24e Lesson - Using Pitch Class Sets in Analysis

Test Subtitle

Contents

**As you read the following excerpt from Kris Shaffer’s *Open Music Theory*, try to find the value in developing a basic understanding of counterpoint in a tonal harmony–two very different styles of composition. We will only discuss strict counterpoint briefly, but it can provide a good deal of insight into our studies.**

# Class reading from *Open Music Theory*

The study of the theory of Western music involves three main components: voice-leading, harmony, and form. *Voice-leading* deals with the relationship of two or more musical lines (or melodies) combined into a single musical idea. *Harmony* addresses the rules or norms for combining chords into successions. *Form* addresses the rules or norms for the combination of phrases and other small musical units into larger units—including whole movements and works.

We will address all three of these facets of musical theory. However, of the three, voice-leading is the most fundamental. Thus, we begin our study of music theory, then, with *strict voice-leading*, or *counterpoint*.

Twentieth-century musician and theorist, Heinrich Schenker, wrote:

The purpose of counterpoint, rather than to teach a specific style of composition, is to lead the ear of the serious student of music for the first time into the infinite world of fundamental musical problems (*Kontrapunkt*, p. 10).

Following this line of thinking, our early voice-leading exercises will not be in a specific style (Classical, Baroque, Romantic, pop/rock, etc.). Instead, these exercises will eliminate important musical elements like *harmony*, *orchestration*, *melodic motives*, *formal structure*, and even many elements of *rhythm*, in order to focus very specifically on a small set of musical problems. These other elements of music will be introduced one-by-one as we progress through this course and into future courses.

The “fundamental musical problems” we will address in the study of counterpoint center around the way in which some basic principles of auditory perception and cognition (how the brain perceives and conceptualizes sound) play out in Western musical structure. For example, our brains tend to assume that sounds similar in pitch or timbre come from the same source. Our brains also listen for patterns, and when a new sound continues or completes a previously heard pattern, it assumes that the new sound belongs together with those others. On the other hand, the breaking of these regularities in the sonic environment can signal danger, or at the very least the need for heightened attention to be applied to the sonic “culprit.” Identifying irregularities in the sonic environment and boosting attention and adrenaline when one is found have been absolutely essential to the survival of the human species. These abilities are also what allows music to have the emotional effect that it does on so many people. Whether or not a composer or songwriter is aware of the science and psychology of hearing, a masterful composer mediates and plays with these basic concepts.

“Mediates” and “plays” are important ideas here. Music that simply makes it easy for the brain to parse and process sound is boring. It calls for no heightened attention – it doesn’t increase our heart rate or make the hair on the back of our neck stand up or give us a little jolt of dopamine. On the other hand, music that constantly activates our innate sense of danger is hardly pleasant for most listeners. Thus, fundamental to most of the music we will study is the dance between tension and relaxation, motion and rest.

The study of counterpoint will help us to engage several important musical “problems” in a limited context, so that we can master them compositionally and understand them analytically. Those problems arise as we seek to bring the following traits together:

* smoothness
* independence and integrity of melodic lines
* tonal fusion (the preference for simultaneous notes to form a consonant unity)
* variety
* motion (towards a goal)

These traits are based in human perception and cognition, but they are often in conflict in specific musical moments, and need to be balanced over the course of larger passages and complete works. Counterpoint will help us begin to practice mediating these conflicts.

Also, note Schenker’s expression “lead the ear.” Counterpoint is not a pencil-and-paper (or lecture-and-homework) study. Rather, the exercises are mini- (micro-? nano-?) compositions that must be *performed*—with voice and/or keyboard, often with a partner—so that the ear, the fingers, the throat, and ultimately the mind can internalize the sound, sight, and feel of good (and bad) musical lines, and good (and bad) combinations of musical lines.

The specific method we will use is called *species counterpoint*—so called because the study progresses through stages, or species, where one or two new musical “problems” are introduced. This approach has existed in some form since the early seventeenth century. The specific method we will use is very close to that articulated by Johann Joseph Fux, in his *Gradus ad parnassum* (*Steps to Parnassus*, 1725). Master composers from the eighteenth to the twenty-first centuries have used this method, or some variation on it. While Fux proposed five species, moving from two-voice combinations up to six- and eight-voice combinations, we will focus on species one through four, in two voices only.

## Conclusions

Any lesson could begin with the question, “Why study this it all?” and the discussion of counterpoint is no different. Why should we study counterpoint in a tonal harmony class when there are entire courses in later semesters dedicated to this specific subject?

First, you should try to conceptualize what counterpoint is in a musical context. Notice the second sentence of the passage above:

“*Voice-leading* deals with the relationship of two or more musical lines (or melodies) combined into a single musical idea.”

And then, from the second paragraph:

However, of the three [aspects of music], voice-leading is the most fundamental. Thus, we begin our study of music theory, then, with *strict voice-leading*, or *counterpoint*.

A brief study of counterpoint is the next step as we work through increasing levels of musical complexity. We began with a single pitch, then combined pitches to create intervals. We then combine intervals to create melodies and combine melodies to create counterpoint. Studying counterpoint allows us to strip away many of the complicating factors of musical harmony and begin to understand the origin of tonality.

In the next topic, we will establish some basic rules for constructing a simple melody and then look at what happens when we create a second melody that works with the original. It is from these interactions that harmony evolved as we know it, so to study counterpoint is to study the fundamental of Western music.

Eighteenth century species counterpoint gives us a relatively straightforward set of rules and norms to begin this study. Even though many of these rules are not observed by modern music, we can study the process of how these rules create music and then apply that *process* to all types of music.

Finally, consider these two further takeaways from the reading: - Music is a built upon tension and release. - Music is structured to create expectations for the listener and then either fulfill or deny those expectations.

These observations consider the nature of musical composition in general, because they also demonstrate the fundamentals of counterpoint. Tension, release, and expectations are based on two primary functions: intervals and melodic motion, and we will study these for the rest of this unit.

## Class reading from *Open Music Theory*

The concept of musical functions is foundational to musical analysis, and essential to the understanding of musical styles.

A musical *function* describes the role that a particular musical element plays in the creation of a larger musical unit. Function is tied very much to the idea of expectation: given a certain element in a certain context, what element(s) is/are likely to come next? Likewise, how does a given element fulfill or deny the expectations set by what came before it?

A musical function typically has two defining features: the characteristics of the musical elements that tend to belong to that function (what notes tend to be found in the chord, for example), and the kinds of elements (or functions) that tend to precede or follow it in a succession of musical elements. Note that this is entirely dependent on the typical patterns of a musical *style*. Different styles of music may exhibit different functions or different behaviors for the same functions. The study of function and the study of style are inextricably linked.

The two musical traits most commonly studied for their functional properties in Western art and popular music are *harmony* and *form*. The study of both harmonic functions and formal functions will lead to an understanding of harmonic and formal *syntax*: the norms or principles according to which musical elements are combined into meaningful and stylistically appropriate successions. The study of harmony or form, then, is not a matter of learning to label chords, phrases, and modules correctly. It is a matter of *interpreting the role that chords, phrases, modules, etc. play in the larger context in which they are found*. That, of course, requires fluency in identifying (and thus labeling) individual musical elements. But identification is only the beginning of a much bigger, and more interesting, process of analysis. And it is that analytical work that will lead to true understanding of the pieces of music analyzed, and the styles to which they belong.

If a musical function describes the role that a particular musical element plays in the creation of a larger musical unit, then *a harmonic function describes the role that a particular chord plays in the creating of a larger harmonic progression*. Each chord tends to occur in some musical situations more than others, to progress to some chords more than others. These tendencies work together to create meaningful harmonic progressions, which can in turn form the harmonic foundation for musical *phrases*, *themes*, and larger formal units.

Generally speaking, the function of a chord concerns the notes that belong to it (its *internal characteristics*), the chords that tend to precede and follow it, and where it tends to be employed in the course of a musical phrase.

A theory of harmonic functions is based on three fundamental principles:

* Chords are collections of scale degrees.
* Each scale degree has its own tendencies.
* The collective tendencies of a chord’s scale degrees in combination is the chord’s function.

(Note the absence of *root* and *quality* from consideration here.)

Because [tendency is style-specific](06-intro-harmonic/1-reading-styletendency.html), the same chord can have different functions in different musical styles. For instance, the kinds of functions we find in classical music are different from those we find in pop/rock songs from the Billboard charts. And though there are some general harmonic traits that are common to most eighteenth- and nineteenth-century Western composers (what we call the “common practice”), when we look in closer detail, we find some significant differences in the way Bach, Mozart, Brahms, and others compose their harmonic progressions.

Our initial exploration of harmonic functions will engage the general “common practice” that is shared by most eighteenth- and nineteenth-century Western composers. As we explore specific genres, composers, and works within that common practice, we will have opportunity to explore the more nuanced differences between composers, as well as to move beyond common-practice Western art music to include other styles, such as pop/rock.

# Class reading

## From *Open Music Theory* by Kris Shaffer

In explaining musical styles, [Leonard Meyer](https://openlibrary.org/works/OL3267613W/Style_and_music) divides musical characteristics into three categories: *laws*, *rules*, and *strategies*. Laws are characteristics of music that are based on human biology and psychology, and as a result laws are more-or-less universal. Rules are culturally conditioned. They are hallmarks of a particular style that are more-or-less universal within the style, but differ from style to style and culture to culture. Finally, strategies are specific ways in which composers work within a style—the things that make one composer’s work sound different from another’s, even if they compose in the same style.

For the most part, principles of voice-leading or harmonic progression are “rules” according to Meyer’s definitions. They are specific to a style. Or, in some cases, they are shared among a few styles of Western music, but are far from universal. Thus, it can be helpful to think of them as collective traits of some music(s) we seek to understand and emulate, rather than hard-and-fast *it-must-be-done-this-way* strictures for all musical practice.

However, these rules are also related to laws, in as much as they represent one set of practices that mediate the various demands on music from basic principles of human auditory perception and cognition. For instance, the prohibition against parallel fifths is a specific way in which Western tonal composers have mediated the conflict between tonal fusion, goal-directed motion, and independence of line. There are many other similar cases.

Note, however, that while “avoid parallel fifths” takes on the form of what we consider “rules” in day-to-day speech, Meyer’s rules of musical style are different. Meyer’s rules are *descriptive*: these things tend to happen universally, frequently, rarely, never, in specific situations. “Avoid parallel fifths” is a *prescriptive* instruction based on that descriptive observation: because parallel fifths occur rarely in this style, and only in specific cases, avoid them in your own strict-style compositions until we have a chance to engage those specific cases — all the while remembering that other styles may have different tendencies.

That word *tendencies* is an important one. There are rarely absolutes in the musical parameters we engage most as performers, analysts, composers, listeners, etc. The absolutes of common styles fell into our unconscious background long ago. Instead, what makes each piece, composer, or style special and unique — what we care about — are the little ways in which they bend the “rules,” the ways in which they express, thwart, and play with the tendencies of the style they engage — the ways they play with our expectations as listeners.

Over time, as we familiarize ourselves with a musical style, the tendencies of the style become *expectations* in our mind, and composers can, in turn, compose with those listener expectations in mind. Though those tendencies are subjective, and to a large extent statistical, the shared stylistic knowledge and the shared psychological expectancy create a kind of quasi-objective language. That musical “language,” like spoken/written languages, is both reliable and bendable/breakable. The meaningfulness of a piece of music is dependent on that reliability. But its specialness is dependent on the ability for the “rules” of that language to be bent, even broken.

With this in mind, as we progress in our study of voice-leading, we will encounter more exceptions to the prescriptive rules, even in strict-style composition, and our hard-and-fast strictures will transition more and more into the language of tendency.

# Class reading

## From *Open Music Theory*

### Modified for this website by Sean Butterfield

*Basso continuo* emerged in the seventeenth century as a shorthand notation for keyboardists (typically church organists) who were accompanying a soloist or small ensemble performing a work originally composed for a larger group. For example, if two or three singers were tasked with performing an eight-voice choral work, they could select the most prominent parts to sing, while an organist could cover the rest. Performing five or six lines of contrapuntal choral music could be a significant challenge, so organists needed a way to condense the texture while still preserving the core musical structure to support the vocalists.

The *thorough bass* emerged as that shortcut. The “thorough” or “continuous” bass is a musical line that includes the lowest note at any given time. Usually, works would not include a single part that could function as this line, so the organist would alternate between voices, as they exchanged registers or took rests. The resulting line, unlike the regular “bass” part, was “continuous” (or “thorough”)—hence the name *thoroughbass* or *basso continuo*.

A good musician could perform this bass line, and with an eye (or ear) on the vocal parts and with knowledge of how to improvise good voice-leading, that musician could *accompany* the thoroughbass line with chords that made musical sense. (This is the original meaning of the term accompany—to accompany a bass line with chords. The fact that keyboardists did this in the context of supporting a soloist or small ensemble led to that term later being applied to any situation where a keyboardist *accompanied* spotlight performers.)

As this technique grew, publishers began publishing thoroughbass reductions of large-ensemble pieces to support smaller groups of musicians. In these publications, *figures* (numbers above or below the bass line) were included—sometimes only for difficult or non-standard chords, and eventually for most chords, enabling more amateur musicians, as well as students, to make use of the technique. These bass lines with figures became known as “figured bass” lines.

*J.S. Bach, Flute Sonata in C Major, ii., BWV 1033. The upper part is played by the flute, the lower part is the* basso continuo *line, played by a keyboardist who uses the numbers below the staff (figures) to guide the chords played above this bass line.*

To this day, harpsichordists performing in Baroque ensembles will often put their left hand to the same “bass” line that the cellos play, and will improvise right-hand chords (with contrapuntally sound embellishment) according to the figures provided with the bass line.

Though most music students are not Baroque keyboard specialists in training, thoroughbass, or *basso continuo*, can be a valuable tool in the study of harmony and voice-leading. In the study of harmony, a thoroughbass line can play a valuable role as a harmonic *reduction* of a complex texture, in order to example and understand better the harmonic skeleton underlying a passage. In aural dictation, transcription, and analysis, the bass line and the melody are often the most prominent (and most important) lines in a passage, and knowing how the inner voices tend to relate to the bass line and melody can aid in a number of listening and aural-analysis tasks. In voice-leading, the *basso continuo* texture affords a straightforward environment in which to make a gradual, staged progression through the intricacies of writing musical lines in a harmonic texture—and to do so without paying significant attention to harmony.

*Basso continuo* (It. for “continuous bass” or “thoroughbass”) is essentially a chordal version of first-species counterpoint. However, instead of composing a single line above a cantus firmus, one composes a succession of chords (performed in the right hand) above a bass line (performed in the left hand). *Basso continuo* writing, also referred to as *realizing a figured bass*, gives no consideration to melody, only to the use of proper chords and the smoothest voice-leading possible. Thus, *basso continuo* style is a simple place to begin engaging the “fundamental musical problems” that arise when more than two lines are combined.

The historical origin of the thoroughbass part was in church settings where a piece for 6–8 singers was to be performed by one or two voices with a keyboard instrument. The keyboardist, rather than play the 4–7 remaining parts, would transcribe the lowest note and shorthand figures to indicate the (simple) intervals present above that lowest voice. This would allow the keyboardist to play one or two of the more important lines, and fill the rest of the texture with blocked or arpeggiated chords. (Think seventeenth-century lead sheet.) A good keyboardist, who knew their harmony and voice-leading, could simply follow the bass line without figures (an *unfigured bass*) and listen to the melody, improvising the rest. Less experienced keyboardists, however, could manage otherwise complicated pieces by reading a bass line and memorizing a small number of figures and basic voice-leading rules.

Coming after species counterpoint in our studies, *basso continuo* exercises provide a new, more complicated environment in which to practice mediating the demands of smoothness, independence of lines, tonal fusion (now considering triads and seventh chords), variety, and motion. New considerations of performability are introduced, and the presence of dissonances within the core harmonies themselves will call for new approaches to harmonic dissonance in this style.

We will use thoroughbass lines for a number of purposes in this book:

* harmonic “reductions” of pieces and passages with dense textures or complicated voice-leading
* shorthand representations of stock harmonic patterns
* the harmonic basis for model composition exercises (akin to the *cantus firmus* of species counterpoint)

Thoroughbass is a simple, and foundational, concept. Master it early, and subsequent activities will be much easier.

Note on figure placement: Thoroughbass figures can appear above or below the bass line. Both are common, but in this book, we generally place them *above* the bass line. This connects them to our habits of interval analysis during species counterpoint, keeps figures separate from other harmonic symbols we will place below the bass line, and make typesetting in notation software easier when both figures and other symbols are in play simultaneously.

## Figures

In general, a thoroughbass figure indicates the *simple intervals above the bass* for all pitch classes present in the chord.

The largest number typically found in thoroughbass figures is 7. In general, *compound intervals* (an octave or larger) are reduced to their *simple interval* equivalent. A tenth becomes a third, a thirteenth becomes a sixth, etc.

The most common chords in tonal music are [*triads* and *seventh chords*](triads.html). The following figures apply to these chords:

* 5/3: use a fifth and a third above the bass (one note of the chord will be doubled)
* 6/3: use a sixth and a third above the bass (one note of the chord will be doubled)
* 6/4: use a sixth and a fourth above the bass (one note of the chord will be doubled)
* 7/5/3: use a seventh, a fifth, and a third above the bass
* 6/5/3: use a sixth, a fifth, and a third above the bass
* 6/4/3: use a sixth, a fourth, and a third above the bass
* 6/4/2: a use a sixth, a fourth, and a second above the bass

These figures are so common, that most of them have shortcuts:

* no figure = 5/3
* 6 = 6/3
* 6/4 is never abbreviated
* 7 = 7/5/3
* 6/5 = 6/5/3
* 4/3 = 6/4/3
* 4/2 (or just 2) = 6/4/2

Other shortcuts for figured bass realization generally follow two simple rules:

* Assume a fifth is present above the bass unless there is a “6” in the figure.
* Assume a third is present above the bass unless there is a “4” or a “2” in the figure.

