

Introduction to Music Theory

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<<http://cnx.org/content/col10208/1.5/>>

C O N N E X I O N S

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Chapter 1

Pitch and Interval

1.1 Octaves and the Major-Minor Tonal System¹

1.1.1 Where Octaves Come From

Musical notes, like all sounds, are made of sound waves. The sound waves that make musical notes are very evenly-spaced waves, and the qualities of these regular waves - for example how big they are or how far apart they are - affect the sound of the note. A note can be high or low, depending on how often (how frequently) one of its waves arrives at your ear. When scientists and engineers talk about how high or low a sound is, they talk about its frequency². The higher the **frequency** of a note, the higher it sounds. They can measure the frequency of notes, and like most measurements, these will be numbers, like "440 vibrations per second."

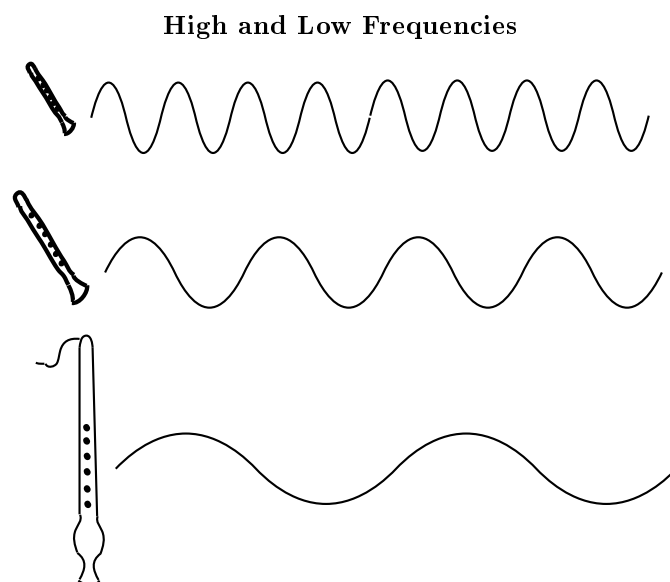


Figure 1.1: A sound that has a shorter wavelength has a higher frequency and a higher pitch.

¹This content is available online at <http://cnx.org/content/m10862/2.18/>.

²"Frequency, Wavelength, and Pitch" <http://cnx.org/content/m11060/latest/#p1e>

But people have been making music and talking about music since long before we knew that sounds were waves with frequencies. So when musicians talk about how high or low a note sounds, they usually don't talk about frequency; they talk about the note's pitch³. And instead of numbers, they give the notes names, like "C". (For example, musicians call the note with frequency "440 vibrations per second" an "A".)

But to see where octaves come from, let's talk about frequencies a little more. Imagine a few men are singing a song together. Nobody is singing harmony; they are all singing the same pitch - the same frequency - for each note.

Now some women join in the song. They can't sing where the men are singing; that's too low for their voices. Instead they sing notes that are exactly double the frequency that the men are singing. That means their note has exactly two waves for each one wave that the men's note has. These two frequencies fit so well together that it sounds like the women are singing the same notes as the men, in the same key (Section 2.1). They are just singing them one octave higher. *Any note that is twice the frequency of another note is one octave higher.*

Notes that are one octave apart are so closely related to each other that musicians give them the same name. A note that is an octave higher or lower than a note named "C natural" will also be named "C natural". A note that is one (or more) octaves higher or lower than an "F sharp" will also be an "F sharp". (For more discussion of how notes are related because of their frequencies, see The Harmonic Series⁴, Standing Waves and Musical Instruments⁵, and Standing Waves and Wind Instruments⁶.)

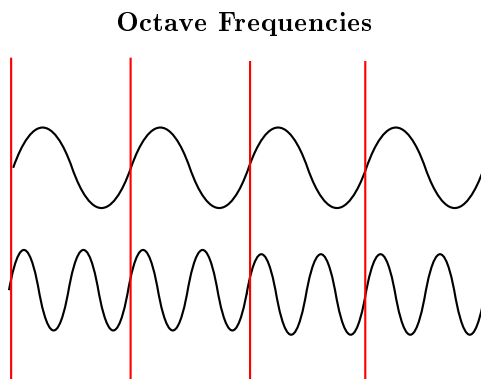


Figure 1.2: When two notes are one octave apart, one has a frequency exactly two times higher than the other - it has twice as many waves. These waves fit together so well, in the instrument, and in the air, and in your ears, that they sound almost like different versions of the same note.

1.1.2 Naming Octaves

The notes in different octaves are so closely related that when musicians talk about a note, a "G" for example, it often doesn't matter which G they are talking about. We can talk about the "F sharp" in a G major scale (Section 2.1) without mentioning which octave the scale or the F sharp are in, because the scale is the same in every octave. Because of this, many discussions of music theory don't bother naming octaves. Informally,

³"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/>>

⁴"Harmonic Series" <<http://cnx.org/content/m11118/latest/>>

⁵"Standing Waves and Musical Instruments" <<http://cnx.org/content/m12413/latest/>>

⁶"Standing Waves and Wind Instruments" <<http://cnx.org/content/m12589/latest/>>

musicians often speak of "the B on the staff" or the "A above the staff", if it's clear which staff⁷ they're talking about.

But there are also two formal systems for naming the notes in a particular octave. Many musicians use **Helmholtz** notation. Others prefer **scientific pitch notation**, which simply labels the octaves with numbers, starting with C1 for the lowest C on a full-sized keyboard. Figure 3 shows the names of the octaves most commonly used in music.

Naming Octaves

Say:	"Contra"	"Great"	"Small"	"One-line"	"Two-line"	"Three-line"
Helmholtz:	CC	C	c	c ⁱ	c ⁱⁱ	c ⁱⁱⁱ
Scientific:	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆

Figure 1.3: The octaves are named from one C to the next higher C. For example, all the notes in between "one line c" and "two line c" are "one line" notes.

The octave below contra can be labelled CCC or Co; higher octaves can be labelled with higher numbers or more lines. Octaves are named from one C to the next higher C. For example, all the notes between "great C" and "small C" are "great". *One-line c is also often called "middle C". No other notes are called "middle", only the C.*

Example 1.1

Naming Notes within a Particular Octave

gⁱ fⁱⁱ fⁱⁱⁱ b f dⁱ A BB

Figure 1.4: Each note is considered to be in the same octave as the C below it.

Exercise 1.1

Give the correct octave name for each note.

(Solution on p. 23.)

⁷"The Staff" <<http://cnx.org/content/m10880/latest/>>

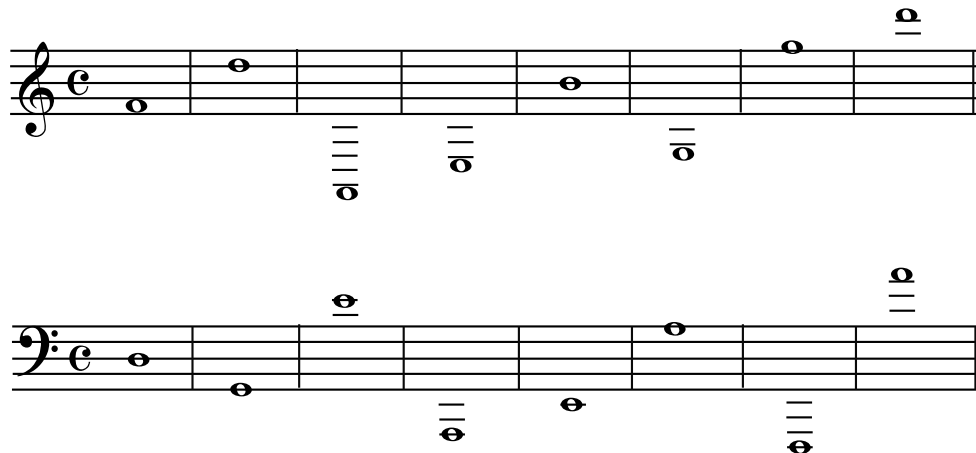


Figure 1.5

1.1.3 Dividing the Octave into Scales

The word "octave" comes from a Latin root meaning "eight". It seems an odd name for a frequency that is two times, not eight times, higher. The octave was named by musicians who were more interested in how octaves are divided into scales, than in how their frequencies are related. Octaves aren't the only notes that sound good together. The people in different musical traditions have different ideas about what notes they think sound best together. In the Western⁸ musical tradition - which includes most familiar music from Europe and the Americas - the octave is divided up into twelve equally spaced notes. If you play all twelve of these notes within one octave you are playing a chromatic scale (p. 6). Other musical traditions - traditional Chinese music for example - have divided the octave differently and so they use different scales. (Please see Major Keys and Scales (Section 2.1), Minor Keys and Scales (Section 2.2), and Scales that aren't Major or Minor⁹ for more about this.)

You may be thinking "OK, that's twelve notes; that still has nothing to do with the number eight", but out of those twelve notes, only seven are used in any particular major (Section 2.1) or minor (Section 2.2) scale. Add the first note of the next octave, so that you have that a "complete"-sounding scale ("do-re-mi-fa-so-la-ti" and then "do" again), and you have the eight notes of the **octave**. These are the **diatonic** scales, and they are the basis of most Western¹⁰ music.

Now take a look at the piano keyboard. Only seven letter names are used to name notes: A, B, C, D, E, F, and G. The eighth note would, of course, be the next A, beginning the next octave. To name the other notes, the notes on the black piano keys, you have to use a sharp or flat¹¹ sign.

⁸"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁹"Scales that aren't Major or Minor" <<http://cnx.org/content/m11636/latest/>>

¹⁰"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

¹¹"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/>>

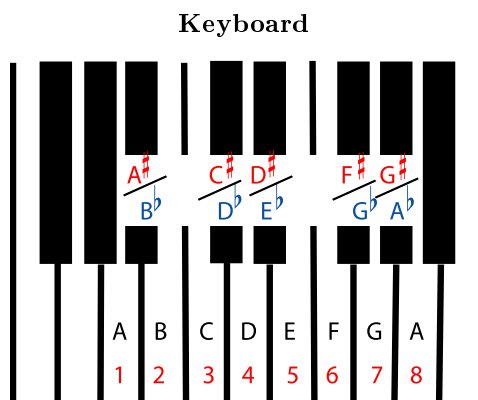


Figure 1.6: The white keys are the natural notes. Black keys can only be named using sharps or flats. The pattern repeats at the eighth tone of a scale, the octave.

Whether it is a popular song, a classical symphony, or an old folk tune, most of the music that feels comfortable and familiar (to Western listeners) is based on either a major or minor scale. It is **tonal** music that mostly uses only seven of the notes within an octave: only one of the possible A's (A sharp, A natural, or A flat), one of the possible B's (B sharp, B natural, or B flat), and so on. The other notes in the chromatic scale are (usually) used sparingly to add interest or to (temporarily) change the key in the middle of the music. For more on the keys and scales that are the basis of tonal music, see Major Keys and Scales (Section 2.1) and Minor Keys and Scales (Section 2.2).

1.2 Half Steps and Whole Steps¹²

The **pitch** of a note is how high or low it sounds. Musicians often find it useful to talk about how much higher or lower one note is than another. This distance between two pitches is called the **interval** between them. In Western music¹³, the small interval from one note to the next closest note higher or lower is called a **half step** or **semi-tone**.

¹²This content is available online at <<http://cnx.org/content/m10866/2.17/>>.

¹³"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

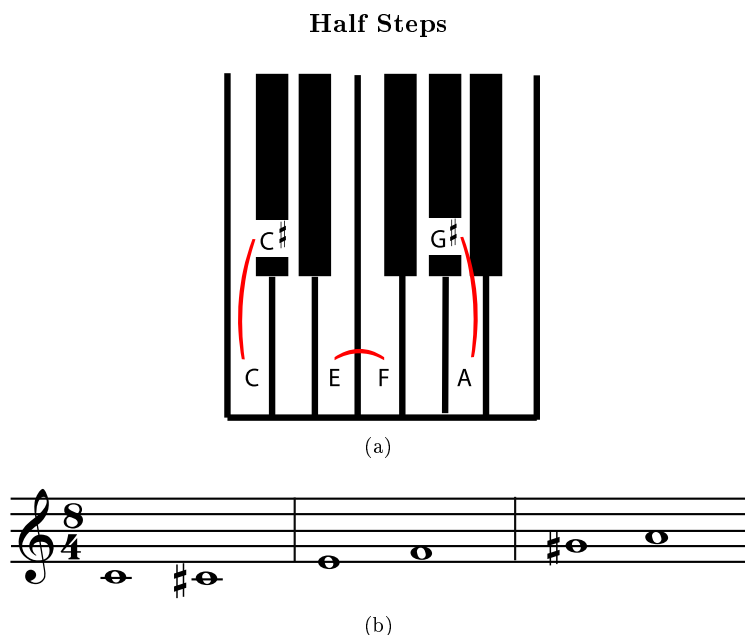


Figure 1.7: Three half-step intervals: between C and C sharp (or D flat); between E and F; and between G sharp (or A flat) and A.

Listen¹⁴ to the half steps in Figure 1.7 (Half Steps).

The intervals in Figure 1.7 (Half Steps) look different on a staff¹⁵; sometimes they are on the same line, sometimes not. But it is clear at the keyboard that in each case there is no note in between them.

So a scale (Section 2.1) that goes up or down by half steps, a **chromatic scale**, plays all the notes on both the white and black keys of a piano. It also plays all the notes easily available on most Western¹⁶ instruments. (A few instruments, like trombone¹⁷ and violin¹⁸, can easily play pitches that aren't in the chromatic scale, but even they usually don't.)

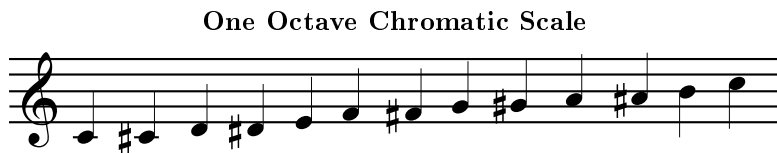


Figure 1.8: All intervals in a *chromatic scale* are half steps. The result is a scale that plays all the notes easily available on most instruments.

¹⁴<http://cnx.org/content/m10866/latest/6f.mid>

¹⁵"The Staff" <<http://cnx.org/content/m10880/latest/>>

¹⁶"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

¹⁷"Trombones" <<http://cnx.org/content/m12602/latest/>>

¹⁸"Introduction to the Violin and FAQ" <<http://cnx.org/content/m13437/latest/>>

Listen¹⁹ to a chromatic scale.

If you go up or down two half steps from one note to another, then those notes are a **whole step**, or **whole tone** apart.

Whole Steps

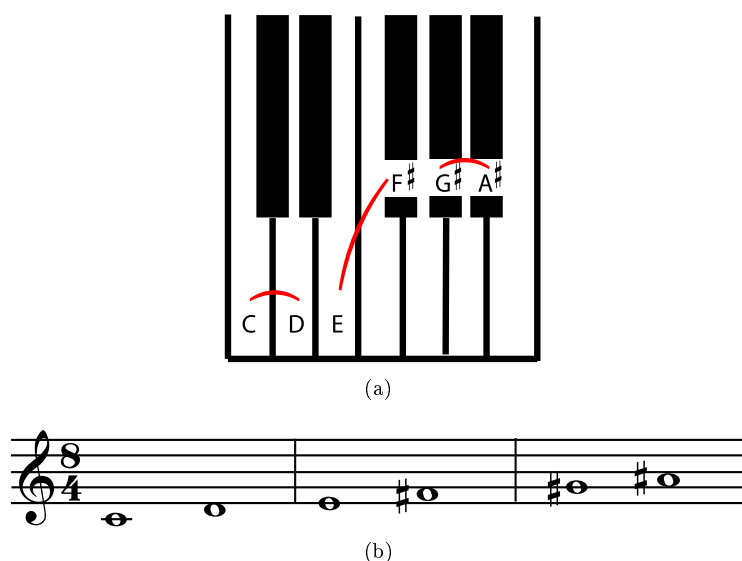


Figure 1.9: Three whole step intervals: between C and D; between E and F sharp; and between G sharp and A sharp (or A flat and B flat).

A **whole tone scale**, a scale made only of whole steps, sounds very different from a chromatic scale.

Whole Tone Scale



Figure 1.10: All intervals in a *whole tone scale* are whole steps.

Listen²⁰ to a whole tone scale.

You can count any number of whole steps or half steps between notes; just remember to count all sharp or flat notes (the black keys on a keyboard) as well as all the natural notes (the white keys) that are in between.

¹⁹<http://cnx.org/content/m10866/latest/6a.mid>

²⁰<http://cnx.org/content/m10866/latest/6b.mid>

Example 1.2

The interval between C and the F above it is 5 half steps, or two and a half steps.

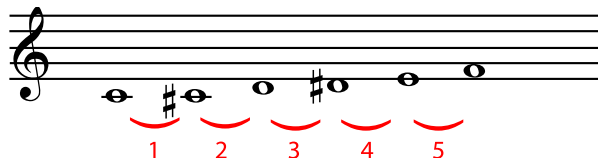


Figure 1.11: Going from C up to F takes five half steps.

Exercise 1.2

(Solution on p. 23.)

Identify the intervals below in terms of half steps and whole steps. If you have trouble keeping track of the notes, use a piano keyboard, a written chromatic scale, or the chromatic fingerings for your instrument to count half steps.

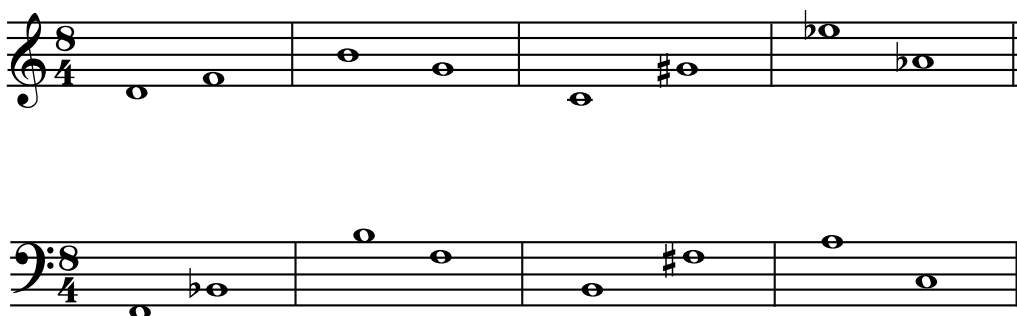


Figure 1.12

Exercise 1.3

(Solution on p. 23.)

Fill in the second note of the interval indicated in each measure. If you need staff paper for this exercise, you can print out this staff paper²¹ PDF file.

²¹<http://cnx.org/content/m10866/latest/staffpaper1.pdf>

5 half steps higher 1 whole step lower 2 whole steps lower 9 half steps lower

1 whole step higher 1 half step lower 2 whole steps higher 11 half steps lower

3 whole steps higher 3 half steps lower 1 half steps higher 7 half steps lower

Figure 1.13

1.3 Interval²²

1.3.1 The Distance Between Pitches

The **interval** between two notes is the distance between the two pitches²³ - in other words, how much higher or lower one note is than the other. This concept is so important that it is almost impossible to talk about scales (Section 2.1), chords²⁴, harmonic progression²⁵, cadence (Section 3.4), or dissonance (Section 3.5) without referring to intervals. So if you want to learn music theory, it would be a good idea to spend some time getting comfortable with the concepts below and practicing identifying intervals.

Scientists usually describe the distance between two pitches in terms of the difference between their frequencies²⁶. Musicians find it more useful to talk about interval. Intervals can be described using half steps and whole steps (Section 1.2). For example, you can say "B natural is a half step below C natural", or "E flat is a step and a half above C natural". But when we talk about larger intervals in the major/minor system (Section 1.1), there is a more convenient and descriptive way to name them.

1.3.2 Naming Intervals

The first step in naming the interval is to find the distance between the notes *as they are written on the staff*. Count every line and every space in between the notes, as well as the lines or spaces that the notes are on. This gives you the number for the interval.

Example 1.3

²²This content is available online at <<http://cnx.org/content/m10867/2.21/>>.

²³"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/>>

²⁴"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

²⁵"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

²⁶"Frequency, Wavelength, and Pitch" <<http://cnx.org/content/m11060/latest/>>

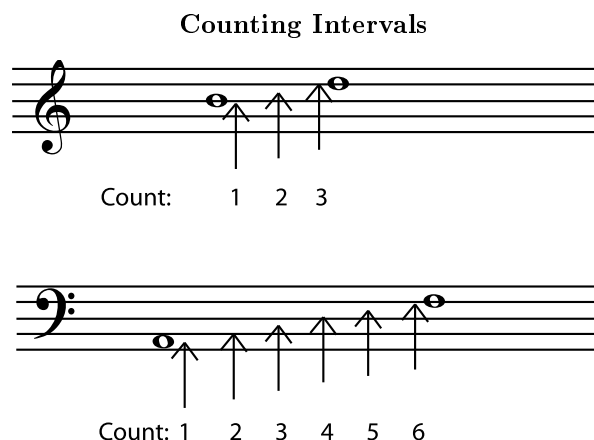


Figure 1.14

To find the interval, count the lines or spaces that the two notes are on as well as all the lines or spaces in between. The interval between B and D is a third. The interval between A and F is a sixth. Note that, at this stage, key signature²⁷, clef²⁸, and accidentals²⁹ do not matter at all.

