all the half steps be as equal as possible. During the later nineteenth and
twentieth centuries, equal temperament became the standard system of tuning, and most
modern instruments approximate this system as nearly as possible.

Despite the standardization of equal temperament as the prevailing tuning system, the
interest in historically accurate performance has led to the construction of instruments
employing various historical tunings. New applications of the tuning systems continue to
be developed. A number of twentieth-century composers have experimented with tuning
systems as the basis for new musical styles.

APPLICATIONS

Fluency with Intervals

It is vital that you develop speed and accuracy in the identification and spelling of inter-
vals. Much of your future work in music theory will require this ability. Many musicians
use the following method to help them identify intervals more quickly.

1. Notice in writing thirds, fifths, and sevenths that the two notes are either on lines or on
spaces.

Figure 3.18

![Figure 3.18](image)

3rds 5ths 7ths

2. Seconds, fourths, sixths, and octaves involve a note on a line and a note on a space.

Figure 3.19

![Figure 3.19](image)

2nds 4ths 6ths Octaves

3. Fourths, fifths, and octaves are perfect if the accidentals are the same, except for the
fourth and fifth involving B and F.

Figure 3.20

![Figure 3.20](image)

P4ths A4 P5ths d5

4. Seconds are major and sevenths are minor if the accidentals are the same, except for
those involving E–F and B–C.
5. Thirds built on C, F, and G are major if the accidentals are the same. Thirds built on the remaining notes are minor if the accidentals are the same.

6. Sixths whose upper tones are C, F, or G are minor if the accidentals are the same. Sixths whose upper tones are any of the remaining notes are major if the accidentals are the same.

7. You can quickly determine other interval qualities by reducing the interval to the “same accidental” form and then noting the effect on interval size when the accidental(s) are replaced.

With sufficient practice, determining the size of intervals will become automatic. In the assignments for this chapter, work first for accuracy and then try to develop speed.

The two pitches of an interval will occur either in succession or simultaneously. If two tones are positioned adjacently and sound one after the other, the resulting interval is considered to be melodic.
Figure 3.25

D. Scarlatti: Sonata in C Major, K. 159, L. 104, mm. 1–2.

If two tones sound at the same time, the resulting interval is said to be *harmonic*. Figure 3.26 demonstrates a series of harmonic intervals occurring between the left-hand and right-hand parts of a keyboard composition.

Figure 3.26

D. Scarlatti: Sonata in C Major, K. 159, L. 104, mm. 1–2.

Figure 3.27 illustrates the notation of both types of intervals. Although most harmonic intervals are aligned vertically, unisons and seconds require offset positioning. Notice that the noteheads of harmonic unisons and seconds touch, but never overlap.

Figure 3.27

Transposition is the process of rewriting a piece of music or a scale so that it sounds higher or lower in pitch. This involves raising or lowering each pitch by the same interval.

The ability to transpose rapidly and accurately is a fundamental skill that all musicians need. Singers often transpose songs to fit their particular voice ranges, and anyone writing for instrumentalists will often need to transpose parts for them. Many musicians are expected to be able to transpose while they perform. This is particularly true of certain wind instrumentalists, but pianists and organists are also called on to transpose at sight. There are several methods of transposition; the choice of method is an individual matter. We will examine two methods here.

**Method 1: Interval Transposition**

One common technique for transposition is by interval. In this method an interval of transposition is established, and all pitches are moved up or down by that interval.
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Figure 3.28

Interval Transposition

Some musicians prefer to transpose by clef. In this method a clef is chosen that would put the part on the correct transposed pitch, and any key signatures are changed. For example, a baritone saxophone player can take music written in the bass clef and transpose it by imagining that it is written in the treble clef with a key signature that has three fewer flats or three more sharps. (Accidentals within the part will have to be converted also.)

Figure 3.28 will now be transposed from B-flat major to C major by substituting the alto clef and changing the key signature. Notice that it is sometimes necessary to change the octave of the clef in making a clef transposition.

Method 2: Clef Transposition

Substitute alto clef and new key signature

If a particular transposition is often required, particularly when you are transposing at sight, clef transposition may be the easiest method.

Tonal and Nontonal Transposition

If the music is tonal and written with a key signature (including C major), the transposition includes transposing the key signature.

Figure 3.29

Clef Transposition

Figure 3.30

Tonal Transposition
If the music is written without key signatures and is chromatic, the transposed parts will also appear without key signature. In this case, you must take particular care to ensure that the line is transposed accurately, but enharmonic notations may be freely written. For example, the A-flat on beat two in Figure 3.31 could just as easily have been written as G-sharp.

Figure 3.31
Nontonal Transposition

Write accidentals as needed