## Unfamiliar figures and chords

Only seven figures are given above. If you see a figure you do not recognize, simply follow the intervals (using the two shortcut rules). Likewise, if analyzing a chord that is not a triad or seventh chord, simply label the *simple* intervals you see/hear above the bass, from top to bottom in descending order: 7/6/3 or 5/4, for example. In time, you will become familiar with a number of other harmonic possibilities, and their corresponding figures.

## Chords of the fifth and chords of the sixth

All chords can be categorized as either a *chord of the fifth* or a *chord of the sixth*. This distinction will be important for our study of voice-leading.

A *chord of the fifth* contains a fifth above the bass, but no sixth above the bass.

A *chord of the sixth* contains a sixth above the bass.

## Chromatic alteration

If a note is chromatically altered (different than the key signature), the figure must be altered as well. Since bass notes are already present in the bass, a chromatic alteration in the bass will not make it into the figure. However, any other alteration in the upper voices (such as a raised leading tone in minor) must be reflected in the figure. To do so, simply put a sharp, flat, or natural to the left of the appropriate number.

Of course, there are some shortcuts. For example, draw a line (a “slash”) through a number to denote that it is raised by half-step (can substitute both for sharp or for natural). Also, when altering the third above the bass, simply use the sharp, flat, or natural and leave out the “3.”

In general, if there is a shortcut available, use it. The shortcuts are more standard than the corresponding full notation.

Keep in mind that some chords have abbreviated figures. For example, it is common for the leading tone to be the third above the bass in a 5/3 chord. In such a situation, a bass note that otherwise would have no figure needs a sharp or a natural for its thoroughbass figure.

## Class discussion

TBD

After having developed voice-leading procedures in Unit 7a, you should now understand why the voice-leading between V and I creates tension and release. This progression defines tonal harmony, and it is from this that we derive our three primary function classifications: tonic, dominant, and pre-dominant function. While it is easy to memorize which chords belong to each of the primary functions, it is more important to understand how and why these functions work. - The most stable harmony is built around the tonic of the key, so stable chords have a *tonic* function. - The harmonies that pull strongly to *tonic* function are built around the dominant of the key, so these chords have a *dominant* function. - There are also harmonies that resolve well to the *dominant* function chords, so these have a *pre-dominant* function. - Some systems call these chords *subdominant* function because they all share the fourth scale degree. We already use words such as “dominant” and “tonic” in a variety of ways (e.g. scale degrees, harmonic function, chord types, etc.), so we will be differentiating pre-dominant from subdominant to create slightly less confusion.

These harmonic functions shape every musical phrase, and nowhere is that more obvious than in studying how phrases end. *Cadences* are the term that we use to describe the harmonic progression at the end of a musical phrase. If a musical phrase could be considered equivalent to a written sentence, then the *cadence* is the period at the end of that sentence. All cadences finish a phrase, but not all cadences provide closure and stability. In fact, some cadences are purposefully unsettled.

We will study the chords associated with classifying cadences, but it takes far more than a particular harmonic progression to create a cadence. In addition to chord progressions, cadences are affected by melodic shapes, melodic rhythm, harmonic rhythm, context, meter, and many other elements of music.

For this course, we will study six types of cadences: - *perfect authentic cadence (PAC)* - *imperfect authentic cadence (IAC)* - *half cadence (HC)* - *deceptive cadence (DC)* - *plagal cadence (PC)* - *phrygian half cadence (PHC)*

*Take special care to remember the abbreviations in parentheses for each cadence type. These will be used repeatedly in your analyses.*

## Identifying cadences

For each cadence in the following examples, determine: - what chord progressions are associated with each type of cadence. - *perfect authentic cadence* - *imperfect authentic cadence* - *half cadence* - *deceptive cadence* - *plagal cadence* - *phrygian half cadence* - what chord functions (i.e. tonic, dominant, pre-dominant) are used in each type of cadence. - what chord tones are present in the soprano and bass. - what other musical elements affect the phrase ending.

{% capture ex1 %}X:1 T:Standard cadences T:Old hundredth psalm M:4/4 L:1/4 Q:1/4=80 K:G V:1 [GD]| [GD] [FD] [EB,] [DD]| [GB,] [AD] H[BD] [BD]| [BD] [BG] [AF] [GG]| [cG] [BG] H[AF] [GG]| [AF] [GB] [AF] [DG]| [EE] [FC] H[GB,] [dD]| [BD] [GG] [AF] [cA]| [GB] [AF] H[GG]|| [G4C4]| [G4B,4]|] V:2 clef=bass [G,B,]| [G,B,] [A,D,] [E,G,] [B,,G,]| [E,G,] [D,F,] H[G,G,,] w: \_ \_ \_ \_ \_ \_ \_ IAC [G,G,]| [G,G,] [G,D] [DD,] [E,B,]| [C,E] [G,,D] H[DD,] w: \_ \_ \_ \_ \_ \_ \_ HC [E,B,]| [D,D] [G,D] [D,D] [B,,G,]| [C,G,] [D,A,] H[G,E,] w: \_ \_ \_ \_ \_ \_ \_ DC [G,B,]| [G,G,] [E,B,] [D,D] [A,,E]| [D/2B,,/2]-[D/2C,/2] [D/2D,/2]-[C/2D,/2] H[G,,B,]|| [C,4E,4]| [G,,4D,4]|] w: \_ \_ \_ \_ \_ \_ \_ \_ \_ PAC \_ plagal{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Phrygian half cadence M:4/4 L:1 K:Eb V:1 [FC]| [GD]|] V:2 clef=bass [CA,,]| [=B,G,,]|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

## Conclusions

Cadences close each musical idea and phrase–they are the punctuation at the end of musical sentences. We classify each cadence by their harmonic progressions.

* **Authentic Cadence** - any cadence in which a dominant function harmony (i.e. V or viio) resolves to I. There are two types of authentic cadences, so we always label any authentic cadence as one of these:
  + **Perfect Authentic Cadence (PAC)**
    - Must have a V chord resolving to a I chord
    - Both the V chord and I chord are in root position
    - Do is in the soprano voice of the I chord
  + **Imperfect Authentic Cadence (IAC)**
    - Any authentic cadence that does not fulfill all of the requirements for a PAC.
* **Half Cadence (HC)**
  + Any phrase that ends on a V chord.
  + **Phrygian Half Cadence (PHC)**
    - This is a special type of half cadence that only occurs in minor and must have a iv6 resolving to a root-position V chord
* **Plagal Cadence (PC)**
  + Any phrase that ends in IV resolving to I
    - Commonly associated with “Amen” at the end of chorales
* **Deceptive Cadence (DC)**
  + Any phrase that ends with V resolving to vi

We now have the analytical foundation and tools to begin studying harmonic *function*–how and why a chord works with other chords to build tonality. In this lesson, we will derive the basic aspects of function by combining two major concepts from previous units: 1. As shown in the two-part examples in [Unit 6b](06-intro-harmonic/b1-diafuncvoicelead.html), the progression from V7 to I creates a strong and natural sense of resolution. There are many reasons we hear this progression as a strong cadence, but perhaps the strongest reason is the voice-leading between the V7 and I chords–meaning the way in which individual pitches naturally pull toward each other. 2. When written as a scale, diatonic collections are simply a sequence of five whole steps and two half-steps–the major scale, for example, is W-W-H-W-W-W-H–but as we determined in [Unit 2c](02-int-scales-keys/d1-keys.html), you can find all seven pitches in the diatonic collection by altering a a single half-step in a circle-of-fifths. This alteration changes one of the P5 intervals to a d5, and it is these two pitches within the diatonic collection, ti and fa, that establish the voice leading that pulls V7 to I and therefore around which tonal harmony is constructed.

As a side note, the significance of cultural conditioning cannot be overlooked. A person who grows up listening to *any* style of music will be conditioned to hear the tendencies used in that music as a natural progression, and this holds true for those raised around music descended from the diatonic tradition. This does not change the importance of voice-leading in forming these progressions, but it is worth remembering the difference between laws, rules, and strategies discussed in the first reading from Unit 6.

The examples below demonstrate how these half-steps create this the foundation of diatonic harmony. If you understand the voice-leading principles that pull the V chord into the I chord, you can then extend these rules to create the basic progression from which all diatonic harmony evolves.

## Goals for this topic

The next five examples are meant to expose the logic behind the voice-leading of standard diatonic harmonies. To use these, study each example before moving on to the next and form a hypothesis regarding the voice leading (which chord tones resolve or pull to other chord tones). Once you have developed a theory as to how and why the progression works, move to the next example to see if your hypothesis can be applied. If it cannot, alter your hypothesis to account for both examples. Continue this way until you have found voice-leading rules that apply to all of the examples.

**This example has two idealized progressions of a V chord resolving to a I chord: one as triads and the other with a seventh chord.** - Study how each voice resolves. - It is tempting to focus on which scale degree resolves to which scale degree (e.g. ti to do), but this does not provide a complete explanation. - Instead focus on the how each chordal member resolves in the progression. This should include the chordal member to which it resolves and the interval necessary to do so. - Try to discern which chordal members have multiple options and which seem locked into a specific resolution. - What pitches are doubled? Are any omitted?

{% capture ex1 %}X:1 T:Basic V to I progressions M:4/4 L:1 Q:1/4=100 K:C V:1 [BG]| [cG]|| [BF]| [cE]|] V:2 clef=bass [G,D]| [C,E]|| [G,D]| [C,C]|] w:C:V I V7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

**The next example focuses on a simple triadic progression and follows the circle-of-fifths backwards to add a ii chord. Does this follow the voice-leading explanation that you created after looking at the first examples? If not, how does it differ? After you have studied this, try creating a voicing for a vi chord that would precede the ii chord.**

{% capture ex2 %}X:2 T:Adding the ii chord M:4/4 L:1 Q:1/4=100 K:C V:1 [FA]| [BG]| [cG]|] V:2 clef=bass [D,D]| [G,,D]| [C,E]|] w:C:ii V I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

**The next example adds the vi chord. Were you able to correctly construct this using your voice-leading rules? Is it more accurate to explain the voice-leading of the progression using chordal members or scale degrees? If you continue around the circle-of-fifths, what would the voicing for the next chord be?**

{% capture ex3 %}X:3 T:Adding the vi chord M:4/4 L:1 Q:1/4=100 K:C V:1 [EA]| [FA]| [BG]| [cG]|] V:2 clef=bass [A,,C]| [D,D]| [G,,D]| [C,E]|] w:C:vi ii V I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

**Again, we ask the same questions. Were you able to correctly add the iii chord using your voice-leading rules? Is it more accurate to explain the voice-leading of the progression using chordal members or scale degrees?**

{% capture ex4 %}X:4 T:Adding the iii chord M:4/4 L:1 Q:1/4=100 K:C V:1 [EG]| [EA]| [FA]| [BG]| [cG]|] V:2 clef=bass [E,B,]| [A,,C]| [D,D]| [G,,D]| [C,E]|] w:C:iii vi ii V I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

As we look at implied harmony in two-voice counterpoint, we can demonstrate that simple voice-leading is all that is necessary to *imply* diatonic function. If we take that further, we should be able to create the fundamentals of harmonic progression using the voice-leading inherent in diatonic systems.

Beginning theory students often learn two general rules of thumb for voice-leading: - ti resolves to do - fa resolves to mi

This is helpful to begin thinking about voice-leading in the most basic of ways, but it only applies to a specific, albeit common, set of circumstances that arise in common practice harmony–the V7 to I progression. In contrast to those rules, look at the following two-voice outline of one of the most common progressions in tonal music.

{% capture ex6 %}X:6 T:Implied harmonies from two voices M:4/4 L:1/2 Q:1/4=80 K:C V:1 cA| Bc|] V:2 clef=bass E,F,| G,C,|] w:C:I6 IV V I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

In this common progression, the bass voice moves fa to sol, and it sounds acceptable to almost anyone’s ear. From this alone, you should infer that there is far more detail necessary to understand voice-leading.

So instead, you must base your general rules around *chordal members* and their resolutions, rather than scale degrees and their resolutions. Specifically: - For chords that have roots separated by a P5: - The *seventh* of the first chord resolves to the *third* of the second chord. - the *third* of the first chord resolves to the *root* of the second chord. - If both chords are in root position, the bass voice moves from the *root* of the first chord to the *root* of the next chord.

Before moving on, take a moment to check these rules against the finished example from above, copied below for your convenience.

{% capture ex7 %}X:7 T:Adding the iii chord M:4/4 L:1 Q:1/4=100 K:C V:1 [EG]| [EA]| [FA]| [BG]| [cG]|] V:2 clef=bass [E,B,]| [A,,C]| [D,D]| [G,,D]| [C,E]|] w:C:iii vi ii V I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

You can also alter this example to include seventh chords in order to apply the chordal seventh resolutions, but we will do that in the next topic.

## Adding IV and viio

**Beyond the iii chord, the voice-leading runs into an issue with harmonic function. While it is possible to continue this pattern through these two chords, in tonal harmony, the IV and viio chords actually function most often as if they are extensions of the ii7 and V7 chords respectively. Look at the following example to see voice-leading using both of these chords. The first measure uses the ii7 and V7 chords as part of a diatonic progression, but the second progression substitutes the IV for the ii7 chord and the viio chord for the V7 chord. After looking at this example, explain why IV and viio function similarly to ii7 and V7.**

*Please note that to demonstrate how closely related these chords are, many voice-leading rules of common practice harmony are broken in this example–most notably the parallel octaves between the soprano and bass between viio and I. This is for demonstration purposes only, do not assume that this is good voice-leading for IV or viio. We will discuss the rules of voice-leading in this style when we study part-writing in Units 10 and 11.*

{% capture ex5 %}X:5 T:Adding the IV and viio chords M:4/4 L:1 Q:1/4=100 K:C V:1 [Fc]| [BF]| [cE]|| [Fc]| [BF]| [cE]|] V:2 clef=bass [D,D]| [G,,D]| [C,C]|| [A,,C]| [B,,D]| [C,C]|] w:C:ii7 V7 I IV6 viio I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Conclusions

It is possible to continue our voice-leading pattern backwards to add the last two diatonic chords, IV and viio, but these chords actually function differently. Instead, the IV and viio chords function similarly to their two functional counterparts, ii7 and V7. The logic is fairly simple, if you remove the root from a ii7 chord, D-F-A-C in C major, you are left with a IV chord, F-A-C. Likewise, if you remove the root from a V7 chord, you are left with a viio chord. By this logic, the IV and viio chords often use alternative voice leading, because their tendency tones are not necessarily tied to the chordal thirds and sevenths.

When we add these to our harmonic progression flowchart, we get our basic outline for harmonic progressions.

| (*unnamed*) | (*unnamed*) | pre-dominant | dominant | tonic |
| --- | --- | --- | --- | --- |
| iii | vi | ii | V | I |
|  |  | IV | viio |  |

Using just this flowchart, you can build basic chordal progressions for a given melody by harmonizing the pitches with the correct progressions. Please note that the I chord can comfortably jump back to anywhere in the progressions.

## Adding in Exceptions

There are a few common exceptions that should be added to this progression flowchart. We will discuss how these are used as we work through their appropriate topics (e.g. cadences, chordal substitutions), but for now, please add them to your list of possible progressions. - chords that have the same function can move to each other - V can move to viio, and viio can move to V - ii can move to IV, and IV can move to ii. - V can move to vi - This is most commonly used at the end of a phrase. In this case, vi is “replacing” a I chord and assuming a tonic function, so it must be used and voice carefully. See [Unit 7c](07-harmonic-functions/c1-cadences.html) (later in this unit) for a full explanation of cadences. - IV can go to I - This is most commonly used at the end of a phrase, and in this case, IV is “replacing” the V chord. This is another cadence, so it must be prepared properly. It is better to avoid using this progression in the middle of a phrase, so in your early attempts at part-writing, do not attempt to use this. - UNCOMMON: vi can move to V - There are instances where vi will move to V, but in these cases, it is best to think of the vi chord as taking on a tonic function. In your early part-writing, do not use this progression, because like V moving to vi–a much more common progression–this progression is likely to result in poor voice-leading. - RARE: iii can move to IV - It is difficult to use this without creating multiple voice-leading issues, so in your early attempts at part-writing, do not attempt to use this.

## Changes in Minor

Minor follows all of the same progressions and exceptions, but the chord qualities change to match the naturally occurring pitches in the key signature. Please remember that minor keys must have a major V chord and diminished vii chord to function diatonically. This means that both of these chords are built using the raised seventh scale degree, even though this isn’t necessarily implied by the Roman numeral of the viio.

| (*unnamed*) | (*unnamed*) | pre-dominant | dominant | tonic |
| --- | --- | --- | --- | --- |
| III | VI | iio | V | i |
|  |  | iv | viio |  |

In Unit 4, we discussed the two most common classifications of meter: simple and compound. In this lesson, we will add two more advanced classifications as well as discuss the idea of how beat and division relationships can be used to combine them.

## Asymetric (irregular) meters

In the example below, each line shows a metric pattern of of a meter that we have not yet defined in our studies so far. These meters are grouped in pairs, so the first two lines are related, the third and fourth lines are related, and the fifth and sixth lines are related. (The 1/1 time signature is just a placeholder and has nothing to do with these meters.) How would you label these ? Can your knowledge of simple and compound meters apply to these? What rhythmic value gets the beat for each line?

{% capture ex1 %}X:1 T:Patterns in asymetric meters M:1/1 L:1/8 Q:1/4=110 K:C cG cGG| cG cGG| cG cGG|] cGG cG| cGG cG|cGG cG|] cG cG cGG| cG cG cGG| cG cG cGG|] cG cGG cG| cG cGG cG| cG cGG cG|] cG cGG cGG| cG cGG cGG| cG cGG cGG|] cGG cGG cG| cGG cGG cG| cGG cGG cG|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## 5/8, 7/8, and 8/8 meters

In the patterns above, the beaming and pitch patterns show clear groupings of division, but if we use these grouping to define our beats, we realize that each measure is a mixture of a simple and compound beats–some are grouped in two while others are grouped in three. Any meter in which the beats have varying lengths is considered to be an *asymetric meter* or *irregular meter*.