The **simple intervals** are one octave or smaller.

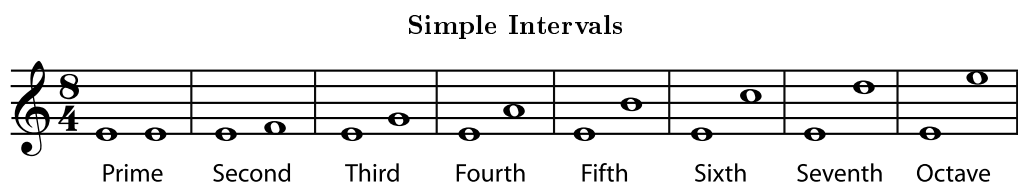


Figure 1.15

If you like you can listen to each interval as written in Figure 1.15 (Simple Intervals): prime³⁰, second³¹, third³², fourth³³, fifth³⁴, sixth³⁵, seventh³⁶, octave³⁷.

Compound intervals are larger than an octave.

²⁷"Key Signature" <<http://cnx.org/content/m10881/latest/>>

²⁸"Clef" <<http://cnx.org/content/m10941/latest/>>

²⁹"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

³⁰<http://cnx.org/content/m10867/latest/prime.mid>

³¹<http://cnx.org/content/m10867/latest/second.mid>

³²<http://cnx.org/content/m10867/latest/third.mid>

³³<http://cnx.org/content/m10867/latest/fourth.mid>

³⁴<http://cnx.org/content/m10867/latest/fifth.mid>

³⁵<http://cnx.org/content/m10867/latest/sixth.mid>

³⁶<http://cnx.org/content/m10867/latest/seventh.mid>

³⁷<http://cnx.org/content/m10867/latest/octave.mid>

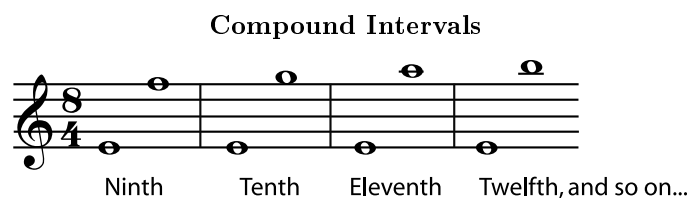


Figure 1.16

Listen to the compound intervals in Figure 1.16 (Compound Intervals): ninth³⁸, tenth³⁹, eleventh⁴⁰.

Exercise 1.4

(Solution on p. 24.)

Name the intervals.



Figure 1.17

Exercise 1.5

(Solution on p. 24.)

Write a note that will give the named interval.

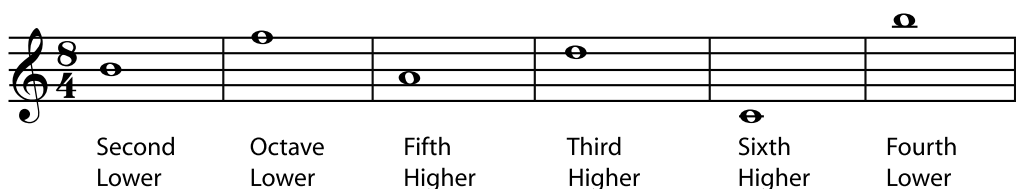


Figure 1.18

1.3.3 Classifying Intervals

So far, the actual distance, in half-steps, between the two notes has not mattered. But a third made up of three half-steps sounds different from a third made up of four half-steps. And a fifth made up of seven half-steps sounds very different from one of only six half-steps. So in the second step of identifying an interval, clef⁴¹, key signature⁴², and accidentals⁴³ become important.

³⁸<http://cnx.org/content/m10867/latest/ninth.mid>

³⁹<http://cnx.org/content/m10867/latest/tenth.mid>

⁴⁰<http://cnx.org/content/m10867/latest/eleventh.mid>

⁴¹"Clef" <<http://cnx.org/content/m10941/latest/>>

⁴²"Key Signature" <<http://cnx.org/content/m10881/latest/>>

⁴³"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>



Figure 1.19: A to C natural and A to C sharp are both thirds, but A to C sharp is a larger interval, with a different sound. The difference between the intervals A to E natural and A to E flat is even more noticeable.

Listen to the differences in the thirds⁴⁴ and the fifths⁴⁵ in Figure 1.19.

So the second step to naming an interval is to classify it based on the number of half steps (Section 1.2) in the interval. Familiarity with the chromatic scale (p. 6) is necessary to do this accurately.

1.3.3.1 Perfect Intervals

Primes, octaves, fourths, and fifths can be **perfect** intervals.

NOTE: These intervals are *never classified as major or minor*, although they can be augmented or diminished (see below (Section 1.3.3.3: Augmented and Diminished Intervals)).

What makes these particular intervals perfect? The physics of sound waves (**acoustics**) shows us that the notes of a perfect interval are very closely related to each other. (For more information on this, see Frequency, Wavelength, and Pitch⁴⁶ and Harmonic Series⁴⁷.) Because they are so closely related, they sound particularly good together, a fact that has been noticed since at least the times of classical Greece, and probably even longer. (Both the octave and the perfect fifth have prominent positions in most of the world's musical traditions.) Because they sound so closely related to each other, they have been given the name "perfect" intervals.

NOTE: Actually, modern equal temperament⁴⁸ tuning does not give the harmonic-series-based pure⁴⁹ perfect fourths and fifths. For the music-theory purpose of identifying intervals, this does not matter. To learn more about how tuning affects intervals as they are actually played, see Tuning Systems⁵⁰.

A perfect prime is also called a **unison**. It is two notes that are the same pitch⁵¹. A perfect octave is the "same" note an octave (Section 1.1) - 12 half-steps - higher or lower. A **perfect 5th** is 7 half-steps. A **perfect fourth** is 5 half-steps.

⁴⁴<http://cnx.org/content/m10867/latest/twothirds.mid>

⁴⁵<http://cnx.org/content/m10867/latest/twofifths.mid>

⁴⁶"Frequency, Wavelength, and Pitch" <<http://cnx.org/content/m11060/latest/>>

⁴⁷"Harmonic Series" <<http://cnx.org/content/m11118/latest/>>

⁴⁸"Tuning Systems": Section Equal Temperament <<http://cnx.org/content/m11639/latest/#s22>>

⁴⁹"Tuning Systems": Section Pythagorean Intonation <<http://cnx.org/content/m11639/latest/#s11>>

⁵⁰"Tuning Systems" <<http://cnx.org/content/m11639/latest/>>

⁵¹"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/>>

Example 1.4

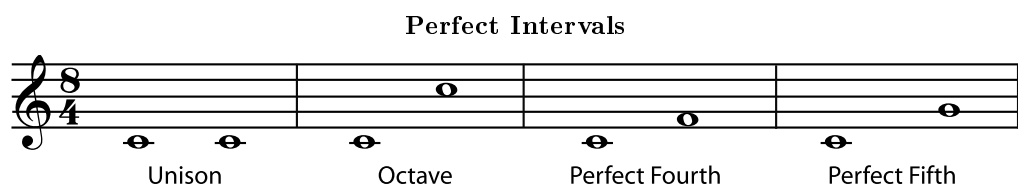


Figure 1.20

Listen to the octave⁵², perfect fourth⁵³, and perfect fifth⁵⁴.

1.3.3.2 Major and Minor Intervals

Seconds, thirds, sixths, and sevenths can be **major intervals** or **minor intervals**. The minor interval is always a half-step smaller than the major interval.

Major and Minor Intervals

- 1 half-step = minor second (m2)
- 2 half-steps = major second (M2)
- 3 half-steps = minor third (m3)
- 4 half-steps = major third (M3)
- 8 half-steps = minor sixth (m6)
- 9 half-steps = major sixth (M6)
- 10 half-steps = minor seventh (m7)
- 11 half-steps = major seventh (M7)

Example 1.5

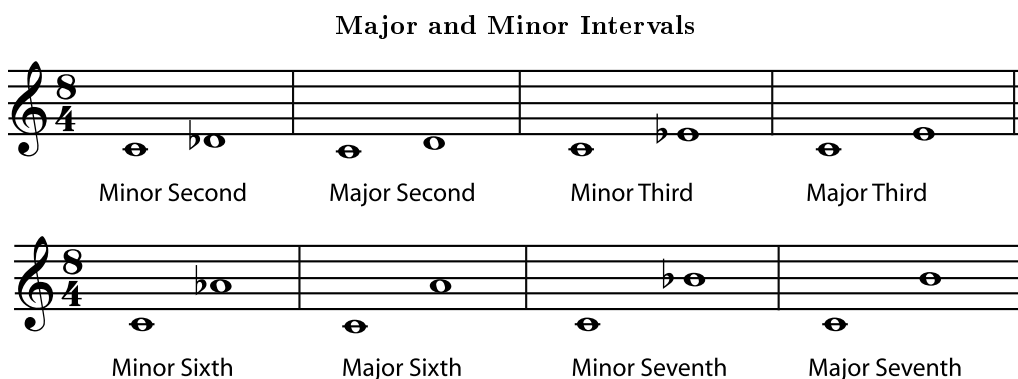


Figure 1.21

⁵²<http://cnx.org/content/m10867/latest/P8.mp3>

⁵³<http://cnx.org/content/m10867/latest/P4.mp3>

⁵⁴<http://cnx.org/content/m10867/latest/P5.mp3>

Listen to the minor second⁵⁵, major second⁵⁶, minor third⁵⁷, major third⁵⁸, minor sixth⁵⁹, major sixth⁶⁰, minor seventh⁶¹, and major seventh⁶².

Exercise 1.6

(Solution on p. 24.)

Give the complete name for each interval.

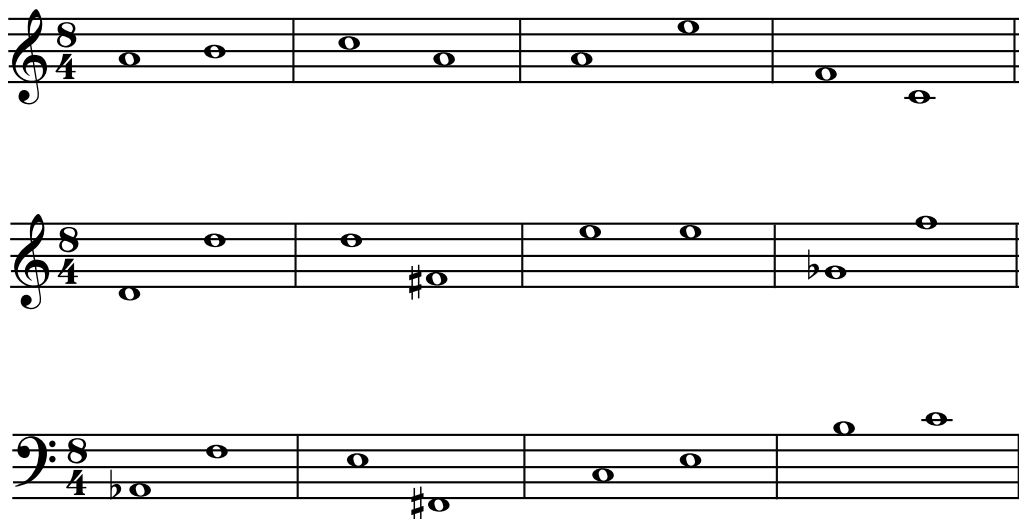


Figure 1.22

Exercise 1.7

(Solution on p. 25.)

Fill in the second note of the interval given.

⁵⁵<http://cnx.org/content/m10867/latest/min2.mp3>

⁵⁶<http://cnx.org/content/m10867/latest/M2.mp3>

⁵⁷<http://cnx.org/content/m10867/latest/min3.mp3>

⁵⁸<http://cnx.org/content/m10867/latest/M3.mp3>

⁵⁹<http://cnx.org/content/m10867/latest/min6.mp3>

⁶⁰<http://cnx.org/content/m10867/latest/M6.mp3>

⁶¹<http://cnx.org/content/m10867/latest/min7.mp3>

⁶²<http://cnx.org/content/m10867/latest/M7.mp3>

Figure 1.23 displays musical notation for intervals relative to a central note (G4) across three staves. The intervals are labeled as follows:

- Staff 1 (Treble Clef): P5 higher, P4 lower, m2 lower, Pprime
- Staff 2 (Treble Clef): M3 higher, m7 lower, P 8ve higher, M6 higher
- Staff 3 (Bass Clef): m6 lower, M2 higher, P5 lower, m3 higher

Figure 1.23

1.3.3.3 Augmented and Diminished Intervals

If an interval is a half-step larger than a perfect or a major interval, it is called **augmented**. An interval that is a half-step smaller than a perfect or a minor interval is called **diminished**. A double sharp⁶³ or double flat⁶⁴ is sometimes needed to write an augmented or diminished interval correctly. Always remember, though, that it is the actual distance in half steps between the notes that determines the type of interval, not whether the notes are written as natural, sharp, or double-sharp.

Example 1.6

Some Diminished and Augmented Intervals

Figure 1.24 displays musical notation for augmented and diminished intervals across two staves. The intervals are labeled as follows:

- Staff 1 (Treble Clef): Augmented Prime, Diminished Second, Augmented Third, Diminished Sixth
- Staff 2 (Treble Clef): Augmented Seventh, Diminished Octave, Augmented Fourth, Diminished Fifth

Figure 1.24

⁶³"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0f>>

⁶⁴"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0f>>

Listen to the augmented prime⁶⁵, diminished second⁶⁶, augmented third⁶⁷, diminished sixth⁶⁸, augmented seventh⁶⁹, diminished octave⁷⁰, augmented fourth⁷¹, and diminished fifth⁷². Are you surprised that the augmented fourth and diminished fifth sound the same?

Exercise 1.8

(Solution on p. 25.)

Write a note that will give the named interval.

Augmented Octave Higher Diminished Sixth Lower Augmented Fourth Higher Diminished Second Lower

Augmented Prime Higher Diminished Seventh Lower Augmented Third Higher Diminished Fifth Lower

Figure 1.25

As mentioned above, the diminished fifth and augmented fourth sound the same. Both are six half-steps, or *three whole tones*, so another term for this interval is a **tritone**. In Western Music⁷³, this unique interval, which cannot be spelled as a major, minor, or perfect interval, is considered unusually dissonant (Section 3.5) and unstable (tending to want to resolve (p. 66) to another interval).

You have probably noticed by now that the tritone is not the only interval that can be "spelled" in more than one way. In fact, because of enharmonic spellings⁷⁴, the interval for any two pitches can be written in various ways. A major third could be written as a diminished fourth, for example, or a minor second as an augmented prime. *Always classify the interval as it is written; the composer had a reason for writing it that way.* That reason sometimes has to do with subtle differences in the way different written notes will be interpreted by performers, but it is mostly a matter of placing the notes correctly in the context of the key (Section 2.1), the chord⁷⁵, and the evolving harmony⁷⁶. (Please see Beginning Harmonic Analysis (Section 3.3) for more on that subject.)

⁶⁵<http://cnx.org/content/m10867/latest/aug1.mid>

⁶⁶<http://cnx.org/content/m10867/latest/dim2.mid>

⁶⁷<http://cnx.org/content/m10867/latest/aug3.mid>

⁶⁸<http://cnx.org/content/m10867/latest/dim6.mid>

⁶⁹<http://cnx.org/content/m10867/latest/aug7.mid>

⁷⁰<http://cnx.org/content/m10867/latest/dim8.mid>

⁷¹<http://cnx.org/content/m10867/latest/aug4.mid>

⁷²<http://cnx.org/content/m10867/latest/dim5.mid>

⁷³"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁷⁴"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

⁷⁵"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

⁷⁶"Harmony" <<http://cnx.org/content/m11654/latest/>>

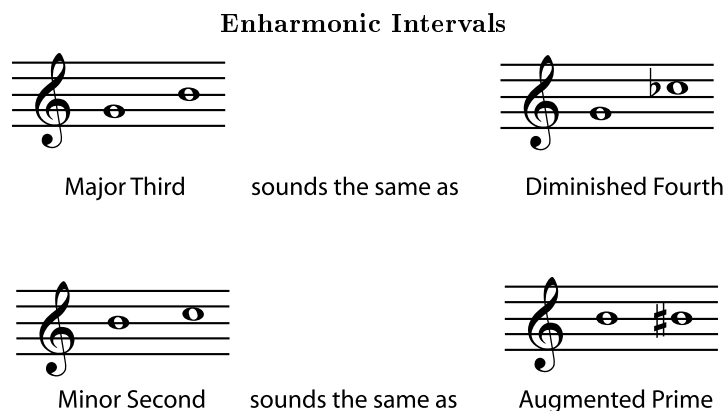


Figure 1.26: Any interval can be written in a variety of ways using enharmonic⁷⁷ spelling. Always classify the interval as it is written.

1.3.4 Inverting Intervals

To **invert** any interval, simply imagine that one of the notes has moved one octave, so that the higher note has become the lower and vice-versa. Because inverting an interval only involves moving one note by an octave (it is still essentially the "same" note in the tonal system), intervals that are **inversions** of each other have a very close relationship in the tonal (Section 1.1) system.

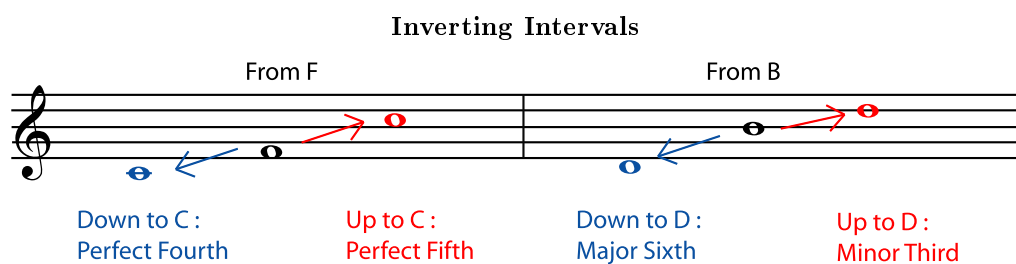
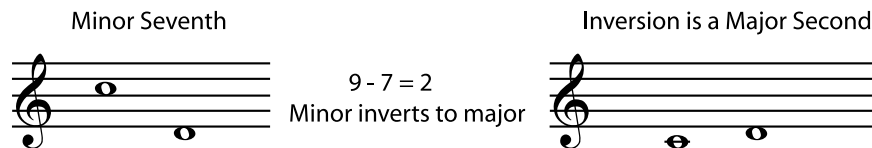


Figure 1.27

To find the inversion of an interval

1. To name the new interval, subtract the name of the old interval from 9.
2. The inversion of a perfect interval is still perfect.
3. The inversion of a major interval is minor, and of a minor interval is major.
4. The inversion of an augmented interval is diminished and of a diminished interval is augmented.

⁷⁷"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

Example 1.7**Figure 1.28****Exercise 1.9***(Solution on p. 26.)*

What are the inversions of the following intervals?

1. Augmented third
2. Perfect fifth
3. Diminished fifth
4. Major seventh
5. Minor sixth

1.4 Ear Training⁷⁸

1.4.1 What is Ear Training?

When musicians talk about **ear**, they don't mean the sense organ itself so much as the brain's ability to perceive, distinguish, and understand what the ear has heard. The term **ear training** refers to teaching musicians to recognize information about notes⁷⁹ and chords⁸⁰ just by hearing them. (You can check your "ear" by trying this ear training game⁸¹.)

A few people have what is called **perfect pitch** or **absolute pitch**. These people, when they hear music, can tell you exactly what they are hearing: the G above middle C (p. 3), for example, or the first inversion (Section 3.1.2: First and Second Inversions) of an F minor chord (Section 3.2.1: Major and Minor Chords). A few musicians with particularly perceptive ears can even tell you that a piano is tuned a few cents⁸² higher than the one that they play at home. This is an unusual skill that even most trained musicians do not have, and research seems to suggest that if you don't have it at a very early age, you cannot develop it. (For more on this subject, you may want to look up Robert Jourdain's *Music, the Brain, and Ecstasy: How Music Captures our Imagination*.)

However, most musicians can be trained to recognize **relative pitch**. In other words, if you play two notes, they can tell you that one of them is a major third (Major and Minor Intervals, p. 13) higher than the other. If you play four chords⁸³ in a row, they can tell you that you played a tonic-subdominant-dominant seventh-tonic (I-IV-V7-I) chord progression⁸⁴.

⁷⁸This content is available online at <<http://cnx.org/content/m12401/1.12/>>.

⁷⁹"Duration: Note Lengths in Written Music" <<http://cnx.org/content/m10945/latest/>>

⁸⁰"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

⁸¹<http://cnx.org/content/m12401/latest/EarTraining.exe>

⁸²"Tuning Systems" <<http://cnx.org/content/m11639/latest/#p3d>>

⁸³"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

⁸⁴"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

Fortunately, having relative pitch is good enough, and for many musicians may even be more useful than perfect pitch, because of the way Western⁸⁵ music is conceived. Since all major keys (Section 2.1) are so similar, a piece in a major key will sound almost exactly the same whether you play it in C major or D major. The thing that matters is not what note you start on, but how all the notes are related to each other and to the "home" note (the tonic (p. 28)) of the key. If someone really wants the piece to be in a different key (because it's easier to sing or play in that key, or just because they want it to sound higher or lower), the whole thing can be transposed⁸⁶, but the only difference that would make (in the sound) is that the entire piece will sound higher or lower. Most listeners would not even notice the difference, unless you played it in both keys, one right after the other.

NOTE: All minor keys (Section 2.2) are also heard by most listeners as interchangeable, but there are important differences between major keys and minor keys. In fact, the differences in sound between a major key and a minor key is one of the first differences that a musician should be able to hear. If you would like to see whether your "ear" can recognize the difference between major and minor keys, please try the listening exercise (Exercise 2.1) in Major Keys and Scales (Exercise 2.1).

So, you often don't need to know exactly what notes or chords are being played. Simply having an ear well-trained in "relative pitch" is extremely useful in many ways. Guitar and piano players can figure out chord progressions⁸⁷ just by listening to them, and then play the progressions in their favorite keys. Other instrumentalists can play a favorite tune without a written copy of it, just by knowing what the interval to the next note must be. Composers and music arrangers can jot down a piece of music without having to "pick it out" on an instrument to find the notes and chords they want. And of course, ear training is crucial to any musician who wants to play jazz or any type of improvisation. Given a well-trained "ear", any musical idea that you "hear" in your head, you can play. And ear training is also crucial for those interested in music theory, musicology, or just being able to write down a tune accurately.

As with all other musical skills, there are many different levels and kinds of proficiency. One musician may be very good at "playing by ear", but may not even read music and cannot name intervals (Section 1.3) or write the music down. Another may be very good at "taking dictation" (writing down the music they hear), and yet feel unable to do jazz improvisation. As always, the key is to practice the particular skills that you want to develop.

1.4.2 Ear Training Skills

1.4.2.1 Tuning

This is the most basic ear training skill, crucial to being able to play music that people will want to hear.

Suggestions

- At the beginner level, work with a skilled musician who can teach you how to tune your instrument and help you identify and fix tuning problems.
- Play with other musicians often. (Playing along with recordings does not teach good tuning skills.) Don't just tune at the beginning of rehearsals and performances. Listen at all times and be ready to retune any note whenever necessary.
- Spend as much time as necessary tuning whenever you play. Do not (knowingly) practice while out of tune; if you do, it will slow down your ear training tremendously. Whenever possible, until you are good at tuning, get someone else to help you tune every time you play.
- Practice tuning quickly and accurately. Learn any alternate fingerings and other "tricks" available on your instrument for fine-tuning each note as you play.

⁸⁵"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁸⁶"Transposition: Changing Keys" <<http://cnx.org/content/m10668/latest/>>

⁸⁷"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

1.4.2.2 Playing Chords By Ear

For instruments that play chordal accompaniments, this is an incredibly useful skill.

Suggestions

- You do not have to learn to read music to be able to do this, but it is very helpful to know a little bit about music theory so that you can predict which chords are most likely to happen in a song. Try starting with *Beginning Harmonic Analysis* (Section 3.3).
- Really listen to the chord progressions to the songs you do know. What do they sound like? Play the same progressions in different keys and listen to how that does and also does not change the sound of the progression. Change the bass notes of the chords to see how that changes the sound of the progression to your ears. Change fingerings and chord voicings, and again listen carefully to how that changes the sound to your ears.
- Practice figuring out the chords to familiar songs (that you don't know the chords to). For songs that you do know the chords to, try playing them in an unfamiliar key, or see if you can change or add chords to make a new harmony that still fits the melody.
- A teacher who understands harmony can help tremendously with this particular skill. Even if you don't normally take lessons, you might want to consider having a series of lessons on this. Find a teacher who is willing and able to teach you specifically about harmony and typical chord progressions.

1.4.2.3 Playing Tunes by Ear

This is fun to be able to do, makes it easy to increase your repertoire, and is an important step in being able to improvise.

Suggestions

- Just do it! The best way to learn this skill is to spend some of your practice time trying to play tunes you know and like.
- Once you start getting good at this, see how quickly you can get a new tune down. How few mistakes can you make the first time you try it? Can you "recover" quickly from a mistake by making it sound like a bit of improvisation?
- If you play a melody instrument (one that plays only one note at a time), there are different bits of information that help you recognize what the next note will be: how far it is from the note you are on (see Interval (Section 1.3)), where it is in the key (see *Beginning Harmonic Analysis* (Section 3.3)) or where it is in the chord (see Triads (Section 3.1)). These three things are all related to each other, of course - and a musician with a well-trained ear will be aware of all of them, at least subconsciously - but you may find at first that one works better for you than the others. You may want to experiment: is it easier for you to think of the next note as being a perfect fourth higher than the note you are on, or as being the root of the chord, or as being the fifth note in the scale of the key?
- As of this writing, [petersax-online](http://www.petersax.com)⁸⁸ had many exercises graded from simple to more difficult to help the beginner practice playing what you hear.

1.4.2.4 Improvisation

This is *the* skill you need for jazz. Blues, rock, and many Non-Western⁸⁹ traditions also use improvisation.

Suggestions

- Know your scales and arpeggios. A good improviser, given the name of a chord, can quickly play not only the notes of the chord but also the scale implied by the chord. Any decent book on playing jazz, or any teacher familiar with jazz, will introduce the student to these chords and scales.

⁸⁸<http://www.petersax.com>

⁸⁹"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

- There are now many book/CD combinations available to help the beginning improviser in many different genres and on many different instruments. A good book of this type will give the student a chance to improvise on many familiar tunes, and some also introduce the music theory involved. At the time of this writing, one source of a large variety of such books was jazzbooks.com⁹⁰.
- The exercises at the [petersax](http://www.petersax.com)⁹¹ site mentioned above would also be useful for the beginning improviser.
- Listen to jazz often. Listen to the improvisers you admire, and if a particular solo really appeals to you, listen to it many times, find the notes on your instrument, and then try writing it down as accurately as you can. Many famous improvisors, when interviewed, mention how useful it was to them to learn from other soloists by **transcribing** their solos in this way.
- Figure out how to play your favorite jazz (or blues or rock) **licks** (short motives⁹² that show up in many pieces in the same genre) on your instrument. Practice stringing them together in ways that make sense to you, but are different from what you've heard. Add your own variations.
- Find a teacher who is familiar with the type of improvisation you want to learn, join a jazz band, and/or get together with other musicians who also want to practise improvisation and take turns playing background/rhythm for each other.

1.4.2.5 Recognizing Intervals and Writing Music Down

This is the skill that allowed Beethoven to continue composing masterpieces even after he became deaf. If you are interested in composing, arranging, music theory, musicology, or just being able to write down a tune quickly and accurately, you'll want to be able to make that quick connection between what you hear and written music.

Suggestions

- Before you can do this, you must know your major (Section 2.1) and minor (Section 2.2) keys and scales and your Intervals (Section 1.3). You may also want to understand Transposition⁹³, since you may find it easier to work in some keys than in others.
- Here is a game⁹⁴ you can play to practice identifying intervals when you hear them. It's an application (.exe file) that you can play in Windows. Or you can play the same game with a friend. Sit back-to-back and take turns playing intervals and guessing what was just played. If you get good at guessing intervals, see if you can guess the exact notes that were played. (You may be surprised at how well you can guess the exact notes if they are played on an instrument that you play often.)
- As of this writing, Teoria Musical⁹⁵ was a free ear training website that worked well.
- Once again, practice is the best way to become good at this. Start with tunes that you know well, but don't know what the (written) notes are. Listen to them in your head (or play a recording) while trying to write them down. Then play what you have written, noticing where you were correct and where you made mistakes. Which intervals are you good at hearing? Which do you have trouble identifying? Do you often mistake one particular interval for another? Do you tend to identify a note by its interval from the previous note or by its place in the chord or in the key? Answering these questions will help you improve more quickly.
- Some people find it easier to learn to recognize intervals if they associate each interval with a familiar tune. (For example, in the familiar song from *The Sound of Music* that begins "Do, a deer, a female deer...", all the intervals in the phrase "a female deer" are major thirds, and every interval in the phrase "someday I'll wish upon a star" in the song "Somewhere Over the Rainbow" is a minor third.) The tune should be very familiar, so when trying to hear a tritone (p. 16), some people will prefer thinking of the beginning of "The Simpsons" theme; others will prefer the beginning of "Maria" from

⁹⁰<http://www.jazzbooks.com>

⁹¹<http://www.petersax.com>

⁹²"Melody": Section Motif <<http://cnx.org/content/m11647/latest/#s3>>

⁹³"Transposition: Changing Keys" <<http://cnx.org/content/m10668/latest/>>

⁹⁴<http://cnx.org/content/m12401/latest/EarTraining.exe>

⁹⁵<http://www.teoriamusical.net>

West Side Story. If you think this method will work for you, try playing the interval you are having trouble hearing, and see what tune it reminds you of.

Solutions to Exercises in Chapter 1

Solution to Exercise 1.1 (p. 3)

Figure 1.29 shows the solution to Exercise 1.1, consisting of two staves of music in common time (C). The treble staff contains the notes: f^i , d^{ii} , B, e, b^i , g, g^{ii} , and d^{iii} . The bass staff contains the notes: d, G, e^i , AA, E, a, FF, and a^i .

Figure 1.29

Solution to Exercise 1.2 (p. 8)

Figure 1.30 shows the solution to Exercise 1.2, consisting of two staves of music in 8/4 time. The treble staff contains the notes: C, E, G, B, D, F#, A, C. The bass staff contains the notes: C, E, G, B, D, F#, A, C. The intervals between consecutive notes are labeled below each staff.

Treble staff intervals: 3 half steps ($1\frac{1}{2}$ steps), 4 half steps (2 whole steps), 8 half steps (4 whole steps), 7 half steps ($3\frac{1}{2}$ steps).

Bass staff intervals: 5 half steps ($2\frac{1}{2}$ steps), 6 half steps (3 whole steps), 7 half steps ($3\frac{1}{2}$ steps), 9 half steps ($4\frac{1}{2}$ steps).

Figure 1.30

Solution to Exercise 1.3 (p. 8)

5 half steps higher 1 whole step lower 2 whole steps lower 9 half steps lower

1 whole step higher 1 half step lower 2 whole steps higher 11 half steps lower

3 whole steps higher 3 half steps lower 1 half steps higher 7 half steps lower

Figure 1.31: If your answer is different, check to see if you have written a different enharmonic spelling⁹⁶ of the note in the answer. For example, the B flat could be written as an A sharp.

Solution to Exercise 1.4 (p. 11)

Third Fifth Octave Second Seventh Fourth

Figure 1.32

Solution to Exercise 1.5 (p. 11)

Second Lower Octave Lower Fifth Higher Third Higher Sixth Higher Fourth Lower

Figure 1.33

Solution to Exercise 1.6 (p. 14)

⁹⁶"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

Figure 1.34 displays three rows of musical exercises, each consisting of four measures. The first two rows are in treble clef (8/4 time), and the third row is in bass clef (8/4 time). Each measure contains two notes representing a specific interval.

Row 1 (Treble Clef):

- Major Second
- Minor Third
- Perfect Fifth
- Perfect Fourth

Row 2 (Treble Clef):

- Perfect Octave
- Minor Sixth
- Unison (Perfect prime)
- Major Seventh

Row 3 (Bass Clef):

- Major Sixth
- Minor Seventh
- Major Third
- Minor Second

Figure 1.34

Solution to Exercise 1.7 (p. 14)

Figure 1.35 displays three rows of musical exercises, each consisting of four measures. The first two rows are in treble clef (8/4 time), and the third row is in bass clef (8/4 time). Each measure contains two notes representing a specific interval solution.

Row 1 (Treble Clef):

- P5 higher
- P4 lower
- m2 lower
- Pprime

Row 2 (Treble Clef):

- M3 higher
- m7 lower
- P 8ve higher
- M6 higher

Row 3 (Bass Clef):

- m6 lower
- M2 higher
- P5 lower
- m3 higher

Figure 1.35

Solution to Exercise 1.8 (p. 16)

Figure 1.36 displays musical notation for intervals in two staves. The top staff is in treble clef (8/4 time) and the bottom staff is in bass clef (8/4 time). Each staff contains four measures, each with a pair of notes representing an interval.

Treble Staff Intervals:

- Measure 1: Augmented Octave Higher (C4 to E5#)
- Measure 2: Diminished Sixth Lower (B4 to A#3)
- Measure 3: Augmented Fourth Higher (C4 to F#4)
- Measure 4: Diminished Second Lower (B4 to A#4)

Bass Staff Intervals:

- Measure 1: Augmented Prime Higher (C4 to C#4)
- Measure 2: Diminished Seventh Lower (B4 to A#3)
- Measure 3: Augmented Third Higher (C4 to E#4)
- Measure 4: Diminished Fifth Lower (B4 to F#3)

Figure 1.36

Solution to Exercise 1.9 (p. 18)

1. Diminished sixth
2. Perfect fourth
3. Augmented fourth
4. Minor second
5. Major third

Chapter 2

Keys and Scales

2.1 Major Keys and Scales¹

The simple, sing-along, nursery rhymes and folk songs we learn as children; the "catchy" tunes used in advertising jingles; the cheerful, toe-tapping pop and rock we dance to; the uplifting sounds of a symphony: most music in a major key has a bright sound that people often describe as cheerful, inspiring, exciting, or just plain fun.

How are these moods produced? Music in a particular **key** tends to use only some of the many possible notes available; these notes are listed in the **scale** associated with that key. In major keys, the notes of the scale are often used to build "bright"-sounding major chords (Section 3.2). They also give a strong feeling of having a tonal center (p. 28), a note or chord that feels like "home", or "the resting place", in that key. The "bright"-sounding major chords and the strong feeling of tonality are what give major keys their happy, pleasant moods. This contrasts with the moods usually suggested by music that uses minor (Section 2.2) keys, scales, and chords. Although it also has a strong tonal center (the Western² tradition of tonal harmony³ is based on major and minor keys and scales), music in a minor key is more likely to sound sad, ominous, or mysterious. In fact, most musicians, and even many non-musicians, can distinguish major and minor keys just by listening to the music.

Exercise 2.1

(Solution on p. 40.)

Listen to these excerpts. Three are in a major key and two in a minor key. Can you tell which is which simply by listening?

- 1.⁴
- 2.⁵
- 3.⁶
- 4.⁷
- 5.⁸

NOTE: If you must determine whether a piece of music is major or minor, and cannot tell just by listening, you may have to do some simple harmonic analysis (Section 3.3.5: Minor Keys) in order to decide.

¹This content is available online at <<http://cnx.org/content/m10851/2.20/>>.

²"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

³"Harmony" <<http://cnx.org/content/m11654/latest/>>

⁴<http://cnx.org/content/m10851/latest/Guitar1.mp3>

⁵<http://cnx.org/content/m10851/latest/Guitar2.mp3>

⁶<http://cnx.org/content/m10851/latest/Guitar3.mp3>

⁷<http://cnx.org/content/m10851/latest/Tanz.mp3>

⁸<http://cnx.org/content/m10851/latest/Greensleeves.mp3>

2.1.1 Tonal Center

A scale starts with the note that names the key. This note is the **tonal center** of that key, the note where music in that key feels "at rest". It is also called the **tonic**, and it's the "do" in "do-re-mi". For example, music in the key of A major almost always ends on an A major chord, the chord⁹ built on the note A. It often also begins on that chord, returns to that chord often, and features a melody and a bass line that also return to the note A often enough that listeners will know where the tonal center of the music is, even if they don't realize that they know it. (For more information about the tonic chord and its relationship to other chords in a key, please see Beginning Harmonic Analysis (Section 3.3).)

Example 2.1

Listen to these examples. Can you hear that they do not feel "done" until the final tonic is played?

- Example A¹⁰
- Example B¹¹

2.1.2 Major Scales

To find the rest of the notes in a major key, start at the tonic and go up following this pattern: *whole step, whole step, half step, whole step, whole step, whole step, half step*. This will take you to the tonic one octave higher than where you began, and includes all the notes in the key in that octave.

Example 2.2

These major scales all follow the same pattern of whole steps and half steps. They have different sets of notes because the pattern starts on different notes.

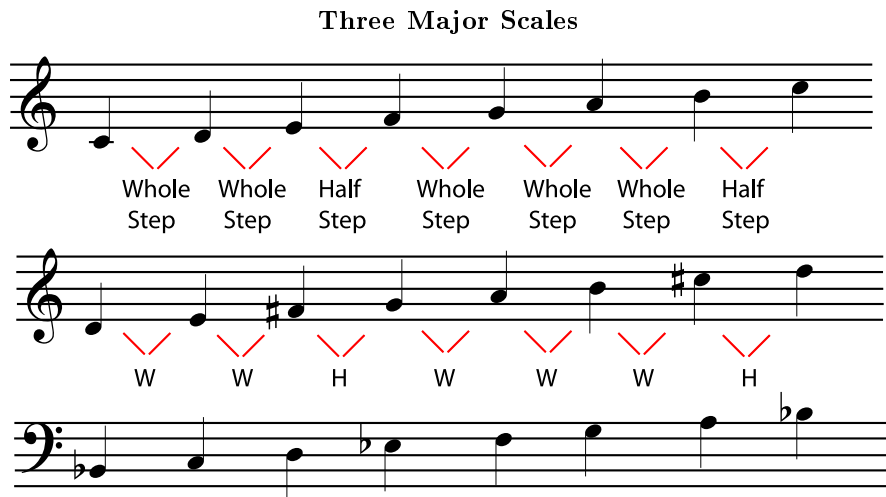


Figure 2.1: All major scales have the same pattern of half steps and whole steps, beginning on the note that names the scale - the tonic (p. 28).

⁹"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

¹⁰<http://cnx.org/content/m10851/latest/Tonal1.MID>

¹¹<http://cnx.org/content/m10851/latest/tonic2.MID>

Listen to the difference between the C major¹² , D major¹³ , and B flat major¹⁴ scales.

Exercise 2.2

(Solution on p. 40.)

For each note below, write a major scale, one octave, ascending (going up), beginning on that note. If you're not sure whether a note should be written as a flat, sharp, or natural, remember that you won't ever skip a line or space, or write two notes of the scale on the same line or space. If you need help keeping track of half steps, use a keyboard, a picture of a keyboard (Figure 1.6: Keyboard), a written chromatic scale (p. 6), or the chromatic scale fingerings for your instrument. If you need more information about half steps and whole steps, see Half Steps and Whole Steps (Section 1.2).

If you need staff paper for this exercise, you can print out this staff paper¹⁵ PDF file.

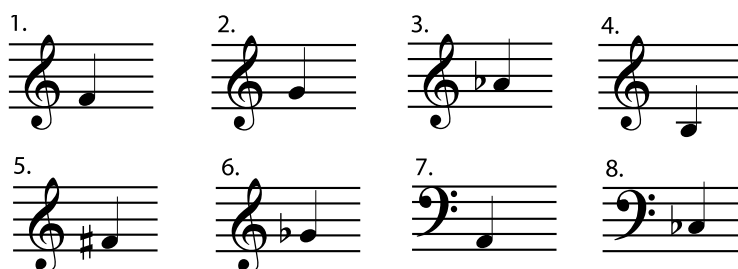


Figure 2.2

In the examples above, the sharps and flats are written next to the notes. In common notation, the sharps and flats *that belong in the key* will be written at the beginning of each staff, in the **key signature**. For more practice identifying keys and writing key signatures, please see Key Signature¹⁶. For more information about how keys are related to each other, please see The Circle of Fifths (Section 2.3).

2.1.3 Music in Different Keys

What difference does key make? Since the major scales all follow the same pattern, they all sound very much alike. Here is a folk tune ("The Saucy Sailor") written in D major and in F major.

¹²<http://cnx.org/content/m10851/latest/tonmjC.mp3>

¹³<http://cnx.org/content/m10851/latest/tonmjD.mp3>

¹⁴<http://cnx.org/content/m10851/latest/tonmjBflat.mp3>

¹⁵<http://cnx.org/content/m10851/latest/staffpaper1.pdf>

¹⁶"Key Signature" <<http://cnx.org/content/m10881/latest/>>

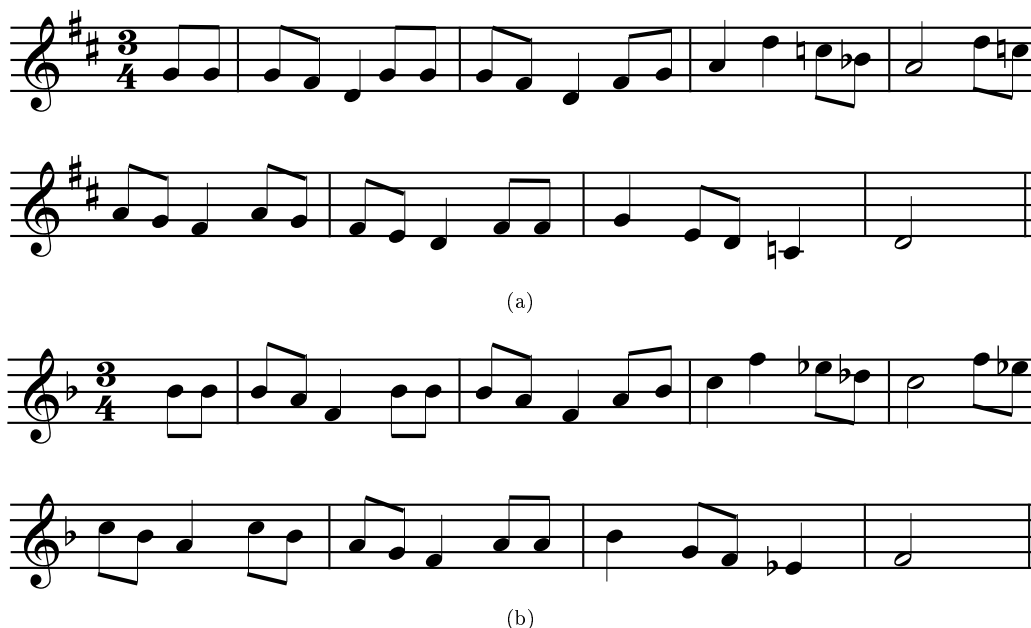


Figure 2.3: The same tune looks very different written in two different major keys.