### 5/8

The first two lines of the above example will be labeled as 5/8. The first line has five eighth notes in each measure but alternates between groups of two then three. The second line reverses the order of the grouping to three then two, but the number of divisions (eighth notes) remains the same. Therefore, 5/8 meters have **two** beats of unequal length – a quarter note and a dotted quarter note. The quarter note has a division of two eighth notes, and the dotted quarter note has a division of three.

The exception to this is when the tempo is slow enough that the eighth note becomes the beat, in which case, this meter becomes a simple quintuple meter with each eighth note divided into two sixteenth notes. When discussing an asymetric meter such as this with other musicians, it is often helpful to describe it using groupings of twos of threes. The first line below is “two plus three,” and the second line is “three plus two.” Try conducting along with both of these.

{% capture ex2 %}X:2 T:Patterns in 5/8 meters M:5/8 L:1/8 Q:1/4=110 K:C “two plus three”cG cGG| cG cGG| cG cGG|] “three plus two”cGG cG| cGG cG|cGG cG|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### 7/8

Lines 3 and 4 of the first example will be labeled as 7/8. Lines 3 and 4 are similar to Lines 1 and 2 in that they have irregular groupings of two and three eighth notes, but instead of consisting of five eighth notes, each measure has a total of seven. Because they are grouped into groups of two and three, 7/8 meters have **three** beats of unequal length–two quarter notes and one dotted quarter note. Also like 5/8, the exception to this is when the tempo is slow enough that the eighth note becomes the beat, in which case, this meter becomes a simple septuple meter with each eighth note divided into two sixteenth notes.

The beat groupings can come in any order as shown below. Try conducting along with these.

{% capture ex3 %}X:3 T:Patterns in 7/8 meters M:7/8 L:1/8 Q:1/4=110 K:C “2+2+3”cG cG cGG| cG cG cGG| cG cG cGG|] “2+3+2”cG cGG cG| cG cGG cG| cG cGG cG|] “3+2+2”cGG cG cG| cGG cG cG| cGG cG cG|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### 8/8

Lines 5 and 6 of the first example will be labeled as 8/8. Lines 3 and 4 are similar to Lines 1 and 2 in that they have irregular groupings of two and three eighth notes, but each measure now has a total of eight. Because they are grouped into groups of two and three, 8/8 meters have **three** beats of unequal length–one quarter note and two dotted quarter notes. As with all irregular meters, the exception to this is when the tempo is slow enough that the eighth note becomes the beat, in which case, this meter becomes a simple septuple meter with each eighth note divided into two sixteenth notes.

Note the similarity to 7/8; both of these assymetric meters have three beats, but where 7/8 has two quarter notes, 8/8 has two *dotted* quarter notes. The beat groupings can come in any order as shown below. Try conducting along with these.

{% capture ex4 %}X:4 T:Patterns in 8/8 meters M:8/8 L:1/8 Q:1/4=110 K:C “2+3+3”cG cGG cGG| cG cGG cGG| cG cGG cGG|] “3+3+2”cGG cGG cG| cGG cGG cG| cGG cGG cG|] “3+2+3”cGG cG cGG| cGG cG cGG| cGG cG cGG|]{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## More asymetric meters

Any grouping of eighth notes can be turned into an asymetric meter if it has groupings of unequal beats. Look at the following for more examples. How many beats are in each of these meters? If a meter shares a time signature with a common meter (simple or compound), how do these differ and what visual cues can you use to differentiate them? Can you think of other possibilities?

{% capture ex5 %}X:5 T:More asymetric meters M:9/8 L:1/8 Q:1/4=110 K:C “2+2+2+3”cG cG cG cGG| cG cG cG cGG| cG cG cG cGG|] [M:11/8]“3+3+3+2”cGG cGG cGG cG| cGG cGG cGG cG| cGG cGG cGG cG|] [M:12/8]“3+3+2+2+2”cGG cGG cG cG cG| cGG cGG cG cG cG| cGG cGG cG cG cG|]{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

## Mixed meters, polymeters, and polyrhythms

*Mixed meters, polymeters, and polyrhythms* are commonly used terms that are often confused. Look at the examples below, and try to come up with definitions that seperate them as cleanly as possible.

{% capture ex6 %}X:6 T:Mixed meter (changing meter) M:5/8 L:1/8 Q:1/4=110 K:C cG cGG| [M:6/8]cGG cGG| [M:3/4]cG cG cG| [M:4/4]cG cG cG cG|]{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

{% capture ex7 %}X:7 T:Polymeter M:3/4 L:1/4 Q:1/4=90 K:C V:1 c G E| c G E| c G E| c G E|] V:2 [M:4/4]C E G c| C E G c| C E G c|]{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

{% capture ex8 %}X:8 T:Implied polymeter M:3/4 L:1/4 Q:1/4=90 K:C V:1 c G E| c G E| c G E| c G E|] V:2 C E G| c C E| G c C| E G c|]{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

{% capture ex9 %}X:9 T:Polyrhythm M:2/4 L:1/8 Q:1/4=110 K:C V:1 cG cG| cG cG| cG cG|] V:2 (3EGG (3EGG| (3EGG (3EGG| (3EGG (3EGG|]{% endcapture %} {% include abc-example.html number=“9” abc=ex9 %}

### Exploring the inbetween

{% capture ex10 %}X:10 T:Polymeter or polyrhythm? M:3/4 L:1/8 Q:1/4=110 K:C V:1 cG cG cG| cG cG cG| cG cG cG|] V:2 [M:6/8]EGG EGG| EGG EGG| EGG EGG|]{% endcapture %} {% include abc-example.html number=“10” abc=ex10 %}

## Metric modulation

## Asymetric beat divisions

quintuplets, setuplets

In Unit 16, we looked at the most common methods used in music to modulate from one key center to another. - pivot chord modulations - common-tone modulations - phrase (direct) modulations

In the majority of those examples, the modulation was to a closely related key, allowing the modulatory methods to rely on the number of pitches and chords that were common to both keys. When music modulates to a distant key–without passing through multiple intermediary keys–the methods for modulation require more complicated techniques.

The following examples demonstrate advanced modulatory methods in simplistic renditions of a four-part chorale. They are written in such a way to highlight a particular modulatory technique and are grouped in pairs to give you multiple examples of the same idea. Listen to each pair of examples, and identify the commonalities within each pair. For each example: - Write the leadsheet symbols above each chord. - When approaching an unfamiliar piece of music, it is often helpful to begin by looking for patterns in the large-scale chordal structure of the piece rather than getting hung up in the minutiae of each passage. - Determine the keys in which the excerpt begins and ends by looking for cadences. - This will require you to use your ear training skills to determine the tonic at each cadence. - Write Roman numerals from the beginning of the piece until you come to a place where they no longer make sense in that key. - Work backward from the end of the piece to create Roman numerals for the second key. - When you come to the bridge between the two keys, try to determine what ties the pieces together. - It will be helpful to consider the guidelines of each modulatory technique that you have already learned. - Do your Roman numerals meet in the *middle* of the phrase as would be expected of a standard pivot chord modulation? Does the modulation happen between phrases as is standard in a direct modulation? Does the modulation involve one or more isolated common-tones?

## Group A

What qualities do this first pair of examples have in common? How would you describe the modulation? Is this similar to any of the original modulatory techniques from Unit 16. Make sure that you can answer all of the questions in the above instructions before moving on to the next group.

{% capture ex1 %}X:1 T:Modulation #1 M:2/4 L:1/4 K:C V:1 Q:1/4=60 [EG] [\_E\_A]| [F\_A] [GF]| [G2E]| [EG] [\_E\_A]| [F\_A] [c\_G]| [\_d2F]|] V:2 clef=bass [C,C] [\_A,,C]| [\_D,\_D] [G,,B,]| [C2C,]| [C,C] [\_A,,C]| [\_D,\_D] [\_E,\_B,]| [\_D,2\_A,]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Modulation #2 M:2/4 L:1/4 K:C V:1 Q:1/4=60 [EG] [EA]| [F\_A] [GF]| [G2E]| [EG] [EA]| [F\_A] [\_BF]| [\_B2G]|] V:2 clef=bass [C,C] [A,,C]| [F,,C] [G,,B,]| [C2C,]| [C,C] [A,,C]| [F,,C] [D\_B,,]| [\_E2\_E,]|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

## Mode mixture pivot chords

The Group A examples modulate by pivoting on a borrowed chord (mode mixture). The first phrase establishes the original key but uses a borrowed chord to provide a colorful alteration. In the second phrase, the borrowed chord is then turned into a pivot chord. For Modulation 1, the borrowed bVI chord becomes a V in the key of D-flat major. In Modulation 2, the borrowed iv chord becomes the ii chord in the key of E-flat major.

As with all pivot chord modulations, these will typically occur in the middle of the phrase because a pivot chord modulation relies on having a functional chord progression on both sides of the pivot. The smoother the chord progression on both sides, the smoother the modulation will sound.

## Group B

{% capture ex3 %}X:3 T:Modulation #3 M:2/4 L:1/4 K:C V:1 Q:1/4=60 [Ec] [BF]| [Ec] [Fd]| [c2E]| [B2F]| [c2E]| [Ec] [BF]| [Ec] [Fd]| [^c2E]| [B2E]| [^c2E]|] V:2 clef=bass [C,G,] [G,,G,]| [A,,C] [B,\_A,,]| [G,2G,,]| [G,2G,,]| [G,2C,]| [C,G,] [G,,G,]| [A,,C] [B,^G,,]| [A,2A,,]| [^G,2E,]| [A,2A,,]|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

{% capture ex4 %}X:4 T:Modulation #4 M:2/4 L:1/4 K:C V:1 Q:1/4=60 [Ec] [BF]| [Ec] [Fd]| [c2E]| [B2F]| [c2E]| [Ec] [BF]| [Ec] [^Ed]| [^c2^F]| [B2^E]| [^A2^C]|] V:2 clef=bass [C,G,] [G,,G,]| [A,,C] [B,\_A,,]| [G,2G,,]| [G,2G,,]| [G,2C,]| [C,G,] [G,,G,]| [A,,C] [B,^G,,]| [^A,2^F,,]| [^C,2^G,]| [^F,2^F,,]|]{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Enharmonic respelling of a viio7 chord

The excerpts in Group B demonstrate the extreme flexibility of a fully diminshed seventh chord. Because this chord is symmetrical, it can be enharmonically respelled to form four different chords. Look at the chart below to see how one diminished seventh chord can be respelled to be four different chords.

| Spelling 1 | Spelling 2 | Spelling 3 | Spelling 4 |
| --- | --- | --- | --- |
| A-flat | G-sharp | G-sharp | A-flat |
| F | F | E-sharp | F |
| D | D | D | D |
| B | B | B | C-flat |
| viio7/C | viio6/5/A | viio4/3/F-sharp | viio4/2/E-flat |

The way in which a fully diminished chord is spelled denotes the key in which it will naturally occur. These keys are shown in the bottom row of the chart along with the inversion figure for this particular spelling.

In Modulation 3 above, the first phrase uses a viio4/2 chord as a passing chord to move into a cadential 6/4 progression. In the second phrase, this viio4/2 chord is respelled to become a viio7 thus creating a functional pivot into the new key of A major.

Modulation 4 begins identically to Modulation 3, but when we reach the viio4/2 in the second phrase, it is respelled as a viio4/3 which acts as the pivot into the new key of F-sharp minor.

Note that there are even further possibilities for modulations if the fully diminished chord is used a secondary leading-tone chord (viio7/x) in one or both of the keys.

## Group C

{% capture ex5 %}X:5 T:Modulation #5 M:2/4 L:1/4 K:C V:1 Q:1/4=60 [Ec] [Ec]| [Fc] [dF]| [c2E]| [Ec] [Ec]| [Fc] [d^E]| [^d2^F]| [^c2E]| [^D2B]|] V:2 clef=bass [C,G,] [A,,A,]| [F,,A,] [G,,B,]| [G,2C,]| [C,G,] [A,,A,]| [F,,A,] [G,,B,]| [B,2^F,,]| [^A,2^F,,]| [^F,2B,,]|]{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

{% capture ex6 %}X:6 T:Modulation #6 M:2/4 L:1/4 K:C V:1 Q:1/4=60 [Ec] [Ec]| [\_Ec] [BD]| [c2C]| [Ec] [Ec]| [\_E2c]| [\_d2\_D]|] V:2 clef=bass [C,G,] [A,,A,]| [^F,\_A,,] [G,,=F,]| [E,2C,]| [C,G,] [A,,A,]| [\_G,2\_A,,]| [\_D,2F,]|]{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

## Enharmonic respelling of a Ger+6 chord

Both of the examples in Group C use the fact that a Ger+6 chord is enharmonically equivalent to a dominant seven chord, and this can be used to create V7 in a distant key. The first phrase of Modulation 5 is a standard diatonic progression, but in the second phrase, the V7 chord is enharmonically respelled to become the Ger+6 in the key of B major. As is typical of a Ger+6, it moves through a cadential 6/4 chord before finishing on a perfect authentic cadence.

Modulation 6 uses a Ger+6 as the predominant in the first phrase, but in the second phrase, the Ger+6 is respelled to become an A-flat dominant seventh chord; allowing it to become the V7 chord in the key of D-flat major.

## Other symmetrical chords

There is one other symmetrical chord which can be enharmonically respelled that we will not cover in this section. The Fr+6 chord can be respelled to become a different Fr+6 chord because it contains two whole steps separated by a M3 on either side. For example, the Fr+6 in C major consists of pitches the A-flat, C, D, and F-sharp. If the F-sharp is respelled as a G-flat, the chord can be re-arranged to become the Fr+6 in the key of G-flat (D, G-flat, A-flat, and C). This is not a common modulation, but it is worth remembering in the rare chance that you encounter this in a piece of music.

## Final notes

As with all modulation techniques, these modulatory tricks rely on setting the listener’s expectations before presenting them with a dramatic modulation. Because chords such as the Ger+6 are less common than standard diatonic progressions, it is most common to see these sorts of modulations in a second phrase after having established the uncommon chord or progression functioning “normally” in the first phrase. This creates the sense of expectation for the second phrase before the surprise of the modulation.

While every chord we have studied in the course thus far has been based in tertian harmony, the chords that we will explore do not rely on intervals of the third for their construction. Although they are no more difficult to understand functionally. Interestingly, this chord type comes in three different variants. (You can think of them as “flavors” if you’d like.)

## Augmented sixth (+6) chords

Analyze and listen to the following short progressions. There are two progressions – one in major, one in the parallel minor – for each of the three variants of this unusual chord. Start your analysis with leadsheet symbols and then provide Roman numerals when possible. In each progression, study the chromatic chord to answer the following questions: - How could you describe its construction? (Hint: Pay special attention to the scale degrees.) - How does it function? (e.g. tonic, passing, etc.) - Does it have tendency tones, and if so, how do they resolve? - What do the three variants have in common and what differentiates each of them? - If you were to compare it to a diatonic or chromatic chord that normally fulfills this function, which chord shares the most commonalities with it? - Do they seem most “at home” in major or minor?

{% capture ex1 %}X:1 T:Standard progressions using the Italian augmented sixth chord M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [cE]| [c^F] [dG]| [c2E]|] [K:Eb] [cE] [cE]| [c^F] [e/2G][d/2=F]| [c2E]|] V:2 clef=bass [K:C] [C,G,] [A,,A,]| [C\_A,,] [G,,B,]| [G,2C,2]|] w:C: [K:Eb] [C,G,] [A,,A,]| [CA,,] [G,,/2C][G,,/2=B,]| [G,2C,2]|] w:c:{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Standard progressions using the German augmented sixth chord M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [cE]| [\_e^F] [dG]| [c2E]|] [K:Eb] [cE] [cE]| [e^F] [e/2G][d/2=F]| [c2E]|] V:2 clef=bass [K:C] [C,G,] [A,,A,]| [C\_A,,] [G,,B,]| [G,2C,2]|] w:C: [K:Eb] [C,G,] [A,,A,]| [CA,,] [G,,/2C][G,,/2=B,]| [G,2C,2]|] w:c:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X:3 T:Standard progressions using the French augmented sixth chord M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [cE]| [d^F] [dG]| [c2E]|] [K:Eb] [cE] [cE]| [d^F] [e/2G][d/2=F]| [c2E]|] V:2 clef=bass [K:C] [C,G,] [A,,A,]| [C\_A,,] [G,,B,]| [G,2C,2]|] w:C: [K:Eb] [C,G,] [A,,A,]| [CA,,] [G,,/2C][G,,/2=B,]| [G,2C,2]|] w:c:{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

#### Building augmented sixth chords

The augmented sixth chords are collections of pitches that create smooth voice-leading. They function based on their voice-leading only, not tertian harmony, so it is unhelpful to describe them using standard chord terms such as root, third, and fifth. Instead, we typically describe the chordal members by their scale degrees. In the table below, you can see that all augmented sixth chords share three common tones – ^b6, ^1, and ^#4. As you hopefully determined from the first examples, the Italian variant consists of only the three primary pitches whereas the German and French variations have an added tone. (For ease of communication, I will always refer to the lowered sixth scale degree as ^b6 even though it is already lowered by the key signature in minor. This goes the same for the ^b3 in German augmented sixth chords.)

| +6 variant | Chordal member | Chordal member | Chordal member | Chordal member |
| --- | --- | --- | --- | --- |
| Italian | ^b6 | ^#4 | ^1 | ^1 (doubled) |
| German | ^b6 | ^#4 | ^1 | ^b3 |
| French | ^b6 | ^#4 | ^1 | ^2 |

#### Augmented sixth chords resolving to V

Augmented sixth chords are named because of the augmented sixth interval that is created between the ^b6 and ^#4. This interval also creates the defining voice-leading feature for this chord. Look at the following examples. How does the augmented sixth resolve? How does it change if it is inverted? Does resolving the tendency tones in any of the chords present voice-leading issues.