Listen to this tune in D major¹⁷ and in F major¹⁸. The music may look quite different, but the only difference when you listen is that one sounds higher than the other. So why bother with different keys at all? Before equal temperament¹⁹ became the standard tuning system, major keys sounded more different from each other than they do now. Even now, there are subtle differences between the sound of a piece in one key or another, mostly because of differences in the timbre²⁰ of various notes on the instruments or voices involved. But today the most common reason to choose a particular key is simply that the music is easiest to sing or play in that key. (Please see Transposition²¹ for more about choosing keys.)

2.2 Minor Keys and Scales²²

2.2.1 Music in a Minor Key

Each major key (Section 2.1) uses a different set of notes²³ (its major scale (Section 2.1.2: Major Scales)). In each major scale, however, the notes are arranged in the same major scale pattern and build the same types of chords that have the same relationships with each other. (See Beginning Harmonic Analysis (Section 3.3) for more on this.) So music that is in, for example, C major, will not sound significantly different from music that is in, say, D major. But music that is in D minor will have a different quality, because the notes in the minor scale follow a different pattern and so have different relationships with each other. Music in

¹⁷<http://cnx.org/content/m10851/latest/SaucySailorD.MID>

¹⁸<http://cnx.org/content/m10851/latest/SaucySailorF.MID>

¹⁹"Tuning Systems": Section Equal Temperament <<http://cnx.org/content/m11639/latest/#s22>>

²⁰"Timbre: The Color of Music" <<http://cnx.org/content/m11059/latest/>>

²¹"Transposition: Changing Keys" <<http://cnx.org/content/m10668/latest/>>

²²This content is available online at <<http://cnx.org/content/m10856/2.18/>>.

²³"Duration: Note Lengths in Written Music" <<http://cnx.org/content/m10945/latest/>>

minor keys has a different sound and emotional feel, and develops differently harmonically. So you can't, for example, transpose²⁴ a piece from C major to D minor (or even to C minor) without changing it a great deal. Music that is in a minor key is sometimes described as sounding more solemn, sad, mysterious, or ominous than music that is in a major key. To hear some simple examples in both major and minor keys, see Major Keys and Scales (Exercise 2.1).

2.2.2 Minor Scales

Minor scales sound different from major scales because they are based on a different pattern of intervals (Section 1.3). Just as it did in major scales, starting the minor scale pattern on a different note will give you a different key signature²⁵, a different set of sharps or flats. The scale that is created by playing all the notes in a minor key signature is a **natural minor scale**. To create a natural minor scale, start on the tonic note (p. 28) and go up the scale using the interval pattern: *whole step, half step, whole step, whole step, half step, whole step, whole step*.

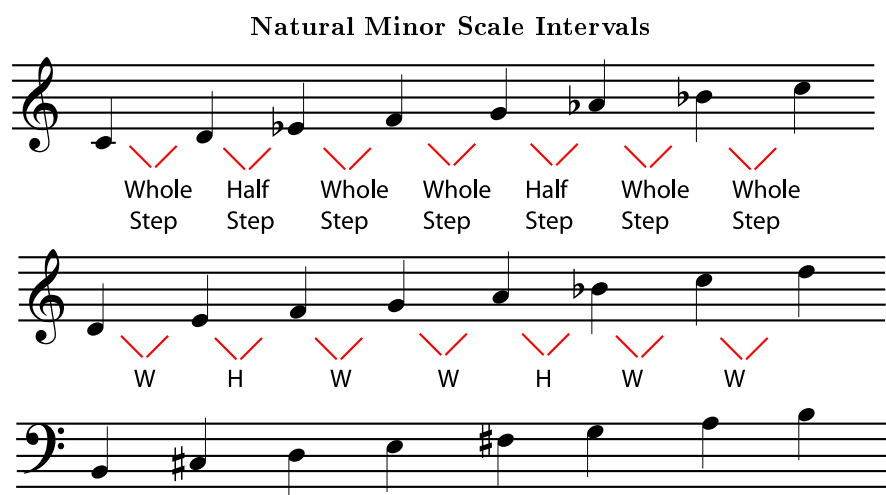


Figure 2.4

Listen²⁶ to these minor scales.

Exercise 2.3

(Solution on p. 41.)

For each note below, write a natural minor scale, one octave, ascending (going up) beginning on that note. If you need staff paper, you may print the staff paper²⁷ PDF file.

²⁴"Transposition: Changing Keys" <<http://cnx.org/content/m10668/latest/>>

²⁵"Key Signature" <<http://cnx.org/content/m10881/latest/>>

²⁶<http://cnx.org/content/m10856/latest/3a.mid>

²⁷<http://cnx.org/content/m10856/latest/staffpaper1.pdf>

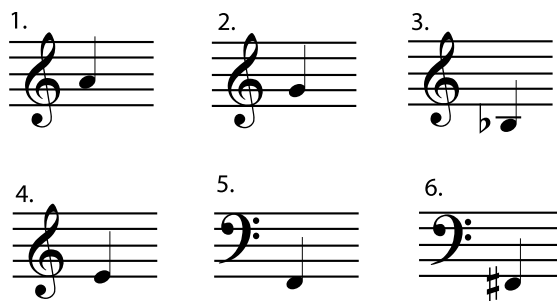


Figure 2.5

2.2.3 Relative Minor and Major Keys

Each minor key shares a key signature²⁸ with a major key. A minor key is called the **relative minor** of the major key that has the same key signature. Even though they have the same key signature, a minor key and its **relative major** sound very different. They have different tonal centers (p. 28), and each will feature melodies, harmonies, and chord progressions²⁹ built around their (different) tonal centers. In fact, certain strategic accidentals³⁰ are very useful in helping establish a strong tonal center in a minor key. These useful accidentals are featured in the melodic minor (Section 2.2.3: Relative Minor and Major Keys) and harmonic minor (Section 2.2.3: Relative Minor and Major Keys) scales.

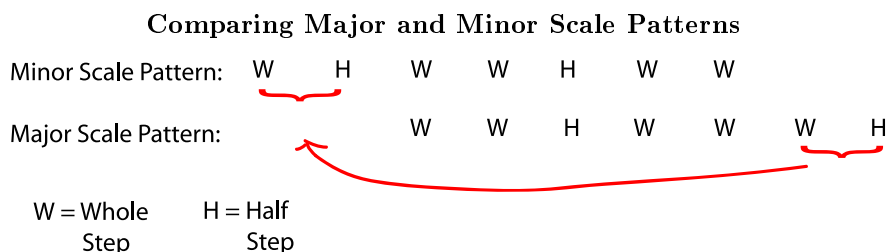


Figure 2.6: The interval patterns for major and natural minor scales are basically the same pattern starting at different points.

It is easy to predict where the relative minor of a major key can be found. Notice that the pattern for minor scales overlaps the pattern for major scales. In other words, they are the same pattern starting in a different place. (If the patterns were very different, minor key signatures would not be the same as major key signatures.) The pattern for the minor scale starts a half step plus a whole step lower than the major scale pattern, so a *relative minor is always three half steps lower than its relative major*. For example, C minor has the same key signature as E flat major, since E flat is a minor third higher than C.

²⁸"Key Signature" <<http://cnx.org/content/m10881/latest/>>

²⁹"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

³⁰"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

Relative Minor

C major: no flats or sharps



C minor: three flats



E flat major: three flats



Figure 2.7: The C major and C minor scales start on the same note, but have different key signatures. C minor and E flat major start on different notes, but have the same key signature. C minor is the **relative minor** of E flat major.

Exercise 2.4

(Solution on p. 42.)

What are the relative majors of the minor keys in Figure 2.5?

2.2.4 Harmonic and Melodic Minor Scales

All of the scales above are **natural minor scales**. They contain only the notes in the minor key signature. There are two other kinds of minor scales that are commonly used, both of which include notes that are not in the key signature. The **harmonic minor scale** raises the seventh note of the scale by one half step, whether you are going up or down the scale. Harmonies in minor keys often use this raised seventh tone in order to make the music feel more strongly centered on the tonic (p. 28). (Please see Beginning Harmonic Analysis (Section 3.3.5: Minor Keys) for more about this.) In the **melodic minor scale**, the sixth and seventh notes of the scale are each raised by one half step when going up the scale, but return to the natural minor when going down the scale. Melodies in minor keys often use this particular pattern of accidentals³¹, so instrumentalists find it useful to practice melodic minor scales.

³¹"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

Comparing Types of Minor Scales



Figure 2.8

Listen to the differences between the natural minor³², harmonic minor³³, and melodic minor³⁴ scales.

Exercise 2.5

(Solution on p. 42.)

Rewrite each scale from Figure 2.5 as an ascending harmonic minor scale.

Exercise 2.6

(Solution on p. 43.)

Rewrite each scale from Figure 2.5 as an ascending and descending melodic minor scale.

2.2.5 Jazz and "Dorian Minor"

Major and minor scales are traditionally the basis for Western Music³⁵, but jazz theory also recognizes other scales, based on the medieval church modes³⁶, which are very useful for improvisation. One of the most useful of these is the scale based on the dorian mode, which is often called the **dorian minor**, since it has a basically minor sound. Like any minor scale, dorian minor may start on any note, but like dorian mode, it is often illustrated as natural notes beginning on d.

³²<http://cnx.org/content/m10856/latest/tonminnatural.mp3>

³³<http://cnx.org/content/m10856/latest/tonminharmonic.mp3>

³⁴<http://cnx.org/content/m10856/latest/tonminmelodic.mp3>

³⁵"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

³⁶"Modes and Ragas: More Than just a Scale" <<http://cnx.org/content/m11633/latest/#p2a>>



Figure 2.9: The "dorian minor" can be written as a scale of natural notes starting on d. Any scale with this interval pattern can be called a "dorian minor scale".

Comparing this scale to the natural minor scale makes it easy to see why the dorian mode sounds minor; only one note is different.

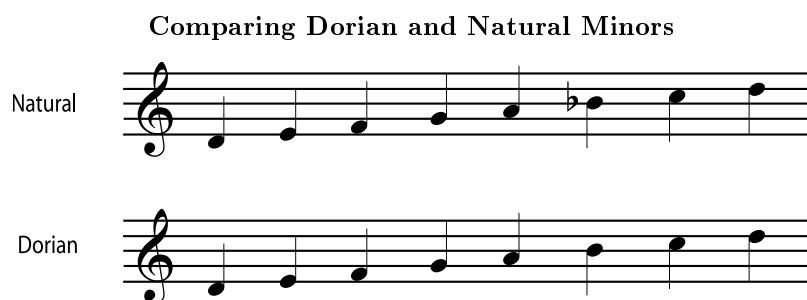


Figure 2.10

You may find it helpful to notice that the "relative major" of the Dorian begins one whole step lower. (So, for example, D Dorian has the same key signature as C major.) In fact, the reason that Dorian is so useful in jazz is that it is the scale used for improvising while a ii chord (Section 3.3.2: Basic Triads in Major Keys) is being played (for example, while a d minor chord is played in the key of C major), a chord which is very common in jazz. (See Beginning Harmonic Analysis (Section 3.3) for more about how chords are classified within a key.) The student who is interested in modal jazz will eventually become acquainted with all of the **modal scales**. Each of these is named for the medieval church mode³⁷ which has the same interval pattern, and each can be used with a different chord within the key. Dorian is included here only to explain the common jazz reference to the "dorian minor" and to give notice to students that the jazz approach to scales can be quite different from the traditional classical approach.

³⁷"Modes and Ragas: More Than just a Scale" <<http://cnx.org/content/m11633/latest/#p2a>>

Comparison of Dorian and Minor Scales

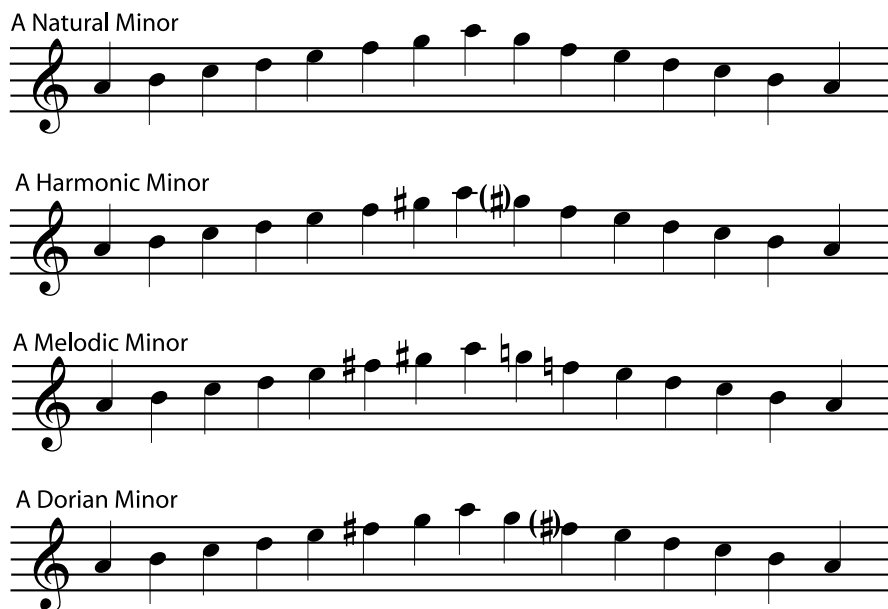


Figure 2.11: You may also find it useful to compare the dorian with the minor scales from Figure 2.8 (Comparing Types of Minor Scales). Notice in particular the relationship of the altered notes in the harmonic, melodic, and dorian minors.

2.3 The Circle of Fifths³⁸

2.3.1 Related Keys

The circle of fifths is a way to arrange keys to show how closely they are related to each other.

³⁸This content is available online at <http://cnx.org/content/m10865/2.11/>.

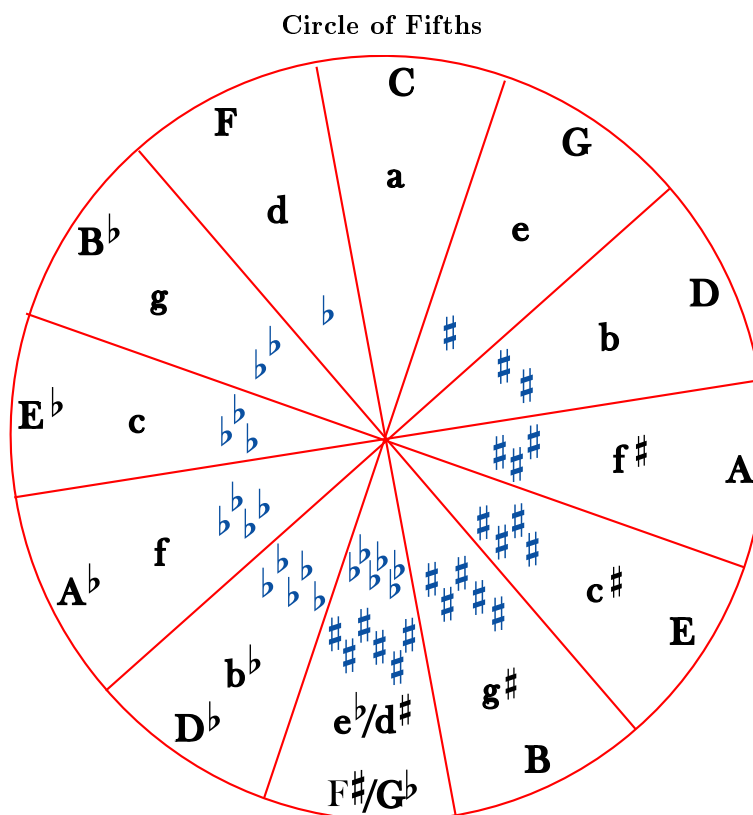


Figure 2.12: The major key for each key signature is shown as a capital letter; the minor key as a small letter. In theory, one could continue around the circle adding flats or sharps (so that B major is also C flat major, with seven flats, E major is also F flat major, with 6 flats and a double flat, and so on), but in practice such key signatures are very rare.

Keys are not considered closely related to each other if they are near each other in the chromatic scale (p. 6) (or on a keyboard). What makes two keys "closely related" is having similar key signatures³⁹. So the most closely related key to C major, for example, is A minor, since they have the same key signature (no sharps and no flats). This puts them in the same "slice" of the circle. The next most closely related keys to C major would be G major (or E minor), with one sharp, and F major (or D minor), with only one flat. The keys that are most distant from C major, with six sharps or six flats, are on the opposite side of the circle.

The circle of fifths gets its name from the fact that as you go from one section of the circle to the next, you are going up or down by an interval (Section 1.3) of a perfect fifth (Section 1.3.3.1: Perfect Intervals). If you go up a perfect fifth (clockwise in the circle), you get the key that has one more sharp or one less flat; if you go down a perfect fifth (counterclockwise), you get the key that has one more flat or one less sharp. Since going down by a perfect fifth is the same as going up by a perfect fourth (p. 12), the counterclockwise direction is sometimes referred to as a "circle of fourths". (Please review inverted intervals (Section 1.3.4: Inverting Intervals) if this is confusing.)

Example 2.3

The key of D major has two sharps. Using the circle of fifths, we find that the most closely related

³⁹"Key Signature" <<http://cnx.org/content/m10881/latest/>>

major keys (one in each direction) are G major, with only one sharp, and A major, with three sharps. The relative minors of all of these keys (B minor, E minor, and F sharp minor) are also closely related to D major.

Exercise 2.7*(Solution on p. 44.)*

What are the keys most closely related to E flat major? To A minor?

Exercise 2.8*(Solution on p. 44.)*

Name the major and minor keys for each key signature.



Figure 2.13

2.3.2 Key Signatures

If you do not know the order of the sharps and flats, you can also use the circle of fifths to find these. The first sharp in a key signature is always F sharp; the second sharp in a key signature is always (a perfect fifth away) C sharp; the third is always G sharp, and so on, all the way to B sharp.

The first flat in a key signature is always B flat (the same as the last sharp); the second is always E flat, and so on, all the way to F flat. Notice that, just as with the key signatures, you add sharps or subtract flats as you go clockwise around the circle, and add flats or subtract sharps as you go counterclockwise.

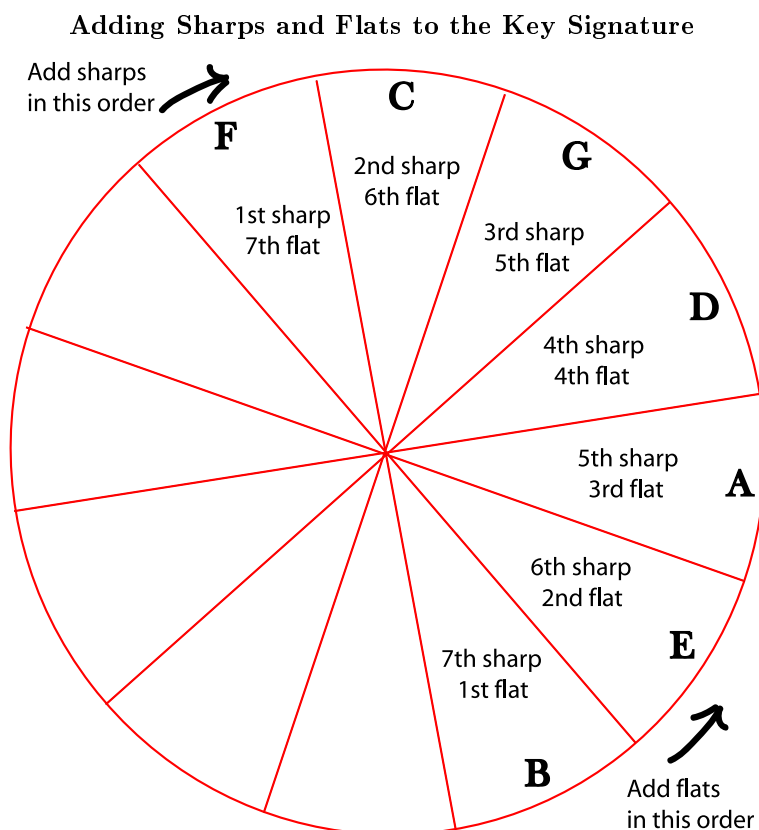


Figure 2.14: Each sharp and flat that is added to a key signature is also a perfect fifth away from the last sharp or flat that was added.

Exercise 2.9

(Solution on p. 45.)

Figure 2.12 (Circle of Fifths) shows that D major has 2 sharps; Figure 2.14 (Adding Sharps and Flats to the Key Signature) shows that they are F sharp and C sharp. After D major, name the next four sharp keys, and name the sharp that is added with each key.

Exercise 2.10

(Solution on p. 45.)

E minor is the first sharp minor key; the first sharp added in both major and minor keys is always F sharp. Name the next three sharp minor keys, and the sharp that is added in each key.

Exercise 2.11

(Solution on p. 45.)

After B flat major, name the next four flat keys, and name the flat that is added with each key.

Solutions to Exercises in Chapter 2

Solution to Exercise 2.1 (p. 27)

1. Major
2. Major
3. Minor
4. Major
5. Minor

Solution to Exercise 2.2 (p. 29)



Figure 2.15

Notice that although they look completely different, the scales of F sharp major and G flat major (numbers 5 and 6) sound exactly the same when played, on a piano as shown in Figure 2.16 (Enharmonic Scales), or on any other instrument using equal temperament⁴⁰ tuning. If this surprises you, please read more about enharmonic⁴¹ scales.

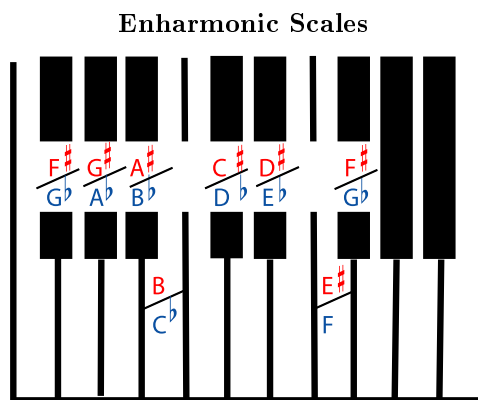


Figure 2.16: Using this figure of a keyboard, or the fingerings from your own instrument, notice that the notes for the F sharp major scale and the G flat major scale in Figure 2.15, although spelled differently, will sound the same.

Solution to Exercise 2.3 (p. 31)

⁴⁰"Tuning Systems": Section Equal Temperament <<http://cnx.org/content/m11639/latest/#s22>>

⁴¹"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

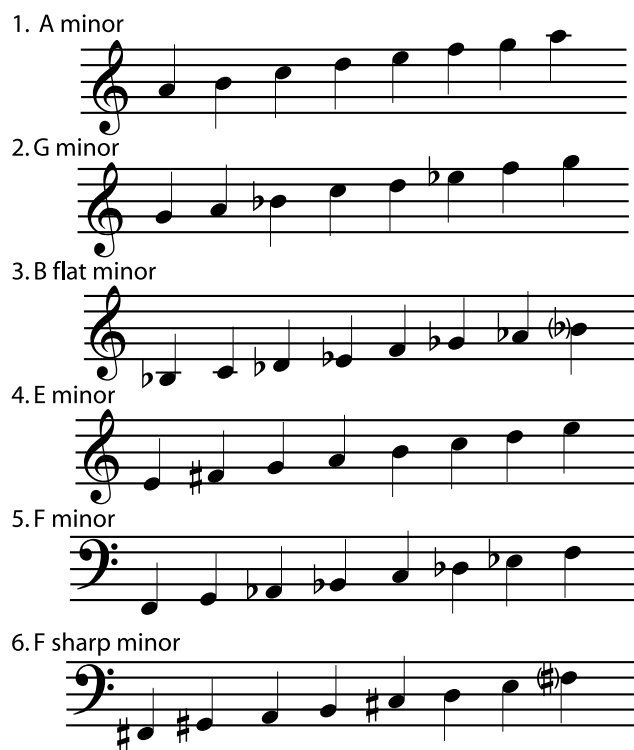



Figure 2.17

Solution to Exercise 2.4 (p. 33)


1. A minor: C major
2. G minor: B flat major
3. B flat minor: D flat major
4. E minor: G major
5. F minor: A flat major
6. F sharp minor: A major

Solution to Exercise 2.5 (p. 34)


1. A harmonic minor




2. G harmonic minor




3. B flat harmonic minor



4. E harmonic minor



5. F harmonic minor



6. F sharp harmonic minor




Figure 2.18

Solution to Exercise 2.6 (p. 34)

1. A melodic minor

2. G melodic minor

3. B flat melodic minor

4. E melodic minor

5. F melodic minor

6. F sharp melodic minor

Figure 2.19

Solution to Exercise 2.7 (p. 38)**E flat major (3 flats):**

- B flat major (2 flats)
- A flat major (4 flats)
- C minor (3 flats)
- G minor (2 flats)
- F minor (4 flats)

A minor (no sharps or flats):

- E minor (1 sharp)
- D minor (1 flat)
- C major (no sharps or flats)
- G major (1 sharp)
- F major (1 flat)

Solution to Exercise 2.8 (p. 38)

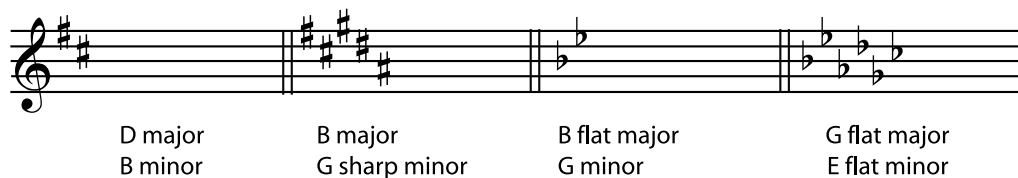


Figure 2.20

Solution to Exercise 2.9 (p. 39)

- A major adds G sharp
- E major adds D sharp
- B major adds A sharp
- F sharp major adds E sharp

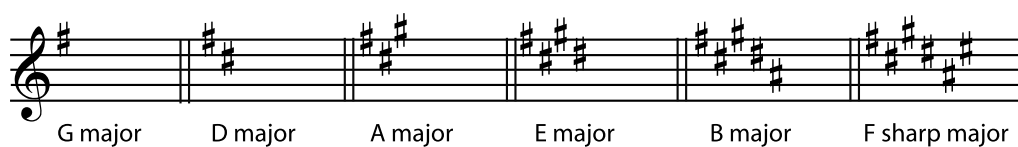


Figure 2.21

Solution to Exercise 2.10 (p. 39)

- B minor adds C sharp
- F sharp minor adds G sharp
- C sharp minor adds D sharp

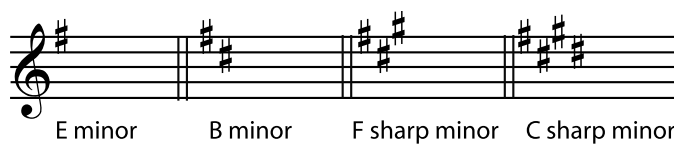
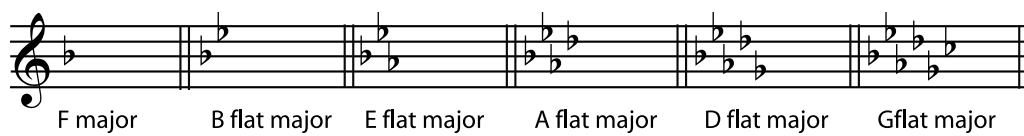


Figure 2.22

Solution to Exercise 2.11 (p. 39)

- E flat major adds A flat
- A flat major adds D flat
- D flat major adds G flat
- G flat major adds C flat

**Figure 2.23**

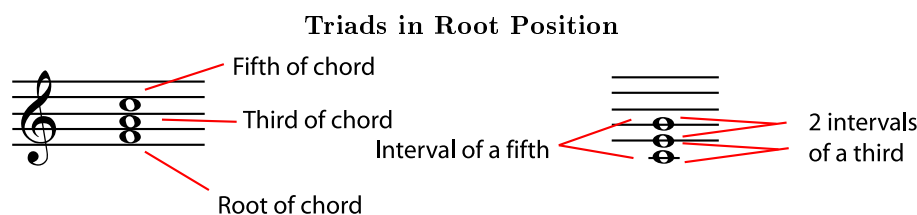
Chapter 3

Triads and Chords

3.1 Triads¹

Harmony² in Western music³ is based on triads. **Triads** are simple three-note chords⁴ built of thirds (p. 10).

3.1.1 Triads in Root Position



The chords in Figure 3.1 (Triads in Root Position) are written in root position, which is the most basic way to write a triad. In **root position**, the **root**, which is the note that names the chord, is the lowest note. The **third of the chord** is written a third (Figure 1.15: Simple Intervals) higher than the root, and the **fifth of the chord** is written a fifth (Figure 1.15: Simple Intervals) higher than the root (which is also a third higher than the third of the chord). So the simplest way to write a triad is as a stack of thirds, in root position.

NOTE: The type of interval or chord - major, minor, diminished, etc., is not important when you are determining the position of the chord. To simplify things, all notes in the examples and exercises below are natural, but it would not change their position at all if some notes were sharp or flat. It would, however, change the name of the triad - see Naming Triads (Section 3.2).

¹This content is available online at <<http://cnx.org/content/m10877/2.14/>>.

²"Harmony" <<http://cnx.org/content/m11654/latest/>>

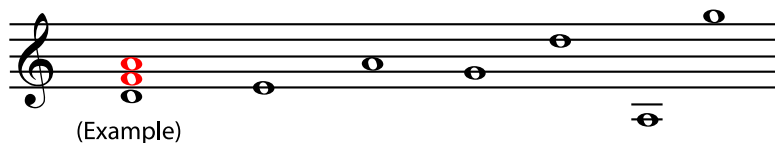
³"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁴"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

Exercise 3.1*(Solution on p. 76.)*

Write a triad in root position using each root given. If you need some staff paper for exercises you can print this PDF file⁵.

Build Root Position Triads:

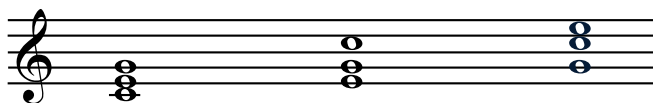
**Figure 3.2****3.1.2 First and Second Inversions**

Any other chord that has the same-named notes as a root position chord is considered to be essentially the same chord in a different **position**. In other words, all chords that have only D naturals, F sharps, and A naturals, are considered D major chords.

NOTE: *But* if you change the pitch⁶ or spelling⁷ of any note in the triad, you have changed the chord (see Naming Triads (Section 3.2)). For example, if the F sharps are written as G flats, or if the A's are sharp instead of natural, you have a different chord, not an inversion of the same chord. If you add notes, you have also changed the name of the chord (see Beyond Triads (Section 3.6)). *You cannot call one chord the inversion of another if either one of them has a note that does not share a name (for example "F sharp" or "B natural") with a note in the other chord.*

If the third of the chord is the lowest note, the chord is in **first inversion**. If the fifth of the chord is the lowest note, the chord is in **second inversion**. A chord in second inversion may also be called a **six-four chord**, because the intervals (Section 1.3) in it are a sixth and a fourth.

Three C major chords



Root Position

First Inversion

Second Inversion

Figure 3.3

It does not matter how far the higher notes are from the lowest note, or how many of each note there are (at different octaves or on different instruments); all that matters is which note is lowest. (In fact, one of the notes may not even be written, only implied by the context of the chord in a piece of music. A practiced

⁵<http://cnx.org/content/m10877/latest/staffpaper1.pdf>

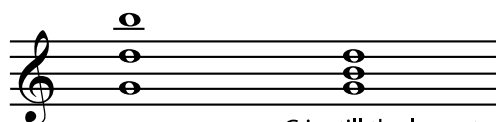
⁶"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/>>

⁷"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

ear will tell you what the missing note is; we won't worry about that here.) To decide what position a chord is in, move the notes to make a stack of thirds and identify the root.

Example 3.1

Notes are G, D, and B. Rewrite as thirds:

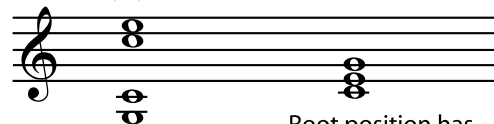


G is still the lowest note,
so the chord was already
in root position.

Figure 3.4

Example 3.2

Notes are a G, 2 C's, and an E.
Rewrite G, C, and E as thirds:



Root position has
C as its lowest note.
Lowest note in original chord
is the fifth in root position,
so it was in second inversion.

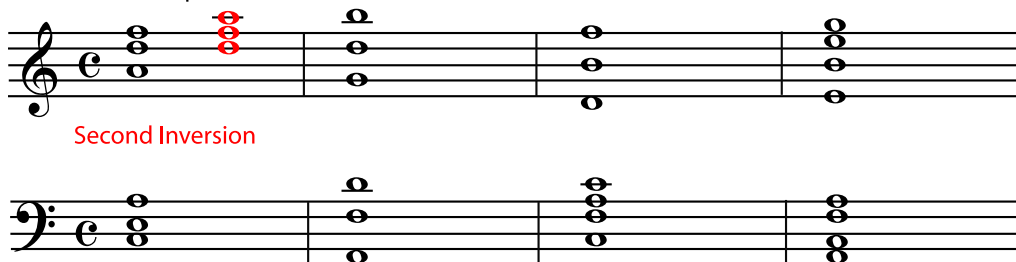
Figure 3.5

Exercise 3.2

(Solution on p. 76.)

Rewrite each chord in root position, and name the original position of the chord.

(Example)



Second Inversion

Figure 3.6

3.2 Naming Triads⁸

The position (Section 3.1) that a chord is in does make a difference in how it sounds, but it is a fairly small difference. Listen⁹ to a G major chord in three different positions.

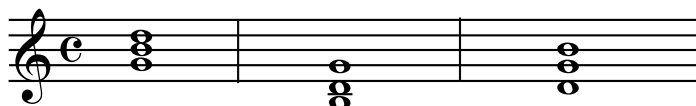


Figure 3.7: G major chord in three different positions.

A much bigger difference in the chord's sound comes from the intervals (Section 1.3) between the root-position notes of the chord. For example, if the B in one of the chords above was changed to a B flat, you would still have a G triad (Section 3.1), but the chord would now sound very different. So chords are named according to the intervals between the notes when the chord is in root position (Section 3.1). Listen¹⁰ to four different G chords.



Figure 3.8: These are also all G chords, but they are four different G chords. The intervals between the notes are different, so the chords sound very different.

3.2.1 Major and Minor Chords

The most commonly used triads (Section 3.1) form major (Section 2.1) chords and minor (Section 2.2) chords. All major chords and minor chords have an interval (Section 1.3) of a perfect fifth (p. 12) between the root and the fifth of the chord (Section 3.1). A perfect fifth (7 half-steps) can be divided into a major third (Major and Minor Intervals, p. 13) (4 half-steps) plus a minor third (Major and Minor Intervals, p. 13) (3 half-steps). If the interval between the root and the third of the chord is the major third (with the minor third between the third and the fifth of the chord), the triad is a **major chord**. If the interval between the root and the third of the chord is the minor third (and the major third is between the third and fifth of the chord), then the triad is a **minor chord**. Listen closely to a major triad¹¹ and a minor triad¹².

Example 3.3

⁸This content is available online at <<http://cnx.org/content/m10890/2.13/>>.

⁹<http://cnx.org/content/m10890/latest/Inversions.MID>

¹⁰<http://cnx.org/content/m10890/latest/GChords.MID>

¹¹<http://cnx.org/content/m10890/latest/chomj.mp3>

¹²<http://cnx.org/content/m10890/latest/chomin.mp3>

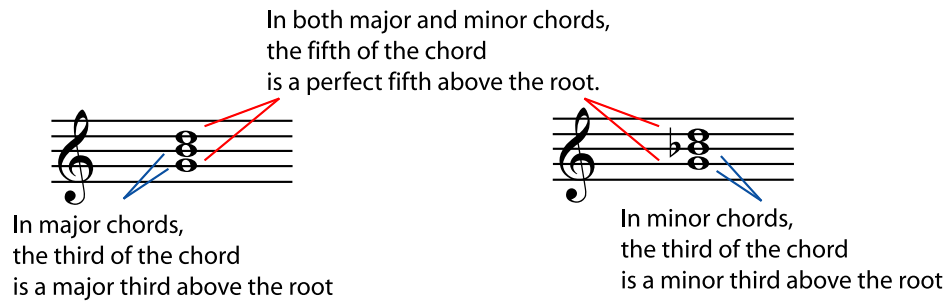


Figure 3.9

Example 3.4

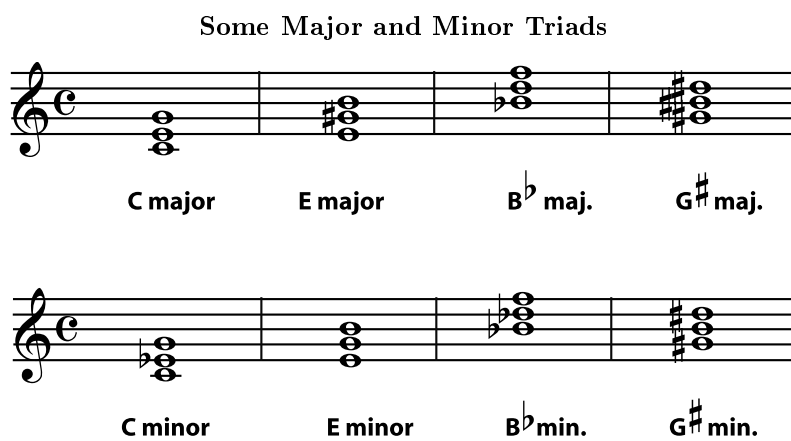


Figure 3.10

Exercise 3.3

(Solution on p. 76.)

Write the major chord for each root given.



Figure 3.11

Exercise 3.4

(Solution on p. 76.)

Write the minor chord for each root given.



Figure 3.12

3.2.2 Augmented and Diminished Chords

Because they don't contain a perfect fifth, augmented and diminished chords have an unsettled feeling and are normally used sparingly. An **augmented chord** is built from two major thirds, which adds up to an augmented fifth. A **diminished chord** is built from two minor thirds, which add up to a diminished fifth. Listen closely to an augmented triad¹³ and a diminished triad¹⁴.

Example 3.5

Some Augmented and Diminished Triads

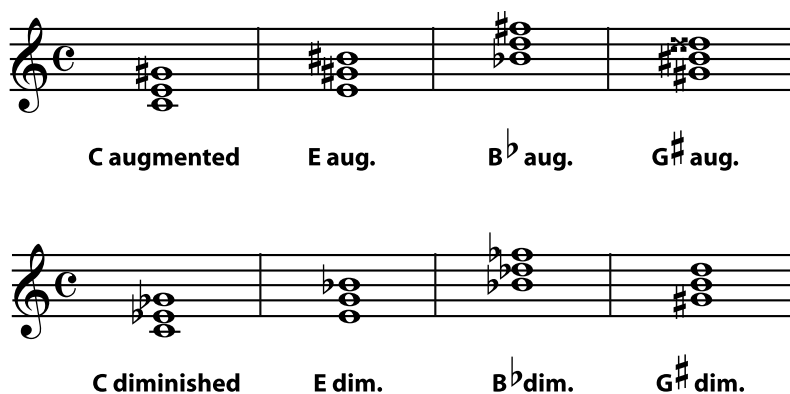


Figure 3.13

Exercise 3.5

(Solution on p. 77.)

Write the augmented triad for each root given.



Figure 3.14

¹³<http://cnx.org/content/m10890/latest/choaug.mp3>

¹⁴<http://cnx.org/content/m10890/latest/chodim.mp3>

Exercise 3.6*(Solution on p. 77.)*

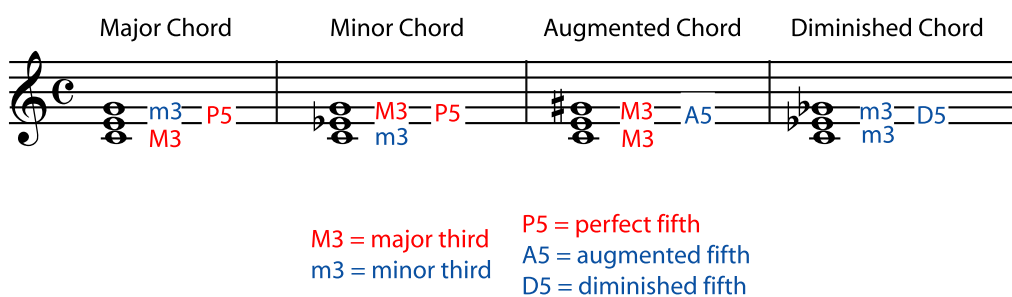
Write the diminished triad for each root given.

**Figure 3.15**

Notice that you can't avoid double sharps or double flats by writing the note on a different space or line. *If you change the spelling¹⁵ of a chord's notes, you have also changed the chord's name.* For example, if, in an augmented G sharp major chord, you rewrite the D double sharp as an E natural, the triad becomes an E augmented chord.

**Figure 3.16:** Changing the spelling of any note in a chord also changes the chord's name.

You can put the chord in a different position (Section 3.1) or add more of the same-named notes at other octaves without changing the name of the chord. But changing the note names or adding different-named notes, will change the name of the chord. Here is a summary of the intervals in triads in root position.

**Figure 3.17****Exercise 3.7***(Solution on p. 77.)*

Now see if you can identify these chords that are not necessarily in root position. Rewrite them in root position first if that helps.