{% capture ex4 %}X:4 T:Standard resolutions to V using augmented sixth chords M:4/4 L:1/4 Q:1/4=50 K:C V:1 [c^F] [dG] [c2E]| [c\_A] [dG] [c2E]|| [\_e^F] [dG] [c2E]| [\_e\_A] [dG] [c2E]|| [d^F] [dG] [c2E]| [d\_A] [dG] [c2E]|] V:2 clef=bass [C\_A,,] [G,,B,] [G,2C,2]| [C^F,,] [G,,B,] [G,2C,2]|| [C\_A,,] [G,,B,] [G,2C,2]| [C^F,,] [G,,B,] [G,2C,2]|| [C\_A,,] [G,,B,] [G,2C,2]| [C^F,,] [G,,B,] [G,2C,2]|] w:C:It+6 V I It+6 V I Ger+6 V I Ger+6 V I Fr+6 V I Fr+6 V I {% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

As you can see, the tendency tones of the augmented sixth–^b6 and ^#4–will always resolve by a half-step. If the ^b6 is in a lower voice than the ^#4, they will resolve outward by half-step to an octave. If the ^#4 is in a lower voice than the ^b6, they will resolve inward by half-step to create an octave. The resolution of this interval is the entire reason for the existence of these augmented sixth chords, so you can consider this resolution of the defining characteristic of these chords.

## Augmented sixth chords resolving to V7 and I6/4

There are certainly voice-leading issues when resolving augmented sixth chords, but the chromatic element, particularly the ^#4, somewhat camouflages the objectionable parallels. Most obviously, when a Ger+6 resolves directly to a V chord, parallel perfect fifths will result when resolving the ^b6 and ^b3 scale degrees. For this reason, there are alternate resolutions for augmented sixth chords that are often preferable. Look at the next example to see two possible fixes for this. Does the cadential I6/4 fix the likely objectionable parallels for a Ger+6? Why does the Ger+6 have an enharmonically spelled pitch when resolving to a cadential I6/4? When an augmented sixth chord resolves to a V7, what changes about the resolution of the tendency tones in the augmented sixth chord?

{% capture ex5 %}X:5 T:Other common resolutions of augmented sixth chords M:4/4 L:1/4 Q:1/4=50 K:C V:1 [^d2^F] [eG][=dG]| [c4E]|| [^F2c] [B2=F]| [c4E]|] V:2 clef=bass [C2\_A,,] [G,,C][G,,B,]| [G,4C,]|| [\_A,,2D] [G,,2D]| [C4C,]||] w:C:Ger+6 I6/4 V I Fr+6 V7 I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Conclusions

Passing through another chord can hide the objectionable parallels created by the tendency tones of the Ger+6. In particular, a cadential 6/4 chord can still provide the standard resolutions for the tendency tone (to the dominant scale degree) but also provides an outlet for the ^b3 to resolve by half-step to the third of the I6/4 as you can see in the first example. In this case, the ^b3 will often be re-spelled to a ^#2, but this does not change the function or labeling of the chord.

The other option that is commonly used is resolving any augmented sixth chord to a V7 chord rather than a triad. In this case though, the smoothest resolution to the seventh of the V7 is to alter the resolution of one of the tones that create the augmented sixth interval–particularly, the ^#4. Instead of resolving upward by half-step to sol, you can resolve the ^#4 *downward by half-step* to the seventh of the V7 as demonstrated in the second example above.

## Labeling augmented sixth chords

As you probably noticed in the examples above, there is no change in the inversion figure for any of the augmented sixth chords. Because these are not based in tertian harmony, there is no standard inversion figure that would explain the intervals. Therefore, rather than create an entirely new set of inversion figures for one uncommon chord, we simply notate each of these chords with the same “Roman numeral” symbol, regardless of inversion. They are:

| +6 variant | Analysis symbol |
| --- | --- |
| Italian | It+6 |
| German | Ger+6 |
| French | Fr+6 |

## Alternate resolutions of the augmented sixth

In all of the examples thus far, the interval between the ^b6 and ^#4 – augmented sixth – has resolved outward to emphasize a specific scale degree, ^5 or sol. Because of this, we assume that a standard augmented sixth chord has a predominant function, *because it emphasizes the root of the dominant*. As with any colorful chord, however, composers do not restrict themselves to this one usage. Analyze the following example. How would you describe what is happening in the penultimate chord?

{% capture ex6 %}X:6 T:Augmented sixth chords resolving to a non-dominant harmony M:4/4 L:1/2 Q:1/2=60 K:C V:1 [cE] [cE]| [cF](cantusFirmus.html) [BF]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [D,A,] [\_D,\_A,]| [G,2C,2]|] w:C:{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

### Conclusion

The penultimate chord does not function as tertian harmony, and it clearly resolves as an augmented sixth chord. The D-flat and B-natural form an augmented sixth that resolves outward by half-step, and the two inner voices create a German+6…in a different key.

These non-dominant resolutions present an issue for standard Roman numeral notation. Before reading on, take a moment and try to come up with a label for the the augmented sixth chord in the previous example. The standard German augmented sixth in that key (C major) would have an A-flat, C, E-flat, and F-sharp, so you cannot simply label it as Ger+6.

Augmented sixth chords are similar to secondary dominant functions in that they embellish a chord using chromatic alterations that strengthen voice leading. A tonicization, however, temporarily treats a non-tonic chord as if it were tonic. Our notation for secondary dominants shows this by using a slash to imply that we are temporarily working in the key of the chord below the slash. In the example above, the augmented sixth chord is the standard Ger+6 in the key of F major, so some theory methods suggest that you should use a slash to label this as Ger+6/IV, because this chord would appear in the key of F major. I find this inadequate because in the key of F major, this chord would function as a pre-dominant harmony whereas it is clearly filling a dominant function here. Other theory methods recommend that this chord be labeled as Ger+6/I to show that it is meant to resolve to the I chord, but this fundamentally alters what the slash means. A slash chord above a Roman numeral means “in the key of”; V/V implies a V chord in the key of the dominant. Using Ger+6/I would mean the Ger+6 in the key of I–in this case, C major–but the standard Ger+6 in the key of C major has A-flat, C, E-flat, and F-sharp.

Instead, the least ambiguous option for alternate resolutions of augmented sixth chords is to show what *pitch* the chord is intended to embellish by placing a scale degree below a slash. Therefore, the example above would be labeled as Ger+6/^1. Using a scale degree below the slash instead of a Roman numeral makes it clear that the slash is functioning differently than its use in labeling secondary functions.

## Practicing augmented sixth chords

Because augmented sixth chords are based entirely on the smooth voice leading that they create, you could use an augmented sixth chord to embellish almost *any* harmony, although it does work best for major triads and dominant chords. Try this for yourself in the following progression by inserting augmented sixth chords at any spot marked with an x. You may change any note necessary for the chord. Please note that each chord will need a “customized” augmented sixth chord that emphasizes its root; there is no one-size-fits-all augmented sixth chord. For example, if you plan to use Ger+6/ii, you would need to make sure that you are using an augmented sixth chord that has an augmented sixth that resolves outward by half-step to ^2.

{% capture ex7 %}X:7 T:Inserting augmented sixth chords T:for varying chords M:4/4 L:1/2 K:C V:1 [cE][cE]| [cE][cE]| [cF](cantusFirmus.html)| [dF][dF]| [c2]|] V:2 clef=bass [C,G,][C,G,]| [A,,A,][A,,A,]| [F,,A,][F,,A,]| [G,,B,][G,,B,]| [C,2]|] w:C:I x vi x IV x V7 x I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

## What is a modulation?

A *modulation* occurs in a tonal piece of music when the tonic pitch changes. Most musicians understand this concept on an intuitive level, but there are a few common misconceptions. - Modulations are sometimes referred to as a “key change,” but the key signature does not necessarily need to be altered for a modulation to occur. Repeated accidentals are a more consistent hint that a modulation may have happened. - The term “key change” also does not account for the fact that a shift between the parallel major and minor modes (e.g. C major to C minor) is *not* a modulation but do have different key signatures. This is a shift in mode – not a modulation – because the tonic does not change.

## Key relationships

In our first studies of modulation, we will look at modulations between closely-related keys. *Closely-related keys* are keys that are within one accidental of each other. Each key has five closely-related keys. To practice, write the closely-related keys for: - C major - A minor - C-sharp major - E-flat minor

When determining closely-related keys, it is helpful to think of the *relative* major and minor keys as well as their closely-related keys, but the *parallel* major or minor is always a distantly-related key.

### Conclusions

Any key will have five closely related keys: two of the same mode, and three of the opposite mode. You can find these quickly by finding the relative major/minor key of the starting key, and then adding one sharp and one flat to both of these keys. For example, C major has a relative minor of A minor. If you add a sharp to both of those key signatures you get G major and E minor. If you add a flat to both of those key signatures, you get F major and D minor. The chart below shows the closely related keys for the four examples from above.

| Key | Closely related major keys | Closely related minor keys |
| --- | --- | --- |
| C major | G major, F major | A minor, E minor, D minor |
| A minor | C major, G major, F major | E minor, D minor |
| C-sharp minor | E major, B major, A major | G-sharp minor, F-sharp minor |
| E-flat minor | G-flat major, C-flat major, D-flat major | A-flat minor, B-flat minor |

## Differentiating modulation and tonicization?

The biggest difficulty regarding modulation is differentiating between modulation and tonicization. Some modulations will be obvious, but others can be contentious. Because a modulation is defined by a change in the tonic, it is necessary to consider how music establishes tonic in the listener’s ear. In earlier units, we discussed the importance of phrasing and cadences, but the following exercise will further clarify their importance.

On a scratch piece of paper, do the following for each of the examples below: 1. Listen to the entire excerpt, and at the end, sing the tonic (do). Use your ear-training while looking at the final chord to determine which pitch you sang. Write this on your scratch paper. - If you are struggling to identify your tonic, try singing along with the soprano line. Once you arrive at the cadence, sing up and down the scale until you arrive at something that feels completely stable. You should then be able to count the scale degrees through which you must move to arrive at do. 2. Listen to the excerpt again, but pause each time you come to the end of a phrase. Most of the phrases in the excerpts below are marked by fermatas, but you should be able to identify cadences as aurally as well. Each time you pause the excerpt, sing your current do. This may require you to find a pitch that is not present in the chord because some of the phrase endings do not have do in the chord. (i.e. if there is a half cadence) 3. Compare your tonics from each phrase. Does it change throughout the excerpt? If so, you should be able to pinpoint the phrase in which it modulated.

Some of these examples modulate, yet some are only tonicizations. What do all of the modulations have in common? What about the tonicizations? How does this change your perception of modulation? Is there some commonality among the modulations that will help you visually identify a modulation if you do not have access to playback or a recording?

Above all else, you will notice that we are not beginning our discussion of modulation by looking at this from a theoretical perspective. Modulation is determined by the listener, and you will often find yourself disagreeing with others. In many cases, modulation is subjective, but this becomes more concrete with experience.

After you have finished listening to each of these and feel that you have an opinion on whether each modulated, go on to the next unit to begin studying the most common methods that composers use to modulate.

{% capture ex1 %}X:1 T:Bach - Chorale - Erkenne mich, mein Huter T:(simplified) M:4/4 L:1/4 K:E Q:1/4=65 V:1 [EG]| [Ec] [EB] [A/2E][A/2F] [GE]| [FE] [FD] H[GE] [Fd]| [Ee] [eG] [dG] [dF]| H[c3E]|] V:2 clef=bass [E,B,]| [A,A,] [B,G,] [C,/2C][D,/2B,] [B,E,]| [A,,C] [B,,B,] H[E,B,] [D,^B,]| [G,C,] [E,C] [G,C] [^B,G,,]| H[C,3C]|] w:E:{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Bach - Chorale No. 108 T:(Original key = E-flat) M:4/4 L:1/4 K:E Q:1/4=75 V:1 [EB,]| [EB] [GB] [Ac] [Gd]| [G2e] H[Ge] [cg]| [cf](cantusFirmus.html) [eA] [eG] [dF]| H[e3G]|] V:2 clef=bass [E,G,]| [G,B,] [E,E] [A,E] [^B,,D]| [C,2C] H[C,C] [CE]| [A,C] [F,C] [B,B,] [B,B,,]| H[E,3B,]| w:E:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X:3 T:Bach - Chorale no. 95 T:(simplified) M:4/4 L:1/4 K:Bb Q:1/4=70 V:1 [dF] [eG] [fB] [fB]| [eA] [dB] [cA] H[cA]| [dB] [eG] [fF] [eG]| [cG] [cF](cantusFirmus.html) H[B2F]| [cF](cantusFirmus.html) [dF] [eE] [eG]| [d\_A] [dG] H[c2E]|] V:2 clef=bass [B,B,] [G,B,] [D,B,] [G,D]| [C,E] [D,F] [F,F] H[F,F]| [B,,F] [C,C] [D,A,] [G,B,]| [E,B,] [F,A,] H[B,,2D]| w:Bb: [F,A,] [D,=B,] [C,C] [E,C]| [F,C] [G,=B,] H[C,2G,]|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

{% capture ex4 %}X:4 T:Beethoven - Die Ehre Gottes aus der Natur T:reduction M:4/4 L:1/4 K:C Q:1/4=100 V:1 [GFDB,] [GFDB,] [GFDB,] [GFDB,]| [c2C] G2| E2 C [eG]| [e2G] [dF] [cE]| [c2E] H[BD] G| [f2F] [d2D]| [B2B,]> [G2G,]| [c2EC] [d2BGD]| [e2cGE]> [e2cGE]| [e2^cAE]> [e2cAE]| [f2dAF]> [d2AD]| [g2ecG] [B2GDB,]| [c2GEC]> [e’2c’ge]| [e’2c’ge] z2| z2 z|] V:2 clef=bass [G,,F,D,B,,] [G,,F,D,B,,][G,,F,D,B,,][G,,F,D,B,,]| [C,,2C,] [G,2G,,]| [E,2E,,] [C,C,,] [C,G,]| [C,2G,] [B,,G,] [C,G,]| [G,2G,,] H[G,G,,] [G,G,,]| w:C: [F,2F,,] [D,2D,,]| [B,,2B,,,]> [G,,,2G,,]| [A,,2A,,,] [G,,,2G,,]| [C,2C,,]> [C2C,]| [A,2^C,A,,E,]> [A,2^C,A,,E,]| [D,2DA,F,]> [F,2F,,]| [G,2C,E,G,,] [G,,,2G,,]| [C,,2G,,E,,C,]> [C,,2G,,E,,C,]| [C,,2G,,E,,C,]> [C,,2G,,E,,C,E,G,C]| H[C,,2G,,E,,C,E,G,C]>|]{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

{% capture ex5 %}X:5 T:Tchaikovsky - Symphony No. 5, Mvt. II T:reduction M:12/8 L:1/8 K:D Q:1/8=90 V:1 z6 z3 DCB,| D3 C6 A,B,C| E3 D6 DEF| G3 G2G G3-G2G|G3 F3 z3 DCB,| D3 C6 A,B,C| E3 D6 DEF| ^G3 G2 G G3-G2 G| ^GBA A6 z3|] V:2 clef=bass [A,6E,A,,C,,] [A,6F,A,,D,,]| [A,6G,A,,E,,] [A,6E,A,,G,,]| [A,6A,,F,,] [A,6DF,A,,D,,]| [G,6DE,B,,E,,B,,,] [A,3DA,,,A,,E,,][A,3CA,,,A,,E,,]| [A,6DD,A,,E,,] [F,,6]| w:D: [A,6G,A,,E,,] [A,6E,A,,G,,]| [A,6A,,F,,] [A,6DF,A,,D,,]| [F,6FB,D,B,,B,,,] [F,3FB,D,D,,][^G,3^ECC,C,,]| [F,9FCC,F,,] z3|]{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

{% capture ex6 %}X:6 T:Chopin - Mazurka in G Minor, op. 67 no.2 M:3/4 L:1/4 K:Bb Q:1/4=150 V:1 D| d/2e/2 d A| B> Gd/2e/2|f/2g/2 f c| d z d/2d/2|d/2e/2 d A| B/2A/2 G c| G/2A/2 B c| G/2A/2 B c| d/2e/2 d A| B> Gd/2e/2|f/2g/2 f c| d z d/2d/2|d/2e/2 d A| B G/2b/2a/g/2| g/2f/2e/2e/2d/2c/2| B/2A/2 G2|] V:2 clef=bass z| D,, [^F,CD][F,CD]| G,, [G,B,D] [G,B,E]| A,, [F,CE][F,A,E]| B,, [F,B,D][F,B,D]| z [D,^F,C][D,F,C]| G,, [D,B,][C,G,E]-| [C,G,E] [G,G,,D] [C,G,E]-| [C,G,E] [G,G,,D] [C,G,E]| w:g: D,, [D,D][D,D]| G,, [G,B,D] [G,B,E]| A,, [F,CE][F,A,E]| B,, [F,B,D][F,B,D]| z [D,^F,C][D,F,C]| G,, [G,DB,][C,G,E]| D, [CG,] [^F,C]| G,, [D,2B,]|]]{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

{% capture ex7 %}X:7 T:Bach - Chorale no. 106 T:(simplified) M:4/4 L:1/4 K:A Q:1/4=65 V:1 [Ac] [GB] [AA] [GB]| [Ac] [F^d] H[G2e]| [fB] [eB] [dG] [Ac]| [BA] [BG] H[A2E]|] V:2 clef=bass [A,E] [E,E] [C,E] [E,E]| [A,,E] [B,,B,] H[E,2B,]| [B,D] [G,B,] [E,E] [A,E]| [D,F] [E,D] H[A,,2C]| w:A:{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

{% capture ex8 %}X:8 T:Mendelssohn - Songs Without Words T:(simplified) M:6/8 L:1/8 K:Bb Q:1/8=90 V:1 z3 z2[Bd]| [A2c][GB] [^F2A][Ac]| [G2B][AC] [G2B,]D| [C2E][CE] [C/2E][D/2F][GE][CE]| D3-D2[BdD]| [A2c][GB] [^F2A][Ac]| [G2B][AC] [GB,]GA| B^cd [fc]=ed| [a2d]f d2A| B[^c=E][dF] [fA][=eG][dF]| [d3F]-[dF]z2|] V:2 clef=bass G,,[G,B,]D, G,,[G,B,]D,| G,,[A,C]D, G,,[A,C]D,| G,,[G,B,]D, G,,[G,B,]D,| G,,[G,]E, G,,[G,C]E,| G,,[G,B,]D, G,,[G,B,]D,| G,,[A,C]D, G,,[A,C]D,| G,,[G,B,]D, G,,[G,]D,| G,,[DB,]G, G,,[^CB,]G,| F,,[A,D]F, F,,[A,D]F,| G,,[B,D]G, A,,[^C]A,| [D,3A,D]-[D,A,D]z2|] w:g:{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

To this point in the course, we have only studied harmony based on triads and seventh chords, but as we have shown in the units covering chromaticism, triads and seventh chords function in progressions due to the underlying voice leading in diatonic harmony. If we look at the construction of melodies and their interactions with vertical harmonies, we can find ways to expand the tertian stack to include extensions beyond seventh chords that function as chord tones.