¹⁵"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

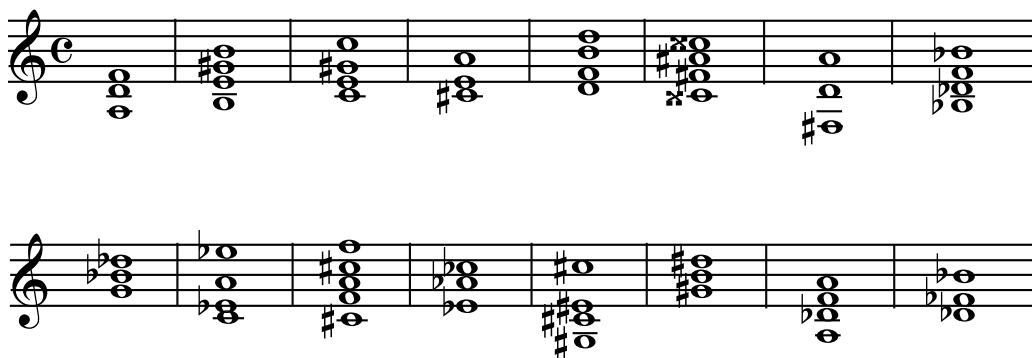


Figure 3.18

3.3 Beginning Harmonic Analysis¹⁶

3.3.1 Introduction

It sounds like a very technical idea, but basic **harmonic analysis** just means understanding how a chord is related to the key and to the other chords in a piece of music. This can be such useful information that you will find many musicians who have not studied much music theory, and even some who don't read music, but who can tell you what the I ("one") or the V ("five") chord are in a certain key.

Why is it useful to know how chords are related?

- Many standard forms¹⁷ (for example, a "twelve bar blues") follow very specific chord progressions¹⁸, which are often discussed in terms of harmonic relationships.
- If you understand chord relationships, you can transpose¹⁹ any chord progression you know to any key (Section 2.1) you like.
- If you are searching for chords to go with a particular melody²⁰ (in a particular key), it is very helpful to know what chords are most likely in that key, and how they might be likely to progress from one to another.
- Improvisation requires an understanding of the chord progression.
- Harmonic analysis is also necessary for anyone who wants to be able to compose reasonable chord progressions or to study and understand the music of the great composers.

3.3.2 Basic Triads in Major Keys

Any chord might show up in any key, but some chords are much more likely than others. The most likely chords to show up in a key are the chords that use only the notes in that key (no accidentals²¹). So these chords have both names and numbers that tell how they fit into the key. (We'll just discuss basic triads (Section 3.1) for the moment, not seventh chords (p. 69) or other added-note (Section 3.6.4: Added Notes,

¹⁶This content is available online at <<http://cnx.org/content/m11643/1.16/>>.

¹⁷"Form in Music" <<http://cnx.org/content/m10842/latest/>>

¹⁸"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

¹⁹"Transposition: Changing Keys" <<http://cnx.org/content/m10668/latest/>>

²⁰"Melody" <<http://cnx.org/content/m11647/latest/>>

²¹"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

Suspensions, and Extensions) or altered (p. 74) chords.) The chords are numbered using Roman numerals from I to vii.

Chords in the keys of C major and D major

	C	Dm	Em	F	G	Am	Bdim
--	----------	-----------	-----------	----------	----------	-----------	-------------

C major

I ii iii IV V vi vii^o

	D	Em	F[#]m	G	A	Bm	C[#]dim
--	----------	-----------	-----------------------	----------	----------	-----------	-------------------------

D major

I ii iii IV V vi vii^o

Figure 3.19: To find all the basic chords in a key, build a simple triad (in the key) on each note of the scale. You'll find that although the chords change from one key to the next, the *pattern* of major and minor chords is always the same.

Exercise 3.8

(Solution on p. 78.)

Write and name the chords in G major and in B flat major. (Hint: Determine the key signature²² first. Make certain that each chord begins on a note in the major scale (Section 2.1) and contains only notes in the key signature.) If you need some staff paper, you can print this PDF file²³

You can find all the basic triads that are possible in a key by building one triad, in the key, on each note of the scale (each **scale degree**). One easy way to name all these chords is just to number them: the chord that starts on the first note of the scale is "I", the chord that starts on the next scale degree is "ii", and so on. Roman numerals are used to number the chords. Capital Roman numerals are used for major chords (Section 3.2.1: Major and Minor Chords) and small Roman numerals for minor chords (Section 3.2.1: Major and Minor Chords). The diminished chord (Section 3.2.2: Augmented and Diminished Chords) is in small Roman numerals followed by a small circle. Because major scales always follow the same pattern, the pattern of major and minor chords is also the same in any major key. The chords built on the first, fourth, and fifth degrees of the scale are always major chords (I, IV, and V). The chords built on the second, third, and sixth degrees of the scale are always minor chords (ii, iii, and vi). The chord built on the seventh degree of the scale is a diminished chord.

NOTE: Notice that IV in the key of B flat is an E flat major chord, not an E major chord, and vii in the key of G is F sharp diminished, not F diminished. If you can't name the scale notes in a key, you may find it difficult to predict whether a chord should be based on a sharp, flat, or natural note. This is only one reason (out of many) why it is a good idea to memorize all the scales. (See Major Keys and Scales (Section 2.1).) However, if you don't plan on memorizing all the scales at this time, you'll find it useful to memorize at least the most important chords (start with I, IV, and V) in your favorite keys.

²²"Key Signature" <<http://cnx.org/content/m10881/latest/>>

²³<http://cnx.org/content/m11643/latest/staffpaper1.pdf>

3.3.3 A Hierarchy of Chords

Even among the chords that naturally occur in a key signature, some are much more likely to be used than others. In most music, the most common chord is I. In Western music²⁴, I is the tonal center (Section 2.1) of the music, the chord that feels like the "home base" of the music. As the other two major chords in the key, IV and V are also likely to be very common. In fact, the most common added-note chord in most types of Western music is a V chord (the dominant chord (Section 3.3.4: Naming Chords Within a Key)) with a minor seventh (Major and Minor Intervals, p. 13) added (V7). It is so common that this particular flavor of seventh (Section 3.6.3: Seventh Chords) (a major chord with a minor seventh added) is often called a **dominant seventh**, regardless of whether the chord is being used as the V (the dominant) of the key. Whereas the I chord feels most strongly "at home", V7 gives the strongest feeling of "time to head home now". This is very useful for giving music a satisfying ending. Although it is much less common than the V7, the diminished vii chord (often with a diminished seventh (Section 3.2.2: Augmented and Diminished Chords) added), is considered to be a harmonically unstable chord that strongly wants to resolve to I. Listen to these very short progressions and see how strongly each suggests that you must be in the key of C: C (major) chord(I)²⁵ ; F chord to C chord (IV - I)²⁶ ; G chord to C chord (V - I)²⁷ ; G seventh chord to C chord (V7 - I)²⁸ ; B diminished seventh chord to C chord (viidim7 - I)²⁹ (Please see Cadence (Section 3.4) for more on this subject.)

Many folk songs and other simple tunes can be accompanied using only the I, IV and V (or V7) chords of a key, a fact greatly appreciated by many beginning guitar players. Look at some chord progressions from real music.

Some chord progressions

A Common Twelve Bar Blues:

I	I	I	I7
IV7	IV7	I	I
V7	V7	I	I

Verse of "Jingle Bells"

I	I	I	IV
IV	V7	V7	I
I	I	I	IV
IV	V7	V7	I

Chorus of "Bye Bye, Love"

IV	I	IV	I
IV	I	V7	I

Figure 3.20: Much Western music is harmonically pretty simple, so it can be very useful just to know I, IV, and V in your favorite keys. This figure shows progressions as a list of chords (read left to right as if reading a paragraph), one per measure.

²⁴"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

²⁵<http://cnx.org/content/m11643/latest/Cchord.mid>

²⁶<http://cnx.org/content/m11643/latest/FchordCchord.mid>

²⁷<http://cnx.org/content/m11643/latest/GchordCchord.mid>

²⁸<http://cnx.org/content/m11643/latest/G7chordCchord.mid>

²⁹<http://cnx.org/content/m11643/latest/BdimchordCchord.MID>

A lot of folk music, blues, rock, marches, and even some classical music is based on simple chord progressions, but of course there is plenty of music that has more complicated harmonies. Pop and jazz in particular often include many chords with added (Section 3.6.4: Added Notes, Suspensions, and Extensions) or altered (p. 74) notes. Classical music also tends to use more complex chords in greater variety, and is very likely to use chords that are not in the key.

More Complex Chord Progressions

Chorus of "Love Me Tender"

I	III7	vi	I7
IVM7	iv	I	I
v6	VI7	II7	II7
V7sus4	V7	I	I

Beginning of Liszt's "Liebestraum"

I	III7	Vi7	II7
ii7	V7	I Idim	I

Figure 3.21: Some music has more complex harmonies. This can include more unusual chords such as major sevenths, and chords with altered (p. 74) notes such as sharp fives. It may also include more basic chords that aren't in the key, such as I diminished and II (major), or even chords based on notes that are not in the key such as a sharp IV chord. (Please see Beyond Triads (Section 3.6.2: Chord Symbols) to review how to read chord symbols.)

Extensive study and practice are needed to be able to identify and understand these more complex progressions. It is not uncommon to find college-level music theory courses that are largely devoted to harmonic analysis and its relationship to musical forms. This course will go no further than to encourage you to develop a basic understanding of what harmonic analysis is about.

3.3.4 Naming Chords Within a Key

So far we have concentrated on identifying chord relationships by number, because this system is commonly used by musicians to talk about every kind of music from classical to jazz to blues. There is another set of names that is commonly used, particularly in classical music, to talk about harmonic relationships. Because numbers are used in music to identify everything from beats to intervals to harmonics to what fingering to use, this naming system is sometimes less confusing.

I	=	Tonic
ii	=	Supertonic
iii	=	Mediant
IV	=	Subdominant
V	=	Dominant
vi	=	Submediant
vii ^o	=	Subtonic, or Leading Tone

Figure 3.22

Exercise 3.9*(Solution on p. 78.)***Name the chord.**

1. Dominant in C major
2. Subdominant in E major
3. Tonic in G sharp major
4. Mediant in F major
5. Supertonic in D major
6. Submediant in C major
7. Dominant seventh in A major

Exercise 3.10*(Solution on p. 78.)*

The following chord progression is in the key of G major. Identify the relationship of each chord to the key by both name and number. Which chord is not in the key? Which chord in the key has been left out of the progression?

G	C	Am	Em
A	D	Bm	D7
G			

Figure 3.23

3.3.5 Minor Keys

Since minor scales (Section 2.2) follow a different pattern of intervals (Section 1.3) than major scales, they will produce chord progressions with important differences from major key chord progressions.

Exercise 3.11*(Solution on p. 79.)*

Write (triad) chords that occur in the keys of A minor, E minor, and D minor. Remember to begin each triad on a note of the natural minor (Section 2.2.3: Relative Minor and Major Keys) scale

and to include only notes in the scale in each chord. Which chord relationships are major? Which minor? Which diminished? If you need staff paper, print this PDF file³⁰

Notice that the actual chords created using the major scale and its relative minor (Section 2.2.3: Relative Minor and Major Keys) scale are the same. For example, compare the chords in A minor (Figure 3.48) to the chords in C major (Figure 3.19 (Chords in the keys of C major and D major)). The difference is in how the chords are used. As explained above (p. 56), if the key is C major, the chord progression³¹ will likely make it clear that C is the tonal center (p. 28) of the piece, for example by featuring the bright-sounding (major) tonic, dominant, and subdominant chords (C major, G major or G7, and F major), particularly in strong cadences (Section 3.4) that end on a C chord.

If the piece is in A minor, on the other hand, it will be more likely to feature (particularly in cadences) the tonic, dominant, and subdominant of A minor (the A minor, D minor, and E minor chords). These chords are also available in the key of C major, of course, but they will not be given such a prominent place.

As mentioned above (p. 56), the "flavor" of sound that is created by a major chord, with a minor seventh added, gives a particularly dominant (wanting-to-go-to-the-home-chord) sound, which in turn gives a more strong feeling of tonality to a piece of music. Because of this, many minor pieces change the major chord so that it is a dominant seventh, even though that requires using a note that is not in the key.

Exercise 3.12

(Solution on p. 79.)

Look at the chords in Figure 3.48. What note of each scale would have to be changed in order to make v major? Which other chords would be affected by this change? What would they become, and are these altered chords also likely to be used in the minor key?

The point of the harmonic minor (Section 2.2.3: Relative Minor and Major Keys) scale is to familiarize the musician with this common feature of harmony, so that the expected chords become easy to play in every minor key. There are also changes that can be made to the melodic³² lines of a minor-key piece that also make it more strongly tonal. This involves raising (by one half step (Section 1.2)) both the sixth and seventh scale notes, but only when the melody is ascending. So the musician who wants to become familiar with melodic patterns in every minor key will practice melodic minor (Section 2.2.3: Relative Minor and Major Keys) scales, which use different notes for the ascending and descending scale.

You can begin practicing harmonic analysis by practicing identifying whether a piece is in the major key or in its relative minor. Pick any piece of music for which you have the written music, and use the following steps to determine whether the piece is major or minor:

Is it Major or Minor?

- Identify the chords used in the piece, particularly at the very end, and at other important cadences (Section 3.4) (places where the music comes to a stopping or resting point). This is an important first step that may require practice before you become good at it. Try to start with simple music which either includes the names of the chords, or has simple chords in the accompaniment that will be relatively easy to find and name. If the chords are not named for you and you need to review how to name them just by looking at the written notes, see Naming Triads (Section 3.2) and Beyond Triads (Section 3.6).
- Find the key signature³³.
- Determine both the major key (Section 2.1) represented by that key signature, and its relative minor (Section 2.2.3: Relative Minor and Major Keys) (the minor key that has the same key signature).
- Look at the very end of the piece. Most pieces will end on the tonic chord. If the final chord is the tonic of either the major or minor key for that key signature, you have almost certainly identified the key.
- If the final chord is not the tonic of either the major or the minor key for that key signature, there are two possibilities. One is that the music is not in a major or minor key! Music from other cultures,

³⁰<http://cnx.org/content/m11643/latest/staffpaper1.pdf>

³¹"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

³²"Melody" <<http://cnx.org/content/m11647/latest/>>

³³"Key Signature" <<http://cnx.org/content/m10881/latest/>>

as well as some jazz, folk, modern, and pre-Baroque³⁴ European music are based on other modes or scales. (Please see Modes and Ragas³⁵ and Scales that aren't Major or Minor³⁶ for more about this.) If the music sounds at all "exotic" or "unusual", you should suspect that this may be the case.

- If the final chord is not the tonic of either the major or the minor key for that key signature, but you still suspect that it is in a major or minor key (for example, perhaps it has a "repeat and fade" ending which avoids coming to rest on the tonic), you may have to study the rest of the music in order to discern the key. Look for important cadences before the end of the music (to identify I). You may be able to identify, just by listening, when the piece sounds as if it is approaching and landing on its "resting place". Also look for chords that have that "dominant seventh" flavor (to identify V). Look for the specific accidentals³⁷ that you would expect if the harmonic minor (Section 2.2.3: Relative Minor and Major Keys) or melodic minor (Section 2.2.3: Relative Minor and Major Keys) scales were being used. Check to see whether the major or minor chords are emphasized overall. Put together the various clues to reach your final decision, and check it with your music teacher or a musician friend if possible.

3.3.6 Modulation

Sometimes a piece of music temporarily moves into a new key. This is called **modulation**. It is very common in traditional classical music; long symphony and concerto movements almost always spend at least some time in a different key (usually a closely related key (Section 2.3) such as the dominant (Section 3.3.4: Naming Chords Within a Key) or subdominant (Section 3.3.4: Naming Chords Within a Key), or the relative minor or relative major (Section 2.2.3: Relative Minor and Major Keys)), to keep things interesting. Shorter works, even in classical style, are less likely to have complete modulations. In most styles of music, a slow, gradual modulation to the new key (and back) seems more natural, and abrupt modulations can seem unpleasant and jarring. But implied modulations, in which the tonal center seems to suddenly shift for a short time, can be very common in some shorter works (jazz standards, for example). As in longer works, modulation, with its new set of chords, is a good way to keep a piece interesting. If you find that the chord progression in a piece of music suddenly contains many chords that you would not expect in that key, it may be that the piece has modulated. Lots of accidentals, or even an actual change of key signature³⁸, are other clues that the music has modulated.

A new key signature³⁹ may help you to identify the modulation key. If there is not a change of key signature, remember that the new key is likely to contain whatever accidentals⁴⁰ are showing up. It is also likely that many of the chords in the progression will be chords that are common in the new key. Look particularly for tonic chords and dominant sevenths. The new key is likely to be closely related (Section 2.3) to the original key, but another favorite trick in popular music is to simply move the key up one whole step (Section 1.2), for example from C major to D major. Modulations can make harmonic analysis much more challenging, so try to become comfortable analyzing easier pieces before tackling pieces with modulations.

3.3.7 Further Study

Although the concept of harmonic analysis is pretty basic, actually analyzing complex pieces can be a major challenge. This is one of the main fields of study for those who are interested in studying music theory at a more advanced level. One next step for those interested in the subject is to become familiar with all the ways notes may be added to basic triads. (Please see Beyond Triads (Section 3.6) for an introduction to that subject.) At that point, you may want to spend some time practicing analyzing some simple, familiar

³⁴"Music of the Baroque Period" <<http://cnx.org/content/m14737/latest/>>

³⁵"Modes and Ragas: More Than just a Scale" <<http://cnx.org/content/m11633/latest/>>

³⁶"Scales that aren't Major or Minor" <<http://cnx.org/content/m11636/latest/>>

³⁷"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

³⁸"Key Signature" <<http://cnx.org/content/m10881/latest/>>

³⁹"Key Signature" <<http://cnx.org/content/m10881/latest/>>

⁴⁰"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

pieces. Depending on your interests, you may also want to spend time creating pleasing chord progressions by choosing chords from the correct key that will complement a melody that you know. As of this writing, the site Music Theory for Songwriters⁴¹ featured "chord maps" that help the student predict likely chord progressions.

For more advanced practice, look for music theory books that focus entirely on harmony or that spend plenty of time analyzing harmonies in real music. (Some music history textbooks are in this category.) You will progress more quickly if you can find books that focus on the music genre that you are most interested in (there are books specifically about jazz harmony, for example).

3.4 Cadence in Music⁴²

A **cadence** is any place in a piece of music that has the feel of an ending point. This can be either a strong, definite stopping point - the end of the piece, for example, or the end of a movement or a verse - but it also refers to the "temporary-resting-place" pauses that round off the ends of musical ideas within each larger section.

A musical phrase⁴³, like a sentence, usually contains an understandable idea, and then pauses before the next idea starts. Some of these musical pauses are simply take-a-breath-type pauses, and don't really give an "ending" feeling. In fact, like questions that need answers, many phrases leave the listener with a strong expectation of hearing the next, "answering", phrase. Other phrases, though, end with a more definite "we've arrived where we were going" feeling. The composer's expert control over such feelings of expectation and arrival are one of the main sources of the listener's enjoyment of the music.

Like a story, a piece of music can come to an end by simply stopping, but most listeners will react to such abruptness with dissatisfaction: the story or music simply "stopped" instead of "ending" properly. A more satisfying ending, in both stories and music, is usually provided by giving clues that an end is coming, and then ending in a commonly-accepted way. Stories are also divided into paragraphs, chapters, stanzas, scenes, or episodes, each with their own endings, to help us keep track of things and understand what is going on. Music also groups phrases and motifs⁴⁴ into verses, choruses, sections, and movements, marked off by strong cadences to help us keep track of them. In good stories, there are clues in the plot and the pacing - in the Western⁴⁵ tradition, the chase gets more exciting, characters good and bad get what they deserve, the inevitable tragedy occurs, or misunderstandings get resolved - that signal that the end of the story is nearing. Similarly, in music there are clues that signal to the listener that the end is coming up. These clues may be in the form⁴⁶; in the development of the musical ideas; in the music's tempo⁴⁷, texture⁴⁸, or rhythmic⁴⁹ complexity; in the chord progression⁵⁰; even in the number and length of the phrases⁵¹ (Western listeners are fond of powers of two⁵²). Like the ending of a story, an ending in music is more satisfying if it follows certain customs that the listener expects to hear. If you have grown up listening to a particular musical tradition, you will automatically have these expectations for a piece of music, even if you are not aware of having them. And like the customs for storytelling, these expectations can be different in different musical traditions.

Some things that produce a feeling of cadence

⁴¹<http://www.chordmaps.com>

⁴²This content is available online at <<http://cnx.org/content/m12402/1.9/>>.

⁴³"Melody": Section Melodic Phrases <<http://cnx.org/content/m11647/latest/#s2>>

⁴⁴"Melody": Section Motif <<http://cnx.org/content/m11647/latest/#s3>>

⁴⁵"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁴⁶"Form in Music" <<http://cnx.org/content/m10842/latest/>>

⁴⁷"Tempo" <<http://cnx.org/content/m11648/latest/>>

⁴⁸"The Textures of Music" <<http://cnx.org/content/m11645/latest/>>

⁴⁹"Rhythm" <<http://cnx.org/content/m11646/latest/>>

⁵⁰"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

⁵¹"Melody": Section Melodic Phrases <<http://cnx.org/content/m11647/latest/#s2>>

⁵²"Powers, Roots, and Equal Temperament" <<http://cnx.org/content/m11809/latest/>>

- *Harmony* - In most Western⁵³ and Western-influenced music (including jazz and "world" musics), harmony⁵⁴ is by far the most important signal of cadence. One of the most fundamental "rules" of the major-minor harmony system is that music ends on the tonic (p. 28). A tonal⁵⁵ piece of music will almost certainly end on the tonic chord, although individual phrases or sections may end on a different chord (the dominant (p. 57) is a popular choice). But a composer cannot just throw in a tonic chord and expect it to sound like an ending; the harmony must "lead up to" the ending and make it feel inevitable (just as a good story makes the ending feel inevitable, even if it's a surprise). So the term **cadence**, in tonal music, usually refers to the "ending" chord plus the short chord progression⁵⁶ that led up to it. There are many different terms in use for the most common tonal cadences; you will find the most common terms below (Some Tonal Cadence Terms, p. 63). Some (but not all) modal⁵⁷ musics also use harmony to indicate cadence, but the cadences used can be quite different from those in tonal harmony.
- *Melody* - In the major/minor tradition, the melody will normally end on some note of the tonic chord triad (Section 3.1), and a melody ending on the tonic will give a stronger (more final-sounding) cadence than one ending on the third or fifth of the chord. In some modal⁵⁸ musics, the melody plays the most important role in the cadence. Like a scale, each mode also has a home note, where the melody is expected to end. A mode often also has a formula that the melody usually uses to arrive at the ending note. For example, it may be typical of one mode to go to the final note from the note one whole tone (p. 7) below it; whereas in another mode the penultimate note may be a minor third (p. 10) above the final note. (Or a mode may have more than one possible melodic cadence, or its typical cadence may be more complex.)
- *Rhythm* - Changes in the rhythm⁵⁹, a break or pause in the rhythm, a change in the tempo⁶⁰, or a slowing of or pause in the harmonic rhythm⁶¹ are also commonly found at a cadence.
- *Texture* - Changes in the texture⁶² of the music also often accompany a cadence. For example, the music may momentarily switch from harmony⁶³ to unison or from counterpoint⁶⁴ to a simpler block-chord homophony⁶⁵.
- *Form* - Since cadences mark off phrases and sections, form⁶⁶ and cadence are very closely connected, and the overall architecture of a piece of music will often indicate where the next cadence is going to be - every eight measures for a certain type of dance, for example. (When you listen to a piece of music, you actually expect and listen for these regularly-spaced cadences, at least subconsciously. An accomplished composer may "tease" you by seeming to lead to a cadence in the expected place, but then doing something unexpected instead.)

Harmonic analysis (Section 3.3), form⁶⁷, and cadence in Western⁶⁸ music are closely interwoven into a complex subject that can take up an entire course at the college-music-major level. Complicating matters is the fact that there are several competing systems for naming cadences. This introductory course cannot go very deeply into this subject, and so will only touch on the common terms used when referring to cadences. Unfortunately, the various naming systems may use the same terms to mean different things, so even a list of basic terms is a bit confusing.

⁵³"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁵⁴"Harmony" <<http://cnx.org/content/m11654/latest/>>

⁵⁵"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/#p7d>>

⁵⁶"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

⁵⁷"Modes and Ragas: More Than just a Scale" <<http://cnx.org/content/m11633/latest/>>

⁵⁸"Modes and Ragas: More Than just a Scale" <<http://cnx.org/content/m11633/latest/>>

⁵⁹"Rhythm" <<http://cnx.org/content/m11646/latest/>>

⁶⁰"Tempo" <<http://cnx.org/content/m11648/latest/>>

⁶¹"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

⁶²"The Textures of Music" <<http://cnx.org/content/m11645/latest/>>

⁶³"Harmony" <<http://cnx.org/content/m11654/latest/>>

⁶⁴"An Introduction to Counterpoint" <<http://cnx.org/content/m11634/latest/>>

⁶⁵"The Textures of Music": Section Homophonic <<http://cnx.org/content/m11645/latest/#s12>>

⁶⁶"Form in Music" <<http://cnx.org/content/m10842/latest/>>

⁶⁷"Form in Music" <<http://cnx.org/content/m10842/latest/>>

⁶⁸"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

Some Tonal Cadence Terms

- **Authentic** - A dominant (Section 3.3.4: Naming Chords Within a Key) chord followed by a tonic (p. 28) chord (V-I, or often V7-I).
- **Complete Cadence** - same as authentic cadence.
- **Deceptive Cadence** - This refers to any time that the music seems to lead up to a cadence, but then doesn't actually land on the expected tonic, and also often does not bring the expected pause in the music.
- **False Cadence** - Same as deceptive cadence.
- **Full Close** - Same as authentic cadence.
- **Half-cadence** - May refer to a cadence that ends on the dominant chord (V). This type of cadence is more common at pause-type cadences than at full-stop ones. *OR* may have same meaning as plagal cadence.
- **Half close** - Same as plagal cadence.
- **Imperfect Cadence** - May refer to an authentic (V-I) cadence in which the chord is not in root position, or the melody does not end on the tonic. *OR* may mean a cadence that ends on the dominant chord (same as one meaning of half-cadence).
- **Interrupted Cadence** - Same as deceptive cadence.
- **Perfect Cadence** - Same as authentic cadence. As its name suggests, this is considered the strongest, most final-sounding cadence. Some do not consider a cadence to be completely perfect unless the melody ends on the tonic and both chords (V and I) are in root position (Section 3.1).
- **Plagal Cadence** - A subdominant (Section 3.3.4: Naming Chords Within a Key) chord followed by a tonic chord (IV-I). For many people, this cadence will be familiar as the "Amen" chords at the end of many traditional hymns.
- **Semi-cadence** - Same possible meanings as half cadence.

You can listen to a few simple cadences here: Perfect Cadence⁶⁹ , Plagal Cadence⁷⁰ , Half-cadence⁷¹ , Deceptive Cadence⁷² . The figure below also shows some very simple forms of some common cadences. The first step in becoming comfortable with cadences is to start identifying them in music that is very familiar to you. Find the pauses and stops in the music. Do a harmonic analysis (Section 3.3) of the last few chords before each stop, and identify what type of cadence it is. Then see if you can begin to recognize the type of cadence just by listening to the music.

⁶⁹<http://cnx.org/content/m12402/latest/PerfectCadence.swf>

⁷⁰<http://cnx.org/content/m12402/latest/PlagalCadence.swf>

⁷¹<http://cnx.org/content/m12402/latest/HalfCadence.swf>

⁷²<http://cnx.org/content/m12402/latest/FalseCadence.swf>

Examples of Common Cadences

(a)

(b)

(c)

Detailed description: The figure shows three musical examples of common cadences in C major, each on a single staff in treble clef with a C-clef. (a) Perfect Cadence: The first measure contains a G4-A4-B4 triad (labeled V), and the second measure contains a C4-E4-G4 triad (labeled I). (b) Plagal Cadence: The first measure contains a C4-E4-G4 triad (labeled IV), and the second measure contains a C4-E4-G4 triad (labeled I). (c) Deceptive Cadence: The first measure contains a G4-A4-B4 triad with a descending chromatic line (labeled V7), and the second measure contains a C4-E4-G4 triad (labeled iii).

Figure 3.24: (a) Perfect Cadence in C major (b) Plagal Cadence in C major (c) Deceptive Cadence in C major

Exercise 3.13

(Solution on p. 80.)

Identify the type of cadence in each excerpt. (Hint: First identify the key and then do a harmonic analysis (Section 3.3) of the progression.



Figure 3.25

3.5 Consonance and Dissonance⁷³

Notes that sound good together when played at the same time are called **consonant**. Chords built only of consonances sound pleasant and "stable"; you can listen to one for a long time without feeling that the music needs to change to a different chord. Notes that are **dissonant** can sound harsh or unpleasant when played at the same time. Or they may simply feel "unstable"; if you hear a chord with a dissonance in it, you may feel that the music is pulling you towards the chord that **resolves** the dissonance. Obviously, what seems pleasant or unpleasant is partly a matter of opinion. This discussion only covers consonance and dissonance in Western⁷⁴ music.

NOTE: For activities that introduce these concepts to young students, please see Consonance and Dissonance Activities⁷⁵.

Of course, if there are problems with tuning, the notes will not sound good together, but this is not what consonance and dissonance are about. (Please note, though, that the choice of tuning system can greatly affect which intervals sound consonant and which sound dissonant! Please see Tuning Systems⁷⁶ for more about this.)

Consonance and dissonance refer to intervals (Section 1.3) and chords⁷⁷. The **interval** between two notes is the number of half steps (Section 1.2) between them, and all intervals have a name that musicians commonly use, like major third (Major and Minor Intervals, p. 13) (which is 4 half steps), perfect fifth (p. 12) (7 half steps), or octave (Section 1.1). (See Interval (Section 1.3) to learn how to determine and name the interval between any two notes.)

An interval is measured between two notes. When there are more than two notes sounding at the same time, that's a **chord**. (See Triads (Section 3.1), Naming Triads (Section 3.2), and Beyond Triads (Section 3.6)

⁷³This content is available online at <<http://cnx.org/content/m11953/1.9/>>.

⁷⁴"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁷⁵"Consonance and Dissonance Activities" <<http://cnx.org/content/m11999/latest/>>

⁷⁶"Tuning Systems" <<http://cnx.org/content/m11639/latest/#p11e>>

⁷⁷"Harmony": Chords <<http://cnx.org/content/m11654/latest/#l0b>>

for some basics on chords.) Of course, you can still talk about the interval between any two of the notes in a chord.

The simple intervals (p. 10) that are considered to be consonant are the minor third⁷⁸, major third⁷⁹, perfect fourth⁸⁰, perfect fifth⁸¹, minor sixth⁸², major sixth⁸³, and the octave⁸⁴.

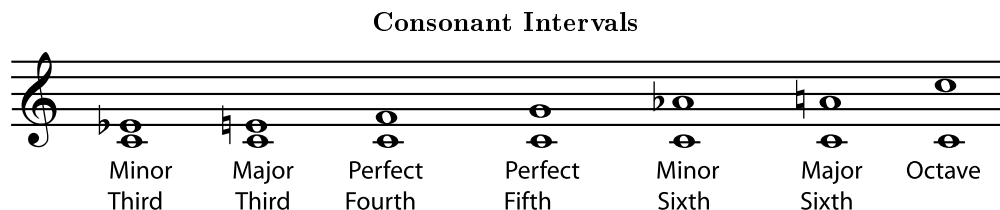


Figure 3.26

In modern Western Music⁸⁵, all of these intervals are considered to be pleasing to the ear. Chords that contain only these intervals are considered to be "stable", restful chords that don't need to be resolved (p. 66). When we hear them, we don't feel a need for them to go to other chords.

The intervals that are considered to be dissonant are the minor second⁸⁶, the major second⁸⁷, the minor seventh⁸⁸, the major seventh⁸⁹, and particularly the tritone⁹⁰, which is the interval in between the perfect fourth and perfect fifth.

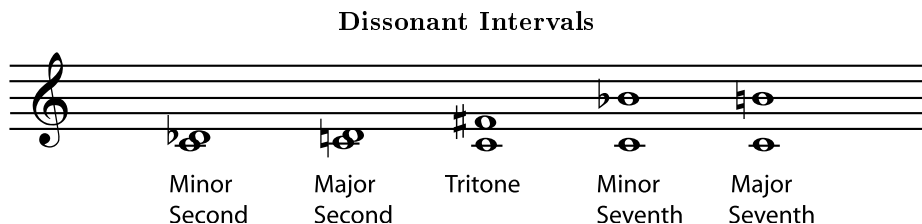


Figure 3.27

⁷⁸<http://cnx.org/content/m11953/latest/minorthird.mid>

⁷⁹<http://cnx.org/content/m11953/latest/majorthird.mid>

⁸⁰<http://cnx.org/content/m11953/latest/fourth.mid>

⁸¹<http://cnx.org/content/m11953/latest/fifth.mid>

⁸²<http://cnx.org/content/m11953/latest/minorsixth.mid>

⁸³<http://cnx.org/content/m11953/latest/majorsixth.mid>

⁸⁴<http://cnx.org/content/m11953/latest/octave.mid>

⁸⁵"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁸⁶<http://cnx.org/content/m11953/latest/minorsecond.mid>

⁸⁷<http://cnx.org/content/m11953/latest/majorsecond.mid>

⁸⁸<http://cnx.org/content/m11953/latest/minorseventh.mid>

⁸⁹<http://cnx.org/content/m11953/latest/majorseventh.mid>

⁹⁰<http://cnx.org/content/m11953/latest/tritone.mid>

These intervals are all considered to be somewhat unpleasant or tension-producing. In tonal music⁹¹, chords containing dissonances are considered "unstable"; when we hear them, we expect them to move on to a more stable chord. Moving from a dissonance to the consonance that is expected to follow it is called **resolution**, or **resolving** the dissonance. The pattern of tension and release created by resolved dissonances is part of what makes a piece of music exciting and interesting. Music that contains no dissonances can tend to seem simplistic or boring. On the other hand, music that contains a lot of dissonances that are never resolved (for example, much of twentieth-century "classical" or "art" music) can be difficult for some people to listen to, because of the unreleased tension.

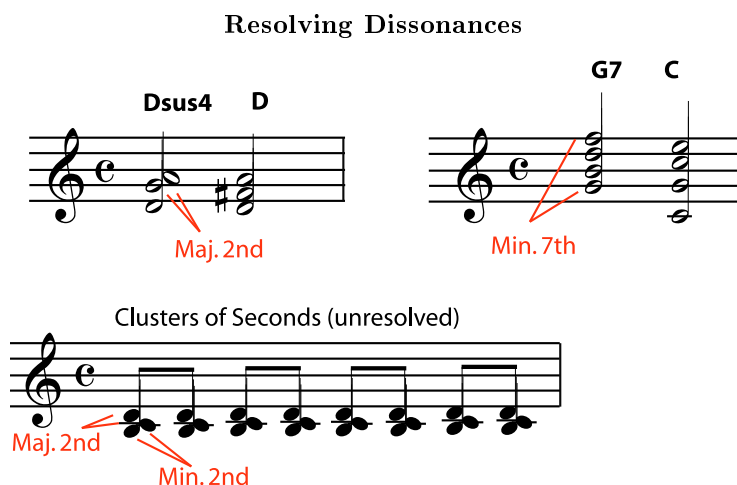


Figure 3.28: In most music a dissonance will resolve; it will be followed by a consonant chord that it naturally leads to, for example a G seventh chord resolves to a C major chord⁹², and a D suspended fourth resolves to a D major chord⁹³. A series of unresolved dissonances⁹⁴, on the other hand, can produce a sense of unresolved tension.

Why are some note combinations consonant and some dissonant? Preferences for certain sounds is partly cultural; that's one of the reasons why the traditional musics of various cultures can sound so different from each other. Even within the tradition of Western music⁹⁵, opinions about what is unpleasantly dissonant have changed a great deal over the centuries. But consonance and dissonance do also have a strong physical basis in nature.

In simplest terms, the sound waves of consonant notes "fit" together much better than the sound waves of dissonant notes. For example, if two notes are an octave apart, there will be exactly two waves of one note for every one wave of the other note. If there are two and a tenth waves or eleven twelfths of a wave of one note for every wave of another note, they don't fit together as well. For much more about the physical basis of consonance and dissonance, see Acoustics for Music Theory⁹⁶, Harmonic Series⁹⁷, and Tuning Systems⁹⁸.

⁹¹"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/#p7d>>

⁹²<http://cnx.org/content/m11953/latest/GseventhC.mid>

⁹³<http://cnx.org/content/m11953/latest/DsusD.mid>

⁹⁴<http://cnx.org/content/m11953/latest/dissonant.mid>

⁹⁵"What Kind of Music is That?" <<http://cnx.org/content/m11421/latest/>>

⁹⁶"Acoustics for Music Theory" <<http://cnx.org/content/m13246/latest/>>

⁹⁷"Harmonic Series" <<http://cnx.org/content/m11118/latest/>>

⁹⁸"Tuning Systems" <<http://cnx.org/content/m11639/latest/>>

3.6 Beyond Triads: Naming Other Chords⁹⁹

3.6.1 Introduction

Once you know how to name triads (please see Triads (Section 3.1) and Naming Triads (Section 3.2)), you need only a few more rules to be able to name all of the most common chords.

This skill is necessary for those studying music theory. It's also very useful at a "practical" level for composers, arrangers, and performers (especially people playing chords, like pianists and guitarists), who need to be able to talk to each other about the chords that they are reading, writing, and playing.

Chord manuals, fingering charts, chord diagrams, and notes written out on a staff are all very useful, especially if the composer wants a very particular sound on a chord. But all you really need to know are the name of the chord, your major scales (Section 2.1) and minor scales (Section 2.2), and a few rules, and you can figure out the notes in any chord for yourself.

What do you need to know to be able to name most chords?

1. You must know your major, minor, augmented and diminished triads. Either have them all memorized, or be able to figure them out following the rules for triads. (See Triads (Section 3.1) and Naming Triads (Section 3.2).)
2. You must be able to find intervals from the root (Section 3.1) of the chord. One way to do this is by using the rules for intervals. (See Interval (Section 1.3).) Or if you know your scales and don't want to learn about intervals, you can use the method in #3 instead.
3. If you know all your scales (always a good thing to know, for so many reasons), you can find all the intervals from the root using scales. For example, the "4" in Csus4 is the 4th note in a C (major or minor) scale, and the "minor 7th" in Dm7 is the 7th note in a D (natural) minor scale. If you would prefer this method, but need to brush up on your scales, please see Major Keys and Scales (Section 2.1) and Minor Keys and Scales (Section 2.2).
4. You need to know the rules for the common seventh chords (Section 3.6.3: Seventh Chords), for extending (Section 3.6.4: Added Notes, Suspensions, and Extensions) and altering (Section 3.6.6: Altering Notes and Chords) chords, for adding notes (Section 3.6.4: Added Notes, Suspensions, and Extensions), and for naming bass notes (Section 3.6.5: Bass Notes). The basic rules for these are all found below.

NOTE: Please note that the modern system of chord symbols, discussed below, is very different from the **figured bass** shorthand popular in the seventeenth century (which is not discussed here). For example, the "6" in figured bass notation implies the first inversion (Section 3.1) chord, not an added 6. (As of this writing, there was a very straightforward summary of figured bass at Ars Nova Software¹⁰⁰.)

3.6.2 Chord Symbols

Some instrumentalists, such as guitarists and pianists, are sometimes expected to be able to play a named chord, or an accompaniment¹⁰¹ based on that chord, without seeing the notes written out in common notation¹⁰². In such cases, a **chord symbol** above the staff¹⁰³ tells the performer what chord should be used as accompaniment to the music until the next symbol appears.

⁹⁹This content is available online at <<http://cnx.org/content/m11995/1.10/>>.

¹⁰⁰<http://www.ars-nova.com/cpmanual/realizeharmony.htm>

¹⁰¹"Harmony": Accompaniment <<http://cnx.org/content/m11654/latest/#10c>>

¹⁰²"The Staff" <<http://cnx.org/content/m10880/latest/>>

¹⁰³"The Staff" <<http://cnx.org/content/m10880/latest/>>

Chord Symbols

He'd ne'er leave the girl with the straw-ber-ry curls and the band played on.

Figure 3.29: A chord symbol above the staff is sometimes the only indication of which notes should be used in the accompaniment¹⁰⁴. Chord symbols also may be used even when an accompaniment is written out, so that performers can read either the chord symbol or the notated music, as they prefer.

There is widespread agreement on how to name chords, but there are several different systems for writing chord symbols. Unfortunately, this can be a little confusing, particularly when different systems use the same symbol to refer to different chords. If you're not certain what chord is wanted, you can get useful clues both from the notes in the music and from the other chord symbols used. (For example, if the "minus" chord symbol is used, check to see if you can spot any chords that are clearly labelled as either minor or diminished.)

Examples of Chord Symbol Variety

Major chord	C	CMaj	C[△]		
Minor chord	Cm	Cmin	C⁻		
Augmented Chord	Caug	C⁺			
Diminished Chord*	Cdim	C⁻			
Major Seventh	CM7	CMaj7	C[△]	C[△]7	C⁷
Minor Seventh	Cm7	Cmin7	C⁻7		
Diminished Seventh*	Cdim7	C[°]			

*It is so common to add the (diminished) seventh to the diminished chord, that the symbol for the diminished chord may be used with the assumption that you will add the diminished seventh.

Figure 3.30: There is unfortunately a wide variation in the use of chord symbols. In particular, notice that some symbols, such as the "minus" sign and the triangle, can refer to different chords, depending on the assumptions of the person who wrote the symbol.

3.6.3 Seventh Chords

If you take a basic triad (Section 3.1) and add a note that is a seventh (p. 10) above the root (Section 3.1), you have a **seventh chord**. There are several different types of seventh chords, distinguished by both the

¹⁰⁴"Harmony": Accompaniment <<http://cnx.org/content/m11654/latest/#10c>>

type of triad and the type of seventh used. Here are the most common.

Seventh Chords

- Seventh (or "dominant seventh") chord = major triad + minor seventh
- Major Seventh chord = major triad + major seventh
- Minor Seventh chord = minor triad + minor seventh
- Diminished Seventh chord = diminished triad + diminished seventh (half step lower than a minor seventh)
- Half-diminished Seventh chord = diminished triad + minor seventh

An easy way to remember where each seventh is:

- The *major seventh* is one half step below the octave (Section 1.1).
- The *minor seventh* is one half step below the major seventh.
- The *diminished seventh* is one half step below the minor seventh.