Let us start by analyzing the following “chorale” arrangement based on the famous tune *The Girl from Ipanema* composed by Antonio Carlos Jobim. Label each chord with leadsheet symbols and Roman numerals, while paying particular attention to labeling all non-chord tones. Note that measure 6 is particularly tricky, but you only need to look back into the previous unit for a way to understand that harmony. For that measure, you may want to consider the melody separately and enharmonically re-spell one pitch of the chorale chord.

{% capture ex1 %}X:1 T:Girl from Ipanema T:4-part chorale M:4/4 L:1/4 K:F Q:1/4=120 V:1 g>e e/2d g/2-| g e/2e/2- e/2e/2 d/2g/2-| g e e d/2g/2-| g/2g/2 e/2e/2- e/2e/2 d/2f/2-| f/2 d d/2- d/2d/2 c/2e/2-| e/2 c c/2- c/2c/2 B| zc3-| c4|] V:2 [A4C]-| [A4C]| [G4=B,]-| [G4=B,]| [G4B,]| [\_D4B,]| [A,4C]-| [A,4C]|] V:3 clef=bass [F,,4E,]-| [F,,4E,]| [G,,4F,]-| [G,,4F,]| w:F: [G,,4F,]| [\_G,,4\_F,]| [F,,4E,]-| [F,,4E,]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

How did you deal with the first measure of this tune? It is clearly an Fmaj7 chord, but the melody starts prominently on the ninth of the chord, and that G cannot be labeled as any kind of non-chord tone.

## Extended tertian harmony versus non-chord tones

The first measure of *The Girl from Ipanema* is a perfect example of functional extended harmonies and should help you begin creating a decision tree to determine whether a tone is a non-chord tone or a functional extension. Because the position of the G in the measure, it does not fit the standard non-chord tone patterns that we established early in the course. As you look at it further, it should be clear that this G is *functional*–it is critical to the texture and structure of this chord–so we must consider it a chord tone, making this harmony an Fmaj9 chord. Measure 3 has a similar issue with the E in the melody over the G7

As we have discussed repeatedly in this course, harmonic analysis is the art of determining which pitches are functional to the harmony and which pitches are embellishment. As we move into an expanded view of tonal harmony, it is imperative that you are extremely familiar with the details of non-chord tones in Unit 9a, because these shapes will provide a foundation to help you begin determining what is functional. Simply put, if you cannot label a pitch as one of the possible non-chord tone shapes, then it is most likely a functioning chord tone. If there are more than four pitches for a given harmony that fall into this category, it means that you must consider the concept of extended tertian harmonies such as ninth chords.

Before you go further, you may wish to refresh yourself on the Roman numeral labeling conventions outlines in Unit 6a. In particular, the section that discusses the terms add and sub are important to our labeling of extended tertian harmonies.

## Identifying patterns

While most musicians have at least a passing familiarity with extended tertian harmonies in jazz and pop, they exist in all styles of tonal harmony. Analyze the following examples by labeling all chords with Roman numerals, inversion figures, and non-chord tones. After you attempt your analyses, read the commentary below each example.

{% capture ex2 %}X:2 T:Schubert, Deutsch Tanz, D. 420 no. 2 M:3/4 L:1/4 K:A Q:1/4=150 V:1 c| d f B-| B ^A/2B/2c/2d/2| e a c-| c/2A/2G/2A/2B/2c/2| d f B-| B ^A/2B/2c/2d/2| c/2e/2A/2c/2B/2G/2| A2:|] V:2 clef=bass z| E,[G,DE][G,DE]| E,[G,DE][G,DE]| E,[A,CE][A,CE]| E,[A,CE][A,CE]| w:A: E,[G,DE][G,DE]| E,[G,DE][G,DE]| [A,2C] [E,D]| [A,2C]:|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

In this excerpt (D.420 no. 2), the melody in the first measure arpeggiates a B minor triad, but this is superimposed over an obvious E7 in the left hand. My first instinct is to try to eliminate either the E (to create a G# diminished seventh chord), or eliminate the F# (to leave the E7). Both would be functionally sound acting as a dominant function in the key, however, both the E and F# are in prominent positions – the E is present throughout the measure, and the F# is not only the high point of the measure, but it is approached and left by a leap. Because both pitches are functional to the harmony, this is an obvious example of a ninth chord.

Label the harmony as V9. There are other systems for labeling extended harmonies using Roman numerals. For example, some systems insist that you should either include a 7 below the 9 for the inversion figure, but I feel this is redundant if you are making proper use of the add and sub labels. Any inversion figure that has a single number–e.g. V9–includes all thirds below it. In the same way that 7 is shorthand for for 7/5/3, 9 is shorthand for 9/7/5/3. Of note, if this chord did *not* have a chordal seventh, I would label it as Vadd9, which denotes a major triad with an added ninth (and no seventh).

{% capture ex3 %}X:3 T:Schubert, Deutsch Tanz, D. 366 no. 4 M:3/4 L:1/4 K:C Q:1/4=135 V:1 E| ^G2 G/2G/2| A A A| B2 B/2B/2| c c c| ^G2 G/2G/2| A A A/2e/2| e/2d/2 d/2c/2 c/2B/2| A2|] V:2 E| F/2E/2F/2E/2F/2E/2| E E E| F/2E/2F/2E/2F/2E/2| E E E| F/2E/2F/2E/2F/2E/2| E E E| F F ^G| A2|] V:3 clef=bass z| [B,D] E, [B,D]| [A,C] E, [A,C]| [^G,D] E, [^G,D]| [A,C] E, [A,E]| w:a: [B,D] E, [B,D]| [A,C] E, [C,A,]| [D,A,] [D,B,] [E,D]| [A,2C]|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

This piece is written for piano, but I separated the right hand into two voices to highlight the possibility of a ninth. You can make many of the same arguments for this excerpt as we did in the first: the ninth above this E7 in measures 1, 3, and 5 is in a prominent position and present throughout the measure. The difference is its melodic role. This ninth can easily be explained as an accented neighbor tone. You must decide when listening to this piece if you hear this F as functional or embellishing. I hear it as an embellishment rather than a functioning chord tone.

{% capture ex4 %}X:4 T:Schumann, Dichterliebe, op. 48 no. 9 M:3/8 L:1/8 K:F Q:1/8=90 V:1 z| z3| z3| z3| z z A| A2 A| d>dd| f3| e2 A| d2 d|] V:2 G/2A/2| B/2A/2G/2e/2d/2^c/2| d/2a/2g/2f/2e/2d/2| e/2d/2^c/2d/2e/2f/2| e/2^c/2A/2B/2G/2A/2| B/2A/2G/2e/2d/2^c/2| d/2a/2g/2f/2e/2d/2| e/2d/2^c/2d/2e/2f/2| e/2^c/2A/2c/2d/2e/2| f/2e/2d/2a/2g/2f/2|] V:3 clef=bass z| A,,[G,/2B,^CE][G,/2B,CE][G,B,CE]| A,,[A,/2DF][A,/2DF][A,DF]| A,,[^G,/2=B,F][G,/2B,F][G,B,F]| A,,[A,/2^CE][A,/2CE][A,CE]| w:d: A,,[G,/2B,^CE][G,/2B,CE][G,B,CE]| A,,[A,/2DF][A,/2DF][A,DF]| A,,[^G,/2=B,F][G,/2B,F][G,B,F]| A,,[A,/2^CE][A,/2CE][A,CE]| D,,[F,/2A,D][F,/2A,D][F,A,D]|]{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

This final excerpt is similar to the first excerpt in that chord in measures 1 and 5 emphasizes the root of the V chord (the A) by placing it alone in the left hand on the downbeat, but clearly stacks a viio7 on the second and third eighth notes of the measure. It would be possible to consider the A as a pedal tone throughout the first eight measures and only analyze this measure as a viio7, but when I listen to it, the A is in too prominent a position and I hear it as defining the function of the chord. Because of this, I would label both of the measures a V9 chords.

Tonal harmony is easiest to study when when it follows strict rules, and because of this, we have studied harmonic function thus far through the lens of major and minor keys. In real music however, the relationship between modes is more fluid.

## Mode mixture (modal interchange)

Look at the following chart of the chords of parallel major and minor keys. Compare the chords built off each diatonic scale degree. (e.g. I to i, ii to iio How many of these chords match qualities? Does this fit with your perception of two keys that are distantly-related?

| C major | Chord | Chord | C minor |
| --- | --- | --- | --- |
| I | C maj | C min | i |
| ii | D min | D dim | iio |
| iii | E min | E-flat maj | III |
| IV | F maj | F min | iv |
| V | G maj | G maj | V |
| vi | A min | A-flat maj | VI |
| viio | Bo | Bo | viio |

You will notice that the only common chords are the dominant function chords, and even these *require* alteration in minor to share function and qualities. So if we think about this as we did when discussing modulations, these keys should have little in common. On the other hand look at the following basic progressions in both keys. Do these look unrelated? How does the voice-leading differ between the two? How many chromatic pitches are required to make the second progression function?

{% capture ex1 %}X:1 T:Variations between parallel major and minor M:4/4 L:1/2 Q:1/2=60 K:C V:1 [cE] [cE]| [dF] [BF]| [c2E]|] [K:Eb] [cE] [cE]| [dF] [=BF]| [c2E]|] V:2 clef=bass [K:C] [C,G,] [A,,A,]| [D,A,] [G,,G,]| [G,2C,2]|] w:C:I vi ii V7 I [K:Eb] [C,G,] [A,,A,]| [D,A,] [G,,G,]| [G,2C,2]|] w:c:i VI iio V7 i{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusion

Even at a glance, you can see that the voice-leading in these two progressions is identical with the only differences between the two resulting from the altered pitches in the key signature. In particular, the resolution from the sixth scale degree to the fifth scale degree is strengthened in minor, because the resolution becomes a half-step between le and sol.

## Borrowing from the parallel minor

When studying the voice-leading of these two parallel modes, they seem almost interchangeable.

And they are.

Alter the following progression in C major to “borrow” either the VI or iio chords from minor. What chordal members do you have to alter for each chord? What scale degrees are these? When you play it back does it sound acceptable? What if you only alter both chords? Does this make it more or less jarring?

{% capture ex2 %}X:2 T:Borrowing chords from the parallel minor M:4/4 L:1/2 Q:1/2=60 K:C V:1 [cE] [cE]| [dF] [BF]| [c2E]|] V:2 clef=bass [K:C] [C,G,] [A,,A,]| [D,A,] [G,,G,]| [G,2C,2]|] w:C:I vi>VI ii>iio V I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

To borrow either iio or VI from minor, you must alter the sixth scale degree for both, and the VI also requires an altered third scale degree. Regardless of which chord you alter–or both–the progression is fairly convincing. Borrowing from the minor mode greatly darkens the progression without changing any of the voice-leading functions. Also, take note of how the roots of chords are affected. The ii chord has a root of re in either the major or minor mode and changes only in quality from a D minor to a D diminished chord. The vi chord undergoes a more substantial change, because not only does its quality change from minor to major, but it does this by changing the actual root of the chord from la to le. Forgetting to alter the root when borrowing chords from different modes is one of the most common mistakes that students make when studying borrowed chords in mode mixture, so always check your roots before building the chord.

Perhaps more importantly than even understanding which chords can be borrowed, you must look at how they function. In this example, we are borrowing chords directly from a circle-of-fifths progression. *They are still fulfilling their diatonic function, because the voice-leading is tendencies are the same regardless of mode.* As with all Roman numeral analysis, its purpose is to explain the function and provide context for a progression. So even though the quality of this ii chord has changed and is no longer diatonic, the meaning of the Roman numeral doesn’t change unless you alter it with further information such as labeling it as a passing or pedal chord. If you put iio without further explanation, you are saying that it still has a pre-dominant function in this context.

## Further borrowing from the parallel minor

The next progression is a longer example containing multiple cadences. Try borrowing each chord individually from the parallel minor. Which chords work and which don’t? Once you have an idea of which chords function best, try combining these into a single progression. How many chords can you borrow before it simply sounds as if its in minor?

{% capture ex3 %}X:3 T:More borrowing from the parallel minor M:4/4 L:1/2 Q:1/4=90 K:C V:1 [c2E]| [dF] [BF]| [c2E]| [cF](cantusFirmus.html) [dF]| [c2E]|] V:2 clef=bass [C,2G,]| [F,,A,] [G,,G,]| [A,,2C]| [A,,A,] [B,,A,]| [C,2G,]|] w:C:I ii6 V7 vi IV6 vii%7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

Almost every chord can be substituted for its minor counterpart in this progression without changing its function. The pre-dominant and tonic functions can all be borrowed without altering their function, although altering the tonic functions quickly changes the sense of whether we are operating in the major or minor mode.

There are two chords that cannot be borrowed. The first is the minor v chord; if you borrow this, you undermine the fundamental core of diatonic tonality, so it sounds as if someone simply played a wrong note. The other non-borrowable chord for this progression is the major VII chord that would be built off of B-flat. Both of these chords demonstrate the importance of the resolution from the leading tone to the tonic to establish dominant and tonic function. This is the basis for tonal harmony.

Of note, you *can* borrow the viio7 from minor because it still has a leading tone.

## Borrowing from the parallel major

The next example uses the same progression in minor. Alter one chord at a time to borrow it from the parallel major, and pay careful attention to which scale degrees you are altering. Which progressions sound acceptable to you? How does the voice-leading change when starting in minor? Pay careful attention to any enharmonically equivalent resolutions.

{% capture ex4 %}X:4 T:Borrowing from the parallel major M:4/4 L:1/2 Q:1/2=60 K:Eb V:1 [c2E]| [dF] [=BF]| [c2E]| [cF](cantusFirmus.html) [dF]| [c2E]|] V:2 clef=bass [C,2G,]| [F,,A,] [G,,G,]| [A,,2C]| [A,,A,] [=B,,A,]| [C,2G,]|] w:c:i iio6 V7 VI iv6 viio7 i{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Roman numeral notation of mode mixture

It is because of mode mixture that we have followed such strict guidelines when labeling Roman numerals to this point. By having each part of a Roman numeral describe an isolated chord tone, we are able to accurately describe even borrowed chords.

| Chordal member | Default implied pitch | To raise by semitone from default | To lower by semitone from default |
| --- | --- | --- | --- |
| root | diatonic scale degree | sharp symbol in front of Roman numeral\* | flat symbol in front of Roman numeral\* |
| third | based on case of Roman numeral | upper case (M3) | lower case (m3) |
| fifth | P5 above root | add + after Rom num | add o after Rom num |
| seventh | m7 above root | add M before inversion figure | add o before inversion figure\*\* |

\*For clarity’s sake, we **always** use a sharp or flat symbol to show that we are raising or lowering the root, even if you are actually adding a natural.

\*\*Because the diminished o implies the interval of a d5 AND a d7, you must use the half-diminished symbol if you wish to alter the fifth but leave the chordal seventh as a m7 above the root.

Test your knowledge of this by writing the correct borrowed chords for every diatonic chord in a parallel major and minor. You may use the following chart as a model. With all of these make sure that you build the chord off of the correct root. For example, students often forget that to build a major VI chord in major, the root is altered thereby changing the entire chord. (In C major for example, the borrowed bVI chord is *not* an A major triad.)

| Roman numeral in major | Borrowed from parallel minor | Roman numeral in minor | Borrowed from parallel major |
| --- | --- | --- | --- |
| I |  | i |  |
| ii |  | iio |  |
| iii |  | III |  |
| IV |  | iv |  |
| V |  | V |  |
| vi |  | VI |  |
| viio |  | viio |  |

## Commonly used mode mixture

As you discovered above, certain chords do not sound good – or function at all – when borrowed. Because of this, there are a few chords that are borrowed most often.

Because of voice-leading resolutions, it is easiest to borrow chords while in major. The most commonly borrowed chords in major are: - viio7 (requires lowered ^6) - iv (requires lowered ^6) - iiø7 (requires lowered ^6) - iio (requires lowered ^6) - bVI (requires lowered ^6 and ^3) - bVII (requires lowered ^7) - Be careful to look at the function of this chord. Label it as V/III if it resolves to a borrowed bIII chord. Label it as bVII if it resolves in any other way. - bIII (requires lowered ^7 and ^3)

Minor is more limited due to voice-leading limitations, but the following chords are commonly borrowed: - I (requires raised ^3) - This is often used to end a minor piece in Baroque and Classical music. It is used often enough that it has a unique name: the Picardy (Picardie) third - IV (requires raised ^6) - Commonly results when used in first inversion to create a scalar bass line of sol-la-ti-do - #vi (requires raised ^6 and ^3) - Commonly results when used in root position to create a scalar bass line of sol-la-ti-do

In Unit 22, we introduced *integer notation* for *pitch classes*. Allen Forte first formalized this system in his seminal work, *The Structure of Atonal Music*, creating a broad analytical framework to compensate for tonal analytical methods inadequacy when music leaves tonality. His *set theory* is a specialized form of analysis that looks for intervallic patterns equally across all twelve chromatic pitches, rather than focusing on the relationship between a central pitch (i.e. tonic) and others.

## Scratching the surface

*Set theory* is a broad field of theoretical study, and we will only introduce a few basic concepts in this unit. If you would like to explore this topic further–and if you intend to go beyond the undergraduate level of music study, you should–I highly recommend that you read some of the many fine books written on the subject. My favorites include: - *The Structure of Atonal Music* - Allen Forte - *Introduction to Post-tonal Theory* - Joseph Straus - *Basic Atonal Theory* - John Rahn

There have been numerous refinements and alterations to this method since the first publication of Forte’s text in 1973, so this unit will attempt to distill the basics into a foundation that will make this sort of analysis more accessible.

## Notating pitch-class sets

When we introduced pc sets (pcs) in Unit 22, we did not formalize their notation, however, because we will study various levels of organization within pc sets, it is important to establish a standard form for writing an *unordered* pcs–a pitch class set that you have not specifically organized according to a predetermined, formalized sorting method. For unordered pcs, you should always notate this using **parentheses with a comma between each pitch class**. The following are all examples of unordered pc sets:

* (0,1,5,t)
* (B-flat,C,D,G)
* (2,4)
* (0,1,3,5,6,7,8,9,e)
* (B,C,D,E,F,G,A)

You will notice that it doesn’t matter if you use pitch names or integer notation; a pitch class set is any collection of pitch classes.

## Modulo 12 arithmetic

Before we begin using integer notation to study pitch classes and pitch-class sets, we must establish the mathematical method necessary for manipulating pitches. Because music uses twelve equally-spaced pitches but our standard counting system is based around tens, we must create a specific equivalency around the number 12. For this, we use modulo 12 (mod12) arithmetic. You already use modulo 12 arithmetic every time you count time in hours, assuming that you use a 12-hour system. For example, if it is 11:00 and you have a meeting in three hours, what time is your meeting? From experience, you understand that when you reach 12, you must reset your counting to find the meeting’s start time at 2:00–not 14:00. (Again, this assumes that you are not using a 12-hour clock cycle, not 24-hour.)

This is exactly how pitch-class integer notation works, although the system begins numbering on 0 instead of 12. In this system, each time you pass 11, you begin again at zero, therefore making every multiple of 12 equal to zero. Complete the following chart to show the first two equivalencies for every number in this system. Can you create a method to quickly find any level of equivalency? What would happen if you crossed below zero?

| Pitch-class integer | First equivalency | Second equivalency |
| --- | --- | --- |
| 0 | 12 | 24 |
| 1 | 13 | 25 |
| 2 | 14 | – |
| 3 | – | – |
| 4 | – | – |
| 5 | – | – |
| 6 | – | – |
| 7 | – | 31 |
| 8 | – | – |
| 9 | – | – |
| t (10) | – | – |
| e (11) | 23 | – |

### Conclusion

While it is easy to complete this chart by simply counting sequentially downward within each column, it is still useful in that it demonstrates the continuum that is mod12 arithmetic. All whole integers can be represented by an integer between 0 and 11, giving us exactly one integer for every possible pitch class in the chromatic system.

| Pitch-class integer | First equivalency | Second equivalency |
| --- | --- | --- |
| 0 | 12 | 24 |
| 1 | 13 | 25 |
| 2 | 14 | 26 |
| 3 | 15 | 27 |
| 4 | 16 | 28 |
| 5 | 17 | 29 |
| 6 | 18 | 30 |
| 7 | 19 | 31 |
| 8 | 20 | 32 |
| 9 | 21 | 33 |
| t (10) | 22 | 34 |
| e (11) | 23 | 35 |

This also works in moving backward. Using basic arithmetic, it is easy to understand that 12 - 5 = 7. But because 12 is equivalent to 0 in mod12, this also means that 0 - 5 = 7. This is correct, but it skips an step in demonstrating how. - 0 - 5 = -5 - You must then convert -5 into an integer between 0 and 11 using multiples of 12. Therefore, -5 + 12 = 7.

This shows that any whole integer, whether positive or negative, can be converted to an integer between 0 and 11. You could create a similar chart to the one above for negative integers.

| Pitch-class integer | First negative equivalency | Second negative equivalency |
| --- | --- | --- |
| 0 | -12 | -24 |
| 1 | -11 | -23 |
| 2 | -10 | -22 |
| 3 | -9 | -21 |
| 4 | -8 | -20 |
| 5 | -7 | -19 |
| 6 | -6 | -18 |
| 7 | -5 | -17 |
| 8 | -4 | -16 |
| 9 | -3 | -15 |
| t (10) | -2 | -14 |
| e (11) | -1 | -13 |

## Transposition using integer notation

Fixed-zero integer notation assigns the following integers to pitch-classes:

| Pitch-class integer | Pitch 1 | Pitch 2 |
| --- | --- | --- |
| 0 | C | B-sharp |
| 1 | C-sharp | D-flat |
| 2 | D | – |
| 3 | D-sharp | E-flat |
| 4 | E | F-flat |
| 5 | F | E-sharp |
| 6 | F-sharp | G-flat |
| 7 | G | – |
| 8 | G-sharp | A-flat |
| 9 | A | – |
| t (10) | A-sharp | B-flat |
| e (11) | B | C-flat |

This is relatively simple to memorize, but it is more important to consider what these numbers truly represent. Consider the following pitch-class set:

(E, F, G, B-flat)

First, transpose these pitches up a P4 using our traditional intervallic method for transposition, and as you do this, pay careful attention to the process that you use for transposing. Do you think of each pitch as part of a key? If so, what scale degree do you use for each pitch? Do you count half-steps? Do you find the first pitch and then as the base for finding the rest of the intervals?

Next: - Convert this pitch-class set into integer notation - Then add 5 to each number - For any resulting number greater that 11, convert that number to its lowest possible integer using mod12 from above. - For example, if you were to get 13, you would need to subtract 12 to get 1. - Convert this new set of integers into pitch letter names.

Did you get the same result as when you transposed the pitches using the traditional method for pitch transposition? If so, why does this work? What do the numbers for integer notation *actually* represent? (Hint: it is not the assigned pitches.)

## Notating transposition

Hopefully, you came to the same result using both methods of transposition. The pc set becomes (4,5,7,t), and then when you add 5 to each integer it becomes (9,t,12,15). All numbers greater than 11 must be reduced by mod12, so the set becomes (9,t,0,3). When these numbers are converted back into pitch letter names, you get (A,B-flat,C,E-flat) which is exactly a P4 above the original pc set.

This works, of course, because *the numbers in integer notation actually represent the number of half-steps above a given pitch*. When using fixed zero, each integer represents that many half-steps above C. From this, we derive the following chart, although if you have already memorized the integers for fixed-zero notation, you can always “reverse engineer” this chart using your knowledge of intervals within the C major scale.

| Pitch-class integer | Interval 1 | Interval 2 | Interval 3 |
| --- | --- | --- | --- |
| 0 | unison | d2 | A7 |
| 1 | m2 | (augmented unison) | – |
| 2 | M2 | d3 | – |
| 3 | m3 | A2 | – |
| 4 | M3 | d4 | – |
| 5 | P4 | A3 | – |
| 6 | A4 | d5 | – |
| 7 | P5 | d6 | – |
| 8 | m6 | A5 | – |
| 9 | M6 | d7 | – |
| t (10) | m7 | A6 | – |
| e (11) | M7 | (diminished unison) | – |

When notating transposition, we write Tn where n = the interval by which you will transpose. The example above would be notated:

T5(E, F, G, B-flat) = (A,B-flat,C,E-flat)

OR using integer notation

T5(4,5,7,t) = (9,t,0,3)

## Transposing downward

Any positive integer implies a transposition upward, so a negative integer is used to transpose downward. For example, perform the following transposition:

T-3(4,5,7,t)

This example is simple enough because each of the integers is easily reduced by -3 to create (1,2,4,7). However, try the following:

T-5(4,5,7,t)

In this example, 4 - 5 = -1. What does -1 equal? Because we use mod12, you can simply add 12 to this number to find its simplest equivalency.

-1 + 12 = 11

Just as you must reduce any number greater that 11 to an integer between 0 and 11, you must also increase any number less than 0. Therefore the set above is:

T-5(4,5,7,t) = (e,0,2,5)

## Normal form (normal order)

In order to make comparing pc sets more useful, we need to use standardized orders to create consistent comparisons. You can imagine how difficult it would be to make sense of multiple pc sets if each set was in a random order. For this, we use *normal form*.

Normal form is similar to the way in which we analyze standard tonal harmony. For example, how would you condense the following open voicing of a seventh chord in its simplest form while retaining its inversion?

{% capture ex1 %}X: 1 T:C major seventh chord T:in an open voicing M:4/4 L:1 K:C V:1 [BG]|] V:2 clef=bass [E,C]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

Most people will reduce this to a closed-position chord such as the following, because it shows every pitch and the inversion in the smallest space possible. This makes it easy to see the intervals and construction of the chord:

{% capture ex2 %}X: 2 T:C major seventh chord T:in a closed voicing M:4/4 L:1 K:C V:1 [EBGc]|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

*Normal form* (or *normal order*) applies the same principles for organizing pitches to pc sets as you did when rearranging this seventh chord. **Normal form is an ascending arrangement of a pc set in which the outside interval is smallest.** For example, take the following pc set and arrange it so it fills the smallest space possible.

(1,7,t)

More precisely, find the ascending arrangement that has the smallest interval between the outside pitch classes. You may use any method that works, but common methods include using mod12, notating the pitches on a staff, or even drawing the pitches on a clock face. As you work through this, consider the speed and efficacy of each method that you try.

### Conclusions

For this trichord, it is probably easiest to translate the pitches into standard pitch letters, and then just treat it as a triad. In this case, the pitches D-flat, G, and B-flat form a G diminished triad, so you can quickly tell that the normal form for this should be:

[7,t,1]

Notice that when notating a pc set in normal form, the parentheses are replaced by brackets. (This notation method is outlined by Joseph Straus in his *Introduction to Post-Tonal Theory*.)

But what happens when you have a more complicated and ambiguous pc set? Try putting the next pentachord into normal form. What difficulties do you find? Which method seems to get the quickest result? Which seems the most consistent?

(1,3,7,t)

## Breaking “ties” for ordering pcs

With any pcs, it is possible that there are multiple arrangements that have the same interval between the outside pitches. Try putting the following trichord into normal form.

(0,5,7)

If you arrange this on a staff in all possible ascending orders, you get:

{% capture ex3 %}X: 3 T:Three possible arrangements of (0,5,7) M:4/4 L:1 K:C V:1 [CFG]| [FGc]| [Gcf]|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusion

After looking at this on the staff, it is obvious that you can eliminate the last arrangement, but how do you choose between the first two which both have an outer interval of 7 (P5)? In pcs theory, the first tie-breaker is looking at the distance between the lowest pitch and the second highest pitch. In the above example, the second interval for the first arrangement is 5 (P4), but the second interval for the second arrangement is only 2 (M2). In this case the normal form this trichord is [0,2,7].

## Developing a method for normal form

Let’s try to create a step-by-step process for finding normal form by using a more difficult example. The following pentachord has multiple ties and will require you to work through multiple levels. Try to develop this method without using a staff or clock faces. While working through this, how many permutations in ascending order are there for a this set? How does that number relate to the cardinality for any set? Remember that each tie is broken by measuring the first pitch against the next closest pitch.

(3,e,5,2,8)

### Conclusion

With a large set such as this pentachord, it is difficult to quickly parse the normal form.

1. **Put the pcs in an ascending form.** It does not matter on which pitch you start, only that the pitches are ascending. You can imagine this using a clock face–each pitch class must go in the order it would if you move clockwise around the clock without skipping any pitch classes. For this pentachord, let’s start with:
   1. (2,3,5,8,e)
2. **List every possible ascending arrangements of the pc set.** There will always be the same number of arrangements as there are members of the pc set, because each integer will have *one* ascending arrangement with it as a starting pitch class. For a pentachord, there will always be five possibilities, and for this particular pc set, they are:
   1. (2,3,5,8,e)
   2. (3,5,8,e,2)
   3. (5,8,e,2,3)
   4. (8,e,2,3,5)
   5. (e,2,3,5,8)
3. **Subtract the first number *from* the last number for each ascending arrangement.** This will give you the interval between the outer pitch classes expressed as a number of half-steps. If the last number is smaller than the first number, you must use mod12 to convert it. For most students, it is easiest to add 12 to the smaller number before subtracting, but after you have practiced, you can apply this to the result if you’d like. For example above:
   1. (2,3,5,8,e) | e-2 = 11-2 = *9*
   2. (3,5,8,e,2) | 2-3 (requires mod 12) = 14-3 = *11*
   3. (5,8,e,2,3) | 3-5 (requires mod 12) = 15-5 = *10*
   4. (8,e,2,3,5) | 5-8 (requires mod 12) = 17-8 = *9*
   5. (e,2,3,5,8) | 8-e (requires mod 12) = 20-11 = *9*
4. **The normal form is the ascending arrangement with the smallest outer interval. If you have multiple arrangements with the same outer interval, you must proceed to the first tie-breaker.** In our above example, we have three options with an outer interval of 9 (M6). (At this point, we have eliminated the two arrangements that had the larger outer intervals of 10 and 11.) We must compare each of the tied arrangements against each other to determine which example has the *next* smallest outer interval. You can do this easily by subtracting the second-to-last number from the first number, so for our remaining three with the outer interval of 9, we get:
   1. (2,3,5,8,e) | 8-2 = *6*
   2. (8,e,2,3,5) | 3-8 (requires mod12) = 15-8 = *7*
   3. (e,2,3,5,8) | 5-e (requires mod12) = 17-11 = *6*
5. **If there is still a tie, repeat the process for the remaining ascending orders, but using the third-to-last pitch class for your subtraction.** Sometimes, this can move through multiple tie-breakers, so just continue moving inward through the arrangements. The previous example still had a tie between the first and last arrangement, so we have to go one last round:
   1. (2,3,5,8,e) | 5-2 = *3*
   2. (e,2,3,5,8) | 3-e (requires mod12) = 15-11 = *4*
6. **Once you have only one smallest interval, you have found the normal form for that pc set.** Remember that you must change your notation to include square brackets once you have determined normal form. For our example above, our normal form is:
   1. [2,3,5,8,e]

Note that there cannot be a definitive normal form for symmetrical sets such as diminished seventh chords, augmented triads, and whole-tone scales. For these, it is simplest to list the lowest integer first.

Near the beginning of the course, we familiarized ourselves with the common scales necessary for learning diatonic function: major, natural minor, melodic minor, harmonic minor, major pentatonic, minor pentatonic, and chromatic scales. If you need to refresh your memory of those scales, please review Unit 2.

## Non-diatonic scales

Most music–whether folk, pop, jazz, classical, etc.–can organize the pitches into what you would identify as a scale, but in most of these styles, rarely do these scales conform to a simple major or minor scale. Some of these scales, like the various diatonic *modes* and the pentatonic collection, are relatively familiar to most listeners. Others–such as octatonic and whole tone collections/scales–are more novel, and most often associated with compositions of the last 100 years.

When characterizing scales, the word “collection” is often more appropriate than “scale.” A *collection* is any group of notes–usually five or more–that can be ordered in an ascending and repeating fashion. Imagine a collection as a source from which a composer can draw musical material–a kind of “soup” within which pitch-classes float freely. Collections by themselves do not imply a tonal center. But in a composition, a composer may establish a tonal center by privileging one note of the collection, which we then call a *scale*.

**Use the following arrangements of *Happy Birthday* to determine the intervallic pattern of each of these scales/collections. After discussing this with your group and writing the scale/collection out in standard ascending form, practice transposing the scale into various keys to ensure that you understand its structure. Finally, please read through the descriptions on the following page for background and the common usage for each of these scales/collections.**

## 5-note Collections

{% capture ex8 %}X: 8 T:Happy Birthday in G Hirajoshi Pentatonic M:3/4 L:1/4 Q:1/4=90 K:Bb D/2>D/2| E D G| D2 D/2>D/2| E D A| G2 D/2>D/2| d B G| D E d/2>d/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

We covered the standard major and minor pentatonic scales in Unit 2b, and you hopefully can see how the Hirajoshi pentatonic scale combines aspects of both standard Western pentatonic scales–the hirajoshi uses the scale degrees of the major pentatonic but the accidentals from the natural minor scale.

| Pentatonic scales | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- |
| Major | ^1 | ^2 | ^3 | ^5 | ^6 |
| Minor | ^1 | ^b3 | ^4 | ^5 | ^b7 |
| Hirajoshi | ^1 | ^2 | ^b3 | ^5 | ^b6 |

## 6-note Collections

{% capture ex9 %}X: 9 T:Happy Birthday in G Whole Tone M:3/4 L:1/4 Q:1/4=90 K:C \_D/2>D/2| \_E \_D G| F2 \_D/2>D/2| \_E \_D A| G2 \_D/2>D/2| \_d B G| F \_E \_d/2>\_d/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“9” abc=ex9 %}

The name clearly states this, but this scale is constructed entirely of major seconds, and because it has six pitches, we call this a *hexatonic* scale. Interestingly, the whole tone scale is one of the few collections of pitches that is both symmetrical and constructed entirely of one interval. It shares this trait with a fully diminished seventh chord (all minor thirds) and an augmented triad (all major thirds). Any whole tone scale also contains two augmented triads, separated by a M2.

Because there are only six pitches, you will have to choose to insert a skip of a diminished third when writing a whole tone scale on a staff, assuming that you want to keep your tonic the same in every octave. If you stack only use major seconds, your octave will be an enharmonic equivalent. There is no preferred place to put the interval of a third; most people just place it where it eliminates as many accidentals as possible.

The symmetry of the whole tone scale means that there are actually only two unique whole tone collections, because you can use any pitch of a given whole tone scale as a tonic. In this chart, you can see that for each of these two collections, you can start on any pitch within the collection and create a whole tone scale.

| The two whole tone collections | 1 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | C | D | E | F# | G# | A# |
| 2 | Db | Eb | F | G | A | B |

Its symmetry also contributes to the whole tone scale’s general malleability–when all pitches are equal, it is both easy to manipulate but hard to solidify. It is often used in compositions to denote confusion or the supernatural.

### Other hexatonic scales

{% capture ex10 %}X: 10 T:Happy Birthday in 3+1 Hexatonic M:3/4 L:1/4 Q:1/4=90 K:C D/2>D/2| \_E D G| ^F2 D/2>D/2| \_E D ^A| G2 D/2>D/2| d B G| ^F \_E d/2>d/2| B G ^A| G2|]{% endcapture %} {% include abc-example.html number=“10” abc=ex10 %}

{% capture ex11 %}X: 11 T:Happy Birthday in 1+3 Hexatonic M:3/4 L:1/4 Q:1/4=90 K:C D/2>D/2| E ^D G| E2 D/2>D/2| E ^D \_A| G2 D/2>D/2| ^d B G| E ^D c/2>c/2| B G \_A| G2|]{% endcapture %} {% include abc-example.html number=“11” abc=ex11 %}

The other two hexatonic scales require a combination of two intervals, the minor second and minor third. By alternating these intervals, you can create a six-note scale which we will label as either a 1+3 hexatonic scale or a 3+1 hexatonic scale. Like the whole-tone scale, 1+3/3+1 hexatonic scales contain two augmented triads, but in this case, the two triads are separated by a minor second.

We always label these hexatonic scales by looking at the first two intervals when the scale is written in *ascending* form. This often confuses students, because when you write this scale in descending form, the first interval will be the opposite of the name. For example, look at the 1+3 hexatonic scale starting on C:

C-C#-E-F-G#-A-C

You can clearly see that this scale begins with a minor second and then alternates with minor thirds. If you write it in descending form, however, the first interval is a m3. To avoid this confusion, we will always label these based on their ascending form.

3+1 and 1+3 hexatonic scales do not have symmetry as obvious as the whole tone scale, but they do have strong symmetrical traits. There are only four unique 1+3/3+1 collections, because like the whole tone scale, each note of a given collection can be used to form another hexatonic scale. For example, if we examine the C 1+3 hexatonic scale above, you can see that this are also the same pitches for the E 1+3, and G# 1+3 scales. If you arrange this scale to start on C#, F, or A, you would create the 3+1 hexatonic scales for those three pitches. This means that every collection contains three 1+3 and three 3+1 hexatonic scales.

| The four 1+3/3+1 hexatonic collections | 1 | 2 | 3 | 4 | 5 | 6 |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | C | Db | E | F | G# | A |
| 2 | C# | D | F | Gb | A | Bb |
| 3 | D | Eb | F# | G | A# | B |
| 4 | Eb | Fb | G | Ab | B | C |

## 8-note Collections

{% capture ex12 %}X: 12 T:Happy Birthday in G Half-whole Octatonic M:3/4 L:1/4 Q:1/4=90 K:C D/2>^C/2| E D G| F2 D/2>^C/2| E D \_A| G2 D/2>^C/2| ^c \_B G| F E \_c/2>\_c/2| \_B G \_A| G2|]{% endcapture %} {% include abc-example.html number=“12” abc=ex12 %}

{% capture ex13 %}X: 13 T:Happy Birthday in G Whole-half Octatonic M:3/4 L:1/4 Q:1/4=90 K:C D/2>D/2| E ^D G| ^F2 D/2>D/2| E ^D A| G2 D/2>D/2| ^c \_B G| ^F E c/2>c/2| \_B G A| G2|]{% endcapture %} {% include abc-example.html number=“13” abc=ex13 %}

The two variants of the octatonic scale, the half-whole and whole-half, are similar to the 1+3/3+1 hexatonic scales in nearly every way. Both: - consist of an alternating pattern of two intervals - contain two standard, symmetrical chords separated by a half-step - can be transformed into another version of the octatonic scale by reassigning tonic to any pitch in the collection

The differentiator between the two scales is the intervallic pattern. The octatonic scale alternates between minor seconds and major seconds, as opposed to the 1+3/3+1 hexatonic scales’ minor seconds and minor thirds. The slightly smaller interval pattern of the octatonic creates a collection of eight pitches with many symmetrical properties. And like hexatonic scales, we will always label an octatonic scale starting from its first interval *in its ascending form*, because in its descending form the pattern will be reversed. If the first interval of your ocatonic scale is a minor second, you will label this as a half-whole (HW) octatonic scale; if the first interval is a major second, you will label this a whole-half (WH) octatonic scale.

You can divide any octatonic collection into two fully diminished seventh chords, as demonstrated in the C Half-whole (HW) scale written out here.

C-C#-Eb-E-F#-G-A-Bb-C

You can see that this collection can be separated into a Co7 and a C#o7 (If you do not see this, make sure to consider all of the enharmonic equivalents). And because a fully diminished seventh chord is symmetrical–as we discussed when studying them for enharmonic modulations in Unit 20b–we can then infer that this scale would have an identical interval pattern if we started on any of the pitches of that diminished seventh chord. For example, if you rearrange the collection to ascend from Eb, F#, or A–the other members of the Co7–you will find that the resulting scale is still alternating between minor seconds and major seconds, just with a different tonic.

Also like the 1+3/3+1 hexatonic scales, if we start the scale from the other pitches–for the C HW listed above, these would be the pitches of the other diminished seventh chord, C#, E, G, and Bb of the C#o7–you create a scale based on the *other* octatonic scale pattern, the WH. Therefore, every octatonic collection contains four HW octatonic scales and four WH octatonic scales, which means that there are only three unique octatonic collections.

| The three octatonic collections | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | C | Db | Eb | E | F# | G | A | Bb |
| 2 | C# | D | E | F | G | Ab | Bb | B |
| 3 | D | Eb | F | Gb | Ab | A | B | C |
| 4 | Eb | E | F# | G | A | Bb | C | Db |

The octatonic scale has long been a favorite of modern composers, because it not only has the tonal fluidity and symmetry of a hexatonic scales, but it also contains many of standard tonal structures such as triads and seventh chords. In a HW octatonic scale, you can create a major triad, minor triad, diminished triad, minor seventh chord, dominant seventh chord, and fully diminished seventh triad off of four of different pitches within the collection. This gives composers an amazing flexibility to use tonally familiar structures in a non-standard manner.

## Secondary dominant functions for chords other than V

At the end of the Unit 14a, you completed the process of transforming a ii7 chord into V7/V. In the final instructions, I suggested that you try altering chords other than the ii chord to see if you could create secondary dominants for chords other than V.

Let’s work through this in the following example. Harmonize the progression in four-part harmony; then alter chords to create secondary dominant chords. How many options are possible if you only alter existing chords? Assuming that you created a secondary dominant chord, try changing it into secondary leading-tone chord.

{% capture ex1 %}X:1 T:Creating secondary dominant functions M:4/4 L:1/2 K:C V:1 [cE] [c]| [d] [d]| [c2]|] V:2 clef=bass [C,G,] [A,,]| [D,] [G,,]| [C,2]|] w:C:I vi ii7 V7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

The previous example has multiple chords that are connected by root movement of a descending P5, which is the reason that it provides multiple opportunities for secondary dominant chords. In the example below, you can see the secondary chords next to their closely related diatonic counterparts. By placing them next to each other, you can see not only how similar the secondary dominant chords are to their diatonic counterparts, but it is also easy to see that they share a function with the chord with the chord that precedes them. This includes a secondary dominant chord that we had not looked at yet: V7/ii. You will notice that this chord is as closely related to the vi7 chord as the V7/V was related to the ii7 chord.

{% capture ex4 %}X:4 T:Possible secondary dominant functions M:4/4 L:1/2 K:C Q:1/4=60 V:1 [cE] [c/2G][^c/2G]| [d/2F][d/2^F] [dG]| [c2E]|] V:2 clef=bass [C,G,] [A,,/2A,][A,,/2A,/2]| [D,/2C][D,/2C] [G,,B,]| [C,2G,]|] w:C:I vi7 V7/ii ii7 V7/V V I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Tonicizing chords other than V

In music, secondary dominant functions can appear anywhere the composer would like to emphasize a chord or prolong its function. *Any major, minor, or dominant quality can be tonicized.*

For secondary leading-tone chords: - For minor chords, you may use a V, a V7, a viio, or a viio7. You may not use a viiø7 (half-diminshed seventh chord) because the chordal seventh will sound strange. - For major and dominant chords, you may use a V, a V7, a viio, *viiø7, or a viio7*. Notice that you may use either a fully diminished or half-diminished seventh chord, even though the naturally-ocurring seventh chord built off the 7th scale degree in a major key will always be a half-diminished chord. For tonicizing a major chord, fully diminished chords actually appear more often than half-diminished chords, because they further strengthen the voice-leading.

## Altering root movement

The following example uses a IV chord instead of a ii chord, and this changes the root movement for much of the passage. Try adding secondary dominant or leading-tone chords in the spots marked with an “x.” The note in the bass is just a placeholder, so please feel free to change it. You should experiment with various inversions to see if you can create more melodic bass lines as well.

{% capture ex2 %}X:2 T:Inserting secondary dominant functions T:into various root movement patterns M:4/4 L:1/2 K:C Q:1/4=80 V:1 [cE]x| [c]x| [c]x| [d2]| [c2]|] V:2 clef=bass [C,G,][C,]| [A,,][A,,]| [F,,][F,,]| [G,,2]| [C,2]|] w:C:I x vi x IV x V7 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

Which chords created the smoothest voice-leading? Were you able to create a harmonization that has good voice-leading while also sounding convincing?

### Conclusions

Your most straightforward option is to use root-position secondary dominant functions in each spot creating a progression that would look something like this:

{% capture ex5 %}X:5 T:Inserting secondary dominant functions T:in root positions M:4/4 L:1/2 Q:1/4=80 K:C V:1 [cE][dE]| [cE][cE]| [cF][d^F]| [d2F]| [c2E]|] V:2 clef=bass [C,G,][E,^G,]| [A,,A,][C,\_B,]| [F,,A,][D,C]| [G,,2B,]| [C,2G,]|] w:C:I V7/vi vi V7/IV IV V7/V V7 I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

The voice-leading is easy to determine as long as you follow the standard resolutions for the tendency tones in each secondary dominant chord. In this progression, you must alternate between complete and incomplete chords to avoid objectional parallels.

## Secondary functions used to create a smooth bass line

There are countless other options you could use to embellish this progression though. You probably noticed the disjunct bass line in the root-position harmonization example, but the three upper voices had smooth voice-leading. By using inversions of secondary dominant chords and/or secondary leading-tone chords, you can create much more melodic bass lines. Take your previous harmonization (or use the clean version below), and alter it by inserting secondary dominant functions at each spot marked with an x. You should be able to create an entirely stepwise bass line. Remember that if you need to change the openness of a chord’s voicing, it can be helpful to have one voice jump a fourth by moving from the third of the first chord to the third of the second chord.

{% capture ex3 %}X:3 T:Creating a step-wise bass line M:4/4 L:1/2 K:C Q:1/4=80 V:1 [cE][d]| [e][e]| [f][d]| [d2]| [c2]|] V:2 clef=bass [C,G,][B,,]| [A,,][G,,]| [F,,][^F,,]| [G,,2]| [C,2]|] w:C:I x vi x IV x V7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

Are there multiple options for any of the chords? Where does the soprano force difficult decisions and resolutions?

### Conclusions

Here is one option for a smoother, more melodic bass line.

{% capture ex6 %}X:6 T:Inserting secondary dominant functions T:to create a smooth bass line M:4/4 L:1/2 Q:1/4=75 K:C V:1 [cE][dE]| [eE][eG]| [fA][dA]| [d2G]| [c2E]|] V:2 clef=bass [C,G,][B,,^G,]| [A,,C][G,,C]| [F,,C][^F,,C]| [G,,2B,]| [C,2G]|] w:C:I V43/vi vi V/64/IV IV V65/V V7 I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

You probably notice when listening to this how similar this sounds to modern sources of harmonic progressions such as pop and jazz. A melodic bass line is often employed in these styles.

## Beginning chromatic harmony

This unit will be your first introduction of *functional* accidentals–meaning altered notes that are critical to the function of a chord rather than embellishing non-chord tone accidentals of diatonic harmony. So this marks the beginning of our studies of *chromatic* harmony. As you read on, remember that *all* tonal harmony relates back to the function and voice-leading that we established in studying diatonic harmony.

## Introducing secondary dominant chords

Secondary dominant chords are a logical extension to diatonic progressions and an obvious starting point for studying chromatic harmony, because they are simply an elaboration of circle-of-fifths progressions. Let’s begin by harmonizing the following progression in four-part harmony. Because it is full of root position triads, you will need to use multiple incomplete chords to use smooth voice-leading while avoiding errors.

{% capture ex1 %}X:1 T:A standard progression M:4/4 L:1/2 K:C Q:1/4=80 V:1 [cE] [c]| [d] [d]| [c2]|] V:2 clef=bass [C,G,] [A,,]| [D,] [G,,]| [C,2]|] w:C:I vi ii V I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

In Unit 7, we discussed the evolution of the circle-of-fifths progression, and in that process, we saw that the circle-of-fifths progressions are strong because the voice-leading closely mirrors a series of V-I progressions. With that in mind, let’s zoom in on the middle measure of the ii-V-I progression that you completed above. (This will work for any voicing that you chose, but I have inserted the voicing that I used in the next example.) On the staff below, I have isolated the ii and V chords in the first two measures. In the second measure, I have copied all of the voices exactly from the first measure, but I have altered only the *key signature* to match the tonic of the second chord–in this case, our second chord was the V chord, a G major triad, so I used the key signature for G major without altering any of the voices. Analyze the second measure in G major while taking into account the new key signature. What progression have we created?

{% capture ex2 %}X:2 T:Altering ii-V M:4/4 L:1/2 K:C Q:1/4=80 V:1 [dF] [dG]|| [K:G] [dF] [dG]|| V:2 clef=bass [K:C] [D,A,] [G,,B,]|| [K:G] [D,A,] [G,,B,]|| w:C:ii V G:? ?{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

As you can see, these two progressions are identical with the exception of one accidental. The ii-V progression in C major has a weaker pull than the V-I progression in G major, but they are functionally similar. Therefore, we could strengthen the ii-V progression in C major by adding one accidental to the ii chord to have it mimic the dominant chord in a secondary key. To try this, take your completed progression from the first example above and alter the one pitch necessary in the ii chord to “borrow” the dominant chord from G major. (I have provided you with my voicing if you deleted yours, but feel free to copy your voices into the appropriate lines of the ABC notation.)

{% capture ex3 %}X:3 T:Changing ii into a dominant chord M:4/4 L:1/2 K:C Q:1/4=80 V:1 [cE] [cE]| [dF] [dG]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [D,A,] [G,,B,]| [C2C,2]|] w:C:I vi ii V I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusion

To do this, you only need to raise the third of the ii chord to create a D major triad–the V chord in the key of G major. This creates a temporary V chord instead of a ii chord which you can hear by playing the following example.

{% capture ex6 %}X:6 T:Changing ii into a dominant chord M:4/4 L:1/2 K:C Q:1/4=80 V:1 [cE] [cE]| [d^F] [dG]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [D,A,] [G,,B,]| [C2C,2]|] w:C:I vi ?? V I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

## Tonicization and secondary function

In this case, the progression is momentarily acting as if a non-tonic chord–in this case, the V chord–*has become* the tonic. We call this *tonicization*. It is the process of borrowing the dominant function from a non-tonic chord’s key to provide emphasis and prolong a chord’s function.

Tonicization is a *secondary function*. When studying function in diatonic contexts we discussed the primary functions of tonic, dominant, and pre-dominant, as well as tertiary functions such as cadential, passing, pedal, and arpeggiated. Secondary function is yet another category of functions in which the primary functions–i.e. the tonic and dominant relationship–*of a second key* are used in our original key.

## Labeling secondary dominant chords

In the example above, the ii chord becomes a major chord once the sharp is added, so it is no longer a ii chord. To denote this in our Roman numerals, we use two Roman numerals separated by a slash: V/V. We read this as “five of five.” In this labeling, the Roman numeral before the backslash is the chord’s function as if it were *in the key of* the Roman numeral after the slash. In our example above, the D minor chord becomes a D major chord, so it now acts as the V chord in the key of G major: a “five of five.”

One important note, standard practice for secondary function chords allows you to tonicize any chord that is *not* a diminished triad. This means that viio in major and minor as well as iio in minor should not be tonicized.

Because we label secondary functions in Roman numerals using slashes, students often confuse the function of the slash with leadsheet symbols. In leadsheet symbols, a slash denotes an inversion to the chord by denoting which pitch is in the bass voice, where in Roman numerals, we use *inversion figures* to denote the bass note. A slash in Roman numerals implies a secondary function and tells you what key is being tonicized. While both systems are useful for theorists, you must be careful not to let the nomenclature mix together.

## Secondary dominant seventh chords

In our progression above, what would happen if we had decided to use a ii7 chord instead of a ii chord? Try it on the following staff. Start by harmonizing the ii7-V-I progression below while making sure that you resolve your chordal thirds and sevenths correctly. Once you have a voicing that you like, alter the ii7 chord using accidentals to create a V7 in the key of G major – a V7/V (read: “five seven of five”)

{% capture ex4 %}X:4 T:Changing ii into a dominant seventh chord M:4/4 L:1/2 K:C V:1 [cE] [c]| [d] [d]| [c2]|] V:2 clef=bass [C,G,] [A,,]| [D,] [G,,]| [C,2]|] w:C:I vi ii7 V I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusion

When you alter the ii7 chord in the same way that you altered the ii triad to create a secondary dominant, you create a secondary dominant seventh chord–in this case, a V7/V.

{% capture ex5 %}X:5 T:Changing ii7 into a dominant seventh chord M:4/4 L:1/2 K:C V:1 [cE] [cE]| [d^F] [dG]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [D,C] [G,,B,]| [C,2C]|] w:C:I vi V7/V V I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

There are many possibilities for using these beyond tonicizing V chords, because any major or minor triad can be tonicized by a secondary dominant seventh chord. Instead of altering the ii chord in the above progressions, try altering the vi chord. What chord will it tonicize? Which accidentals will need to be borrowed? What will you call it once you have altered it? We will fully examine these ideas in Unit 15.

## Introduction

Now that you have some guidelines in the form of stylistic rules, let’s begin developing the process for composing your own part-writing. How would you go about harmonizing the following melody in a four-part chorale style? Before you begin, look at the example and make a list of all the things you would need to do to harmonize this melody.

{% capture ex1 %}X:1 T:Melody M:4/4 L:1/4 K:C V:1 cedf| gfed| c4|] V:2 clef=bass xxxx| xxxx| x4|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

In no particular order, you will need to determine: - Harmonies - Harmonic rhythm - Cadences - Bass lines - Inner voices - Texture

To this point in the course, we have discussed each of these, but you have spent most of your assignments analyzing existing examples rather than creating your own music.

And as a reminder, if you did not access our guide to part-writing in the last unit, you can find it here. [Part-Writing Error Checklist and Guide](https://docs.google.com/document/d/1s9Xd3LPqoaEevshTopxHzLX9jCzxVCZocOBLD_dceMU/edit?usp=sharing) We will continue referencing this for the rest of the unit, so you will probably want to print this out or open it in a separate window.

## Two important concepts to review before beginning

After looking at the list of concepts that are needed to harmonize a melody, you probably feel daunted and combining so many concepts into a single, coherent piece of music. So instead of bringing in every nuance to start, I’d like to draw your attention to two major concepts that will act as your overarching guides for managing your melodic (horizontal) and harmonic (vertical) choices.

### CONCEPT 1 - Manage the horizontal aspect through melody and tendency tones

First, you should always prioritize making smooth, singable part in this style. Your bass line will likely have more leaps, but the upper three voices should predominantly use stepwise motion. Any leaps should be followed by stepwise motion in the opposite direction.

In Unit 7a, we showed that by studying the voice-leading of a simple V (or V7) to I progression, we can propose a broad set of voice-leading rules that explain circle-of-fifths diatonicism. Specifically: - For chords that have roots separated by a P5: - The *seventh* of the first chord resolves to the *third* of the second chord. - the *third* of the first chord resolves to the *root* of the second chord. - If both chords are in root position, the bass voice moves from the *root* of the first chord to the *root* of the next chord.

This is the beginning of a *circle-of-fifths progression*: a progression in which each chord root follows the circle of fifths.

### CONCEPT 2 - Manage the veritcal aspect through stylistic rules

Voice-leading governs the horizontal axis of music by shaping the melodies within each voice, but we need some basic rules to guide the vertical stacking of these melodies to make harmonies. A basic four-part chorale style employs the following four rules to act as general guidelines as a framework for combining voices.

* Range
  + Use the treble and bass staves as your guide.
    - Your soprano should sit between the bottom line of the treble clef staff to a ledger line above the treble clef staff.
    - The alto voice can go as low two ledger lines below the treble clef staff and up to the top of the treble clef.
    - The tenor voice will typically range from the middle of the bass clef staff to three ledger lines above the bass clef staff.
    - The bass voice will range from the top of the bass clef staff to a ledger line below the bass clef staff.
* Spacing
  + Your upper three voices should never have more than an octave between adjacent voices. The soprano and tenor *can* be more than an octave apart though.
  + Your bass can be as more than an octave from the tenor.
* Doubling
  + If you need to double a pitch, you can double (or even triple!) the root of most chords, and you should generally avoid doubling the chordal third and seventh. You can omit the chordal fifth if necessary, but the other pitches cannot be omitted entirely.
* Voice-crossing
  + In your early attempts at part-writing, do not allow your voices to cross.

## A first attempt at part-writing

Let’s use these two main concepts to try to harmonize the simple melody below with one harmony per pitch. Work through harmonizing the melody below, and take notes on each decision you have to make as your work through the process. If you get stuck, go back and look at the two major concepts to see if one of them gives you an idea how to proceed. And once you have finished, analyze your chorale to check for errors.

{% capture ex2 %}X:2 T:A first attempt at part-writing M:4/4 L:1/2 K:C V:1 [c] [A]| [B] [c]|] V:2 clef=bass x x| x x|] w:C:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

As you started, you hopefully realized that you had to make some important choices first such as choosing your key and cadences. By the end, you should have created a process similar to the following.

**To harmonize a melody in a four-part chorale style, you should:** - **Identify the key** - Look for melodic patterns, starting pitches, and ending pitches for clues as to an implied key. - **Determine your phrase** - For the excerpt below, you have little room for decision making, but for a larger melody, try singing the phrase repeatedly and listen to your natural inclination for breaths or pauses. - It can also be helpful to look for spots in which the rhythm slows naturally. - **Choose a cadence** to complete your phrase. - Refer to [Unit 8a](08-cadences-phrasing/a1-cadences.html) to review the types of cadences. - **Create the rest of the diatonic progression** beginning on tonic and ending with your cadence. (If not already provided.) - Beginning on tonic will establish your key center. Refer to [Unit 6b](06-intro-harmonic/b1-diafuncvoicelead.html) for a review of the three primary harmonic functions: tonic, dominant, and pre-dominant. - Refer to [Unit 7a](07-harmonic-functions/a1-diaprogcirclefifths.html) to determine a functional harmonic progression. - **Compose a bass line** based on your harmonization. - This will resemble 1:1 counterpoint, so you can refer to [Unit 5b](05-counterpoint-embell-shapes/b1-cantfirmand1st.html). - It is okay for the bass line to be more disjunct than the other voices, so feel free to leave your chords in root position to make doubling simpler. - You can alter one or more of these once you begin looking at how it interacts with your melody. Contrary motion against the soprano line is less likely to create issues. - **Fill in the alto and tenor voices.** - Refer to the guidelines for voicing, range, and doubling in [Unit 10a](10-intro-harmonic/a1-voiceleadingerrors.html). - When writing your parts, always **strive to have voice-leading that is as smooth as possible** by emphasizing stepwise motion. - As mentioned above, bass lines are the exception and will often have more leaps, especially when using root-position chords. - **Check your work** - Listen to your finished phrase repeatedly. It doesn’t matter whether you play your phrase on piano or via musical notation software; it only matters that you listen to it. - Analyze your chorale for part-writing errors using the system we discussed in Unit 10. - Does your phrase sound convincing when played? If not, restructure your harmony and try again.

## Moving forward

Please do not be afraid of failing! This is a normal and important part of the learning process, so rather than be disappointed, try focusing on the parts that you do not like, and then analyze them for errors. Your first attempts may sound clunky and unconvincing, but you should be able to use the analytical tools that you have developed thus far to find mistakes. Iteration is key.

As you move the list above, you should realize that a four note melody such as this leaves little room for development, so it is easiest to stick with a simple ideas. Because C is in prominent positions at the beginning and end of the example, use C major for your key. And since the melody ends on the tonic, an authentic cadence would be easiest. With those two decisions made, everything else begins to fall into place.

To keep this simple, let’s choose a perfect authentic cadence. This locks in the bass line for our last two notes, because we know that a PAC has a root position V and I chords at the end of the phrase. It is hopefully clear that the first pitch should start on the tonic chord to establish the key in our ear, which leaves only the second chord undetermined.

Because the chord that *follows* our undetermined chord is a dominant chord, it makes sense to use a pre-dominant chord, and the A in the melody would allow for either a ii chord or a IV chord. (If you are struggling to remember the standard diatonic chord progressions, please refer to Refer to [Unit 7a](07-harmonic-functions/a1-diaprogcirclefifths.html).)Let’s choose an inverted ii chord to provide some variety.

{% capture ex3 %}X:3 T:A first attempt at part-writing M:4/4 L:1/2 K:C V:1 [c] [A]| [B] [c]|] V:2 clef=bass [C,] [F,] | [G,] [C,]|] w:C:I ii6 V7 I w:T P D T{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

You now can refer to the handout to see if we met some basic criteria: - Our chords follow a standard progression. - It establishes a key and then cadences in that key. - The lines emphasize smooth voice-leading.

We are now ready to add inner voices, and we can use our voicing and doubling rules from Unit 6b to establish a first chord.

{% capture ex4 %}X:4 T:A first attempt at part-writing M:4/4 L:1/2 K:C V:1 [cE] [A]| [B] [c]|] V:2 clef=bass [C,G,] [F,] | [G,] [C,]|] w:C:I ii6 V7 I w:T P D T{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

And lastly, we can create the alto and tenor lines while observing the melodic guidelines from the handout. - Individual lines should create smooth voice-leading using primarily stepwise motion. - Resolve tendency tones as we studied in our voice-leading discussions (Unit 6b.)

Leading to…

{% capture ex5 %}X:5 T:A first attempt at part-writing M:4/4 L:1/2 K:C V:1 [cE] [AD]| [BF] [cE]|] V:2 clef=bass [C,G,] [F,A,] | [G,G,] [C,G,]|] w:C:I ii6 V7 I w:T P D T{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

Of note, you may have tried to jump to a D for the first beat of the second measure in the tenor line, but this creates an unnecessarily disjunct tenor part. As we studied in Unit 6b, the chordal fifth can be ommitted on a seventh chord if the root is doubled.

Therefore, if we use only the tools that we have developed thus far in the course, we can already create a simple four-part chorale.

Now that we have a functional understanding of diatonic harmony, we can begin analyzing scores that use instruments other than voice or piano, but to so, you will need to understand how to read music composed for transposing instruments.

# Terminology

For various practical and historical reasons, *transposing instruments* produce a different sounding pitch than the one written on the page. For example, when a B-flat clarinet sees a written ‘C,’ that pitch will sound as a ‘B-flat.’

Musicians use the following terms to discuss transposing instruments. - *sounding pitch* - The pitch that an instrument produces, regardless of its standard transposition. - *written pitch* - The pitch as written on the music. - *concert pitch* - The pitch at which the note name matches the standard frequencies for that pitch. (i.e. C = C, A = A, etc.) - In practical usage, concert pitch is almost always interchangeable with sounding pitch.

Transposing instruments are not conceptually difficult to understand–these instruments sound at a different pitch than written–but in practice, it often confuses students because instrument transposition is the process by which we *compensate* for an instrument’s sounding pitch. If we write for a B-flat instrument, it sounds a whole-step *lower*, so we must write the part a whole-step *higher* to get the performer to sound the correct pitch. Conversely, when reading a B-flat transposed part, we must read it a whole-step lower for concert pitch, because it is written a whole-step higher than sounding.

It is easy to transpose in the wrong direction when having to constantly flip back and forth between concert pitch and the transpositions, so it is important to have a complete understanding of transposition for each instrument. Luckily, they can be grouped into relatively few categories.

# Ranges

First, it is helpful to discuss the standard ranges of the instruments while looking at the transpositions. If you can remember that a tenor saxophone has a range similar to a tenor voice, this makes it considerably easier to remember the direction and distance required for its transposition.

Instrument and voice ranges are self-explanatory, but there are a variety of caveats that affect the extremes for almost every instrument. Brass players and vocalists, for example, have a *wide* variation of how high or low an individual can comfortably perform depending on the experience of the performer. Some instruments can be physically altered such as the bassoon, double bass, and piano to add more range. Because of this variation as well as the constantly evolving standards of instrument construction and performance standards, you should always research an instrument before you choose to compose for it. While the internet is full of great resources–such as the link below–the best research for understanding an instrument is to discuss the instrument with expert performers. Even with good references such as the one below, it is not able to show the nuances of each instrument. (For example, this sheet does not show the common range extension techniques and tools such as the low C extension for double bass, the use of piccolo trumpet, or altissimo for woodwinds.)

# Range and transposition handout

For our part-writing, we will use the basic ranges from this helpful resource compiled by Dr. BJ Brooks.

[Orchestral Instrument Ranges and Transpositions](http://octatone.com/orchestral-ranges-transposition/)

NOTE: There is a small mistake on the part for the double bass; the top note (D) is missing a tenor clef.

The ranges on this sheet are the **written ranges** for each of the instruments. If you want to find the sounding range, you will need to apply the transpositions that follow each staff. Read more about this below.

You may print this page for easy reference.

# Clefs

While not directly related to transpositions, some instruments commonly read alternate clefs to lessen the number of ledger lines necessary. These include: - viola (default is alto clef, can switch to treble if necessary) - cello (default is bass clef, often switches to tenor (or even treble!)when necessary) - bassoon (default is bass clef, often switches to tenor when necessary) - French horn (default is treble clef, but occasionally can switch to any other clef if the part goes low enough into their pedal register) - trombone (default is bass clef, often switches to tenor when necessary)

# Transposition

### Terminology confusion

Before going further, please make sure that you understand the above definitions and usage for the terms *sounding* pitch, *concert* pitch, and *written* pitch.

One of the most confusing elements of understanding transposing instruments is the use of key names to describe the instruments. If an instrument is “in B-flat” as described above, that implies that the instrument reads parts that are written a M2 away from concert pitch. Unfortunately, this creates the possibility of confusing statements such as, “For a trumpet in B-flat, the key of A-flat is actually B-flat.” This ambiguity should be clarified by differentiating between the instrument’s transposition and the key signature in which the piece is composed: “For a trumpet [that sounds] in B-flat, the [concert key signature] of A-flat [major](#major) is [written] as B-flat [major](#major).” The language we use in this instance is clunky at best, inadequate at worst. It falls upon the musician to make sure that they are communicating clearly when it comes to transposing instruments.

### Non-transposing instruments (in C)

Non-transposing instruments are the easiest to understand, because they read and sound at the pitch written. This group includes: - voice - piano - violin - viola - cello - flute - oboe - bassoon - trombone (alto, tenor, and bass) - See the section below on the history of brass instruments for details. - euphonium/baritone - tuba - See the section below on the history of brass instruments for details. - harp

### Octave displacing instruments

Some instruments read in concert pitch, but sound in a different octave. This is done to limit the number of ledger lines necessary to write their parts. This group includes: - piccolo (sounds up an octave from written) - bass flute (sounds down an octave from written) - contrabassoon (sounds down an octave from written) - guitar (sounds down an octave from written) - double bass (sounds down an octave from written)

### Instruments written in B-flat

You can find the concert pitch for all B-flat instruments by transposing *down* a M2 from the the written pitch. **This does not necessarily give you the correct octave**–just the correct pitch–so you must then consider the distance and direction based on the specific instrument.

Instruments in B-flat include many of the most common “band” instruments. This group includes: - Clarinet in B-flat (sounds down a M2 from written) - Bass clarinet in B-flat (sounds down a M9–or a M2 plus an octave–from written) - Bass clarinet adds an extra octave below the standard B-flat transposition. All clarinets read from treble clef music, so when accounting for the extra octave that the bass clarinet adds, it is easiest to switch to bass clef when writing this instrument in concert pitch. - Trumpet in B-flat (sounds down a M2 from written) - See section below on the history of brass instruments for a discussion of other common trumpets and their usage. - Soprano saxophone (sounds down a M2 from written) - Tenor saxophone (sounds down a M9–or a M2 plus an octave–from written) - The lower voiced saxophones (tenor and baritone) add an extra octave below the standard transposition. All saxophones read from treble clef music, so to account for the extra octave when writing in concert pitch, it is easiest to switch to bass clef for this instrument.

Conveniently, no B-flat instruments sound higher than their written pitch, so for each of the above instruments, when reading their written parts, transpose *down* a M2 to find concert pitch, although you must add the additional octave for tenor saxophone.

When reading a concert pitch line, transpose *up* a M2 to write for a B-flat instrument. Do not forget the additional octave for bass clarinet and tenor saxophone.

### Instruments written in E-flat

You can find the concert pitch for all E-flat instruments by transposing *up* a m3 or *down* a M6 from than the written pitch. **This does not necessarily give you the correct octave**–just the correct pitch–so you must then consider the distance and direction based on the specific instrument.

This group includes: - Clarinet in E-flat (sounds up a m3 from written) - Alto saxophone (sounds down a M6 from written) - Baritone saxophone (sounds down a M13–or a M6 plus an octave–from written) - The lower voiced saxophones (tenor and baritone) add an extra octave below the standard transposition. All saxophones read from treble clef music, so to account for the extra octave when writing in concert pitch, it is easiest to switch to bass clef for this instrument.

When reading an E-flat clarinet part, transpose a m3 *up* to find concert pitch. When reading an alto or baritone saxophone part, transpose a M6 *down* to find concert pitch, although you must add the additional octave for baritone saxophone.

When reading a concert pitch line, transpose *down* a m3 to write for E-flat clarinet. When reading a concert pitch line, transpose *up* a M6 to write for alto or baritone saxophone. Do not forget to add an additional octave for baritone saxophone.

### Instruments written in F

You can find the concert pitch for all F instruments by transposing *down* a P5 from the written pitch. Conveniently, this will give you the correct pitch *and* octave for both of these instruments.

Both of the “horns” are written in F. This includes: - English horn - French horn - See section below on the history of brass instruments for a discussion of the many keys in which hornists are required to perform. - Many modern hornists prefer to refer to French horn simply as “horn.”

When reading an an English horn or French horn part, transpose *down* a P5 to find concert pitch.

When reading a concert pitch line, transpose *up* a P5 to write for either English horn or French horn.

### Other transposing instruments

Almost all instruments fall into the above categories, but there are two outliers.

Clarinet in A is the only instrument that has a standard transposition in A. (Trumpet and French horn parts are occasionally written in A as well. See the section below on the history of brass instruments for more details.) To find concert pitch from a part in A, transpose *down* a m3 from the written pitch. To write in this transposition, you should write *up* a m3 from concert pitch. Students often confuse these transpositional directions with the more common E-flat instruments, because they are opposites.

Alto flute is the only instrument that has a standard transposition in G. (French horn parts are occasionally written in G as well. See the section below on the history of brass instruments for more details.) To find concert pitch from a part in G, transpose *down* a P4 from the written pitch. To write in this transposition, you should write *up* a P5 from concert pitch. Students often confuse these transpositional directions with the more common F instruments, because they are exact opposites.

## A brief history on brass instrument writing

#### High brass

Brass instrument transpositions often confuse students, because they evolved into their modern forms at a later date than many of the other instruments. This means that depending on the era in which a piece was composed, there are a wide variety of “keys” in which the part might be written.

Early versions of both of the high brass instruments, trumpet and French horn, could only play pitches from the natural overtone series of their instruments which meant that early versions of these instruments were not fully chromatic. To compensate, composers would write the part “in X,” in order to show the performer which “key” their instrument