Common Seventh Chords






C7	CMaj7	Cmin7	C ^o	C ^ø
				
dominant seventh	major seventh	minor seventh	diminished seventh	half-diminished seventh

Figure 3.31

Listen to the differences between the C seventh¹⁰⁵, C major seventh¹⁰⁶, C minor seventh¹⁰⁷, C diminished seventh¹⁰⁸, and C half-diminished seventh¹⁰⁹.

Exercise 3.14

(Solution on p. 81.)

Write the following seventh chords. If you need staff paper, you can print this PDF file¹¹⁰

1. G minor seventh
2. E (dominant) seventh
3. B flat major seventh
4. D diminished seventh
5. F (dominant) seventh
6. F sharp minor seventh
7. G major seventh
8. B half-diminished seventh

¹⁰⁵<http://cnx.org/content/m11995/latest/chodom7.mp3>

¹⁰⁶<http://cnx.org/content/m11995/latest/choM7.mp3>

¹⁰⁷<http://cnx.org/content/m11995/latest/chomin7.mp3>

¹⁰⁸<http://cnx.org/content/m11995/latest/chodim7.mp3>

¹⁰⁹<http://cnx.org/content/m11995/latest/chohalfdim.mp3>

¹¹⁰<http://cnx.org/content/m11995/latest/staffpaper1.pdf>

Exercise 3.15*(Solution on p. 81.)*

Write a Ddim7, Fdim7, G[#]dim7, and Bdim7. Look closely at the chords you have written and see if you can notice something surprising about them. (Hint: try rewriting the chords enharmonically¹¹¹ so that all the notes are either natural or (single) flat.

3.6.4 Added Notes, Suspensions, and Extensions

The seventh is not the only note you can add to a basic triad to get a new chord. You can continue to *extend* the chord by adding to the stack of thirds (Section 3.1), or you can *add* any note you want. The most common additions and extensions add notes that are in the scale named by the chord.

Extending and Adding Notes to Chords

<p>C major</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 etc.</p>	<p>C(add 9) chord</p>
<p>D major</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 etc.</p>	<p>D6 chord</p>
<p>F minor</p> <p>1 2 3 4 5 6 7 8 9 10 11 12 13 etc.</p>	<p>Fm(add11) chord</p>

Figure 3.32: To find out what to call a note added to a chord, count the notes of the scale named by the chord.

The first, third, and fifth (1, 3, and 5) notes of the scale are part of the basic triad. So are any other notes in other octaves that have the same name as 1, 3, or 5. In a C major chord, for example, that would be any C naturals, E naturals, and G naturals. If you want to add a note with a different name, just list its number (its **scale degree**) after the name of the chord.

¹¹¹"Enharmonic Spelling" <<http://cnx.org/content/m11641/latest/>>

Adding to and Extending Chords

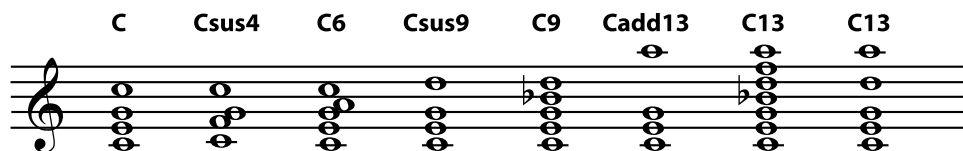


Figure 3.33: Labelling a number as "sus" (suspended) implies that it replaces the chord tone immediately below it. Labelling it "add" implies that only that note is added. In many other situations, the performer is left to decide how to play the chord most effectively. Chord tones may or may not be left out. In an extended chord, all or some of the notes in the "stack of thirds" below the named note may also be added.

Many of the higher added notes are considered **extensions** of the "stack of thirds" begun in the triad. In other words, a C13 can include (it's sometimes the performer's decision which notes will actually be played) the seventh, ninth, and eleventh as well as the thirteenth. Such a chord can be dominant, major, or minor; the performer must take care to play the correct third and seventh. If a chord symbol says to "add13", on the other hand, this usually means that only the thirteenth is added.

A Variety of Ninth Chords

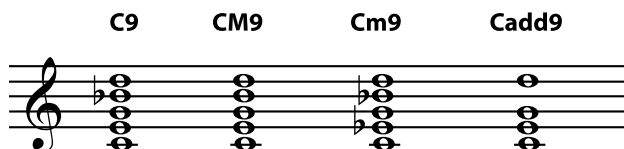


Figure 3.34: Take care to use the correct third and seventh - dominant, major, or minor - with extended chords. If the higher note is labelled "add", don't include the chord extensions that aren't named.

NOTE: All added notes and extensions, including sevenths, introduce dissonance (Section 3.5) into the chord. In some modern music, many of these dissonances are heard as pleasant or interesting or jazzy and don't need to be resolved. However, in other styles of music, dissonances need to be resolved (p. 66), and some chords may be altered to make the dissonance sound less harsh (for example, by leaving out the 3 in a chord with a 4).

You may have noticed that, once you pass the octave (8), you are repeating the scale. In other words, C2 and C9 both add a D, and C4 and C11 both add an F. It may seem that C4 and C11 should therefore be the same chords, but in practice these chords usually do sound different; for example, performers given a C4 chord will put the added note near the bass note and often use it as a temporary replacement for the third (the "3") of the chord. On the other hand, they will put the added note of a C11 at the top of the chord, far away from the bass note and piled up on top of all the other notes of the chord (including the third), which may include the 7 and 9 as well as the 11. The result is that the C11 - an **extension** - has a more diffuse, jazzy, or impressionistic sound. The C4, on the other hand, has a more intense, needs-to-be-resolved, classic

suspension sound. In fact, 2, 4, and 9 chords are often labelled **suspended** (sus), and follow the same rules for resolution (p. 66) in popular music as they do in classical.

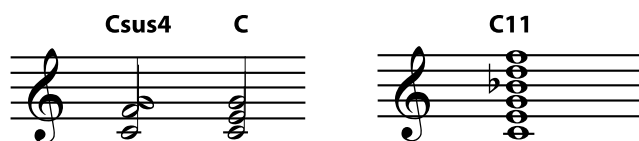


Figure 3.35: Low-number added notes and high-number added notes are treated differently. So even though they both add an F, a C4 suspension¹¹² will sound quite different from a C11¹¹³ extended chord.

3.6.5 Bass Notes

The bass line¹¹⁴ of a piece of music is very important, and the composer/arranger often will want to specify what note should be the lowest-sounding in the chord. At the end of the chord name will be a slash followed by a note name, for example C/E. The note following the slash should be the bass note.

Naming the Bass Note

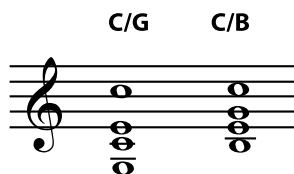


Figure 3.36: The note following the slash is the bass note of the chord. It can be a note that is already in the chord - making the chord a first or second inversion (p. 48) - or it can be an added note, following the same basic rules as other added notes (including using it to replace other notes in the chord).

The note named as the bass note can be a note normally found in the chord - for example, C/E or C/G - or it can be an added note - for example C/B or C/A. If the bass note is not named, it is best to use the tonic (p. 28) as the primary bass note.

Exercise 3.16

(Solution on p. 82.)

Name the chords. (Hint: Look for suspensions, added notes, extensions, and basses that are not the root. Try to identify the main triad or root first.)

¹¹²<http://cnx.org/content/m11995/latest/C4C.mid>

¹¹³<http://cnx.org/content/m11995/latest/C11.mid>

¹¹⁴"Harmony": Accompaniment <<http://cnx.org/content/m11654/latest/#10c>>

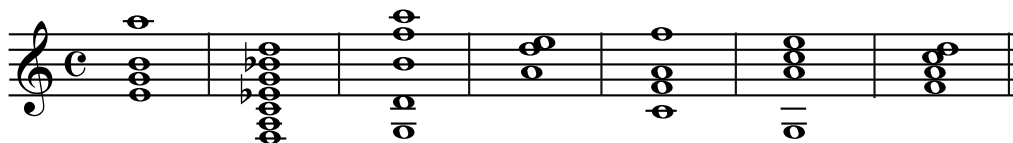


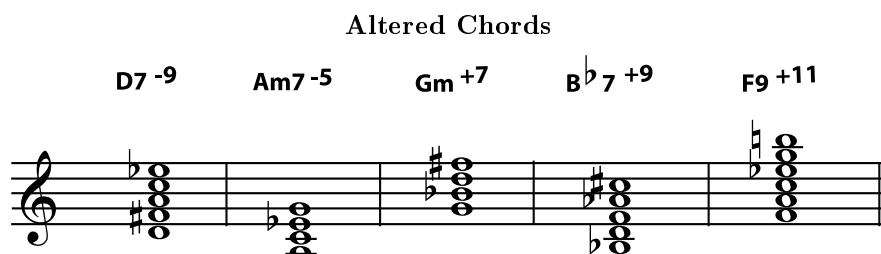
Figure 3.37

Exercise 3.17*(Solution on p. 82.)*

For guitarists, pianists, and other chord players: Get some practical practice. Name some chords you don't have memorized (maybe F6, Am/G, Fsus4, BM7, etc.). Chords with fingerings that you don't know but with a sound that you would recognize work best for this exercise. Decide what notes must be in those chords, find a practical fingering for them, play the notes and see what they sound like.

3.6.6 Altering Notes and Chords

If a note in the chord is not in the major or minor scale of the root (Section 3.1) of the chord, it is an **altered note** and makes the chord an **altered chord**. The alteration - for example "flat five" or "sharp nine" - is listed in the chord symbol. Any number of alterations can be listed, making some chord symbols quite long. *Alterations are not the same as accidentals*¹¹⁵. Remember, a chord symbol always names notes in the scale of the chord root (Section 3.1), ignoring the key signature¹¹⁶ of the piece that the chord is in, so the alterations are from the scale of the chord, not from the key of the piece.



The "half-diminished seventh" may be written as a "minor seventh with flat five" as here.

The "minor chord with sharp seventh" is also sometimes referred to as a "minor, major seventh" chord, for example **Gm 7**

Figure 3.38: There is some variation in the chord symbols for altered chords. Plus/minus or sharp/flat symbols may appear before or after the note number. When sharps and flats are used, remember that the alteration is always from the scale of the chord root, not from the key signature.

¹¹⁵"Pitch: Sharp, Flat, and Natural Notes" <<http://cnx.org/content/m10943/latest/#p0e>>

¹¹⁶"Key Signature" <<http://cnx.org/content/m10881/latest/>>

Exercise 3.18**(Solution on p. 82.)**

On a treble clef staff, write the chords named. You can print this PDF file¹¹⁷ if you need staff paper for this exercise.

1. D (dominant) seventh with a flat nine
2. A minor seventh with a flat five
3. G minor with a sharp seven
4. B flat (dominant) seventh with a sharp nine
5. F nine sharp eleven

¹¹⁷<http://cnx.org/content/m11995/latest/staffpaper1.pdf>

Solutions to Exercises in Chapter 3

Solution to Exercise 3.1 (p. 48)

Build Root Position Triads:

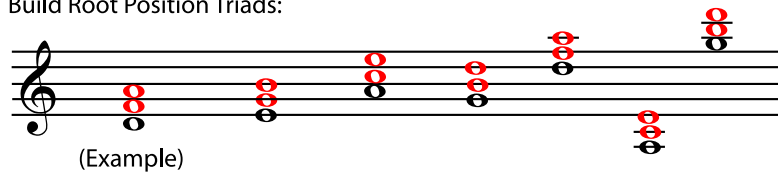


Figure 3.39

Solution to Exercise 3.2 (p. 49)

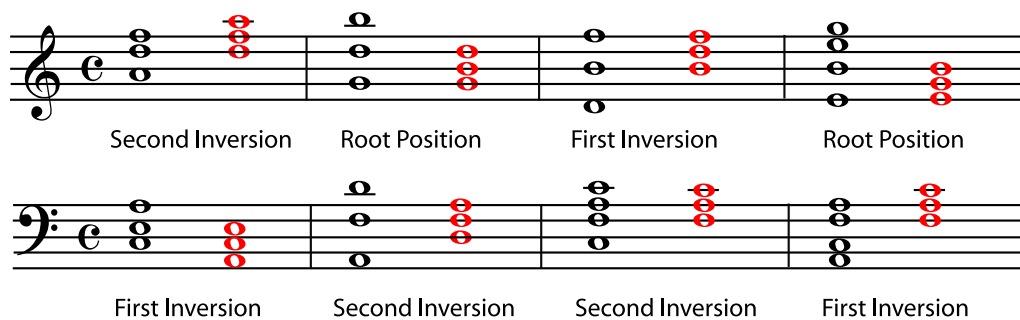


Figure 3.40

Solution to Exercise 3.3 (p. 51)



Figure 3.41

Solution to Exercise 3.4 (p. 51)



Figure 3.42

Solution to Exercise 3.5 (p. 52)

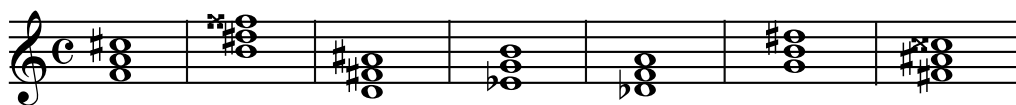


Figure 3.43

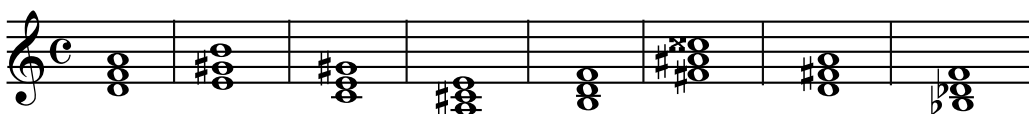
Solution to Exercise 3.6 (p. 53)



Figure 3.44

Solution to Exercise 3.7 (p. 53)

Chords are rewritten in root position.



D minor E major C aug. A major B dim. F# aug. D major B^b minor



G dim. A dim. F aug. A^b minor C# major G# minor D^b aug. B^b dim.

Figure 3.45

Solution to Exercise 3.8 (p. 55)

The figure displays two musical staves, each showing the triads and diads for a specific major key. The first staff is for G major, and the second is for B \flat major.

G major: The staff shows the following triads and diads: G (I), Am (ii), Bm (iii), C (IV), D (V), Em (vi), and F \sharp dim (vii $^\circ$). The notes are written on a treble clef staff.

B \flat major: The staff shows the following triads and diads: B \flat (I), Cm (ii), Dm (iii), E \flat (IV), F (V), Gm (vi), and A \flat dim (vii $^\circ$). The notes are written on a treble clef staff.

Figure 3.46**Solution to Exercise 3.9 (p. 58)**

1. G major (G)
2. A major (A)
3. G sharp major (G \sharp)
4. A minor (Am)
5. E minor (Em)
6. A minor (Am)
7. E seventh (E7)

Solution to Exercise 3.10 (p. 58)

I	IV	ii	vi
G	C	Am	Em
tonic	subdominant	supertonic	submediant
II	V	iii	V7
A	D	Bm	D7
not in key*	dominant	mediant	dominant seventh
I			
G			
tonic			

There is no subtonic in this progression.

*It is A minor (with a C natural), not A major (with a C sharp) that belongs in this key. An A major chord can sound good in the key of G major, however. It is the dominant of the dominant (D major), so playing an A major chord can sometimes make the music feel like it has temporarily moved to the (closely related) key of D major. This type of harmonic complexity helps keep a piece of music interesting.

Figure 3.47

Solution to Exercise 3.11 (p. 58)

The tonic, subdominant, and dominant are minor (i, iv, and v). The mediant, submediant, and subtonic are major (III, VI, and VII). The supertonic (ii) is diminished.

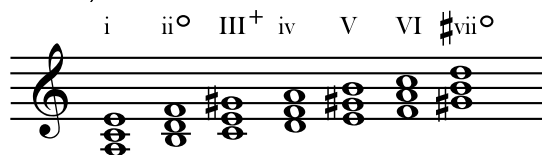
Figure 3.48

Solution to Exercise 3.12 (p. 59)

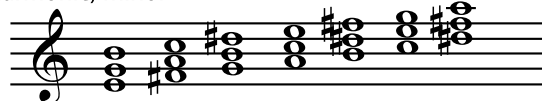
The seventh degree of the scale must be raised by one half step to make the v chord major. If the seventh scale note is raised, the III chord becomes augmented, and the vii chord becomes a diminished chord (based on the sharp vii rather than the vii). The augmented III chord would not be particularly useful in

the key, but, as mentioned above (p. 56), a diminished seventh chord based on the leading tone (here, the sharp vii) is sometimes used in cadences (Section 3.4).

a (harmonic) minor



e (harmonic) minor



d (harmonic) minor

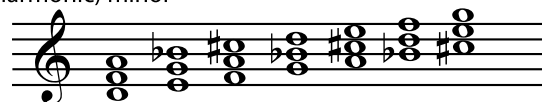


Figure 3.49

Solution to Exercise 3.13 (p. 64)

<p>(Perfect) Authentic</p> <p>in E flat major: I V I</p>	<p>Plagal</p> <p>in G major: vi IV I</p>
<p>Half-cadence</p> <p>in F major: I M7 II7 V</p>	<p>(Perfect) Authentic</p> <p>in D minor: III ii° i V i</p>
<p>in C major: IV M7 V7 I</p> <p>(temporary modulation to V)</p>	

Figure 3.50

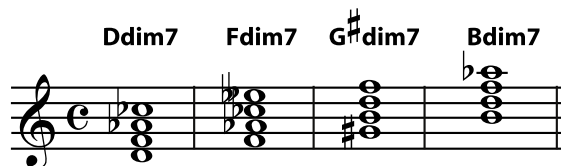
Notice that the half cadence looks like (and in fact is) a modulation (Section 3.3.6: Modulation) to the dominant. In this very common progression, the dominant seventh of the dominant (which requires an accidental) makes the dominant feel like a very strong resting point, and the piece will continue on in the dominant key for a while, before returning to the tonic key. Also notice the accidental required in the minor key to make the (major) dominant chord.

Solution to Exercise 3.14 (p. 70)

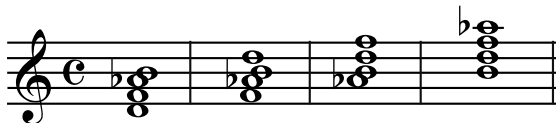
Gm7 E7 B^bMaj7 Ddim7 F7 F[#]m7 GMaj7 B^ø

Figure 3.51

Solution to Exercise 3.15 (p. 71)



Respell each chord so that you are only using natural and (single) flat notes:



All of the chords contain the (enharmonic) equivalent of the same four notes: D, F, A \flat , and B, so these chords sound like inversions of each other. There are two other sets of enharmonically equivalent diminished seventh chords; how quickly can you find them?

Figure 3.52

Solution to Exercise 3.16 (p. 73)

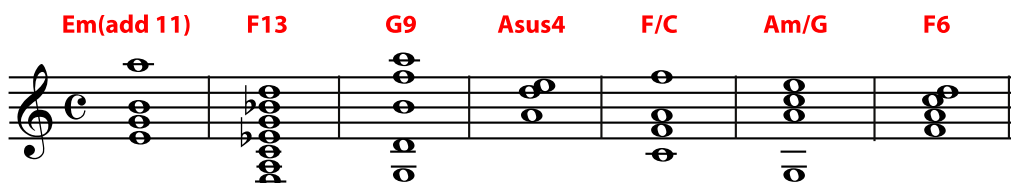


Figure 3.53

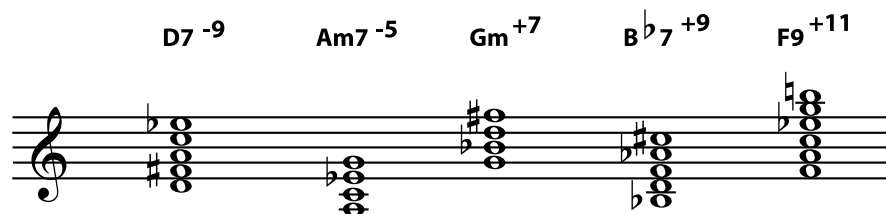
Solution to Exercise 3.17 (p. 74)

You can check your work by

- listening to the chords to see if they sound correct
- playing your chords for your teacher or other trained musician
- checking your answers using a chord manual or chord diagrams

Solution to Exercise 3.18 (p. 74)

Notice that a half-diminished seventh (Seventh Chords, p. 70) can be (and sometimes is) written as it is here, as a minor seventh with flat five.



Note that a "half-diminished seventh" may be written as a "minor seventh with flat five", as it is here.

The "minor chord with sharp seventh" is sometimes referred to as a "minor, major seventh" chord, for example **Gm7**

Figure 3.54

Index of Keywords and Terms

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Introduction to Music Theory

This course introduces the basic concepts and terms needed to discuss melody and harmony. It is intended for teens or adults with no background in music theory but some familiarity with reading common notation and playing an instrument (or singing). Concepts covered include interval, major and minor keys and scales, triads and chords.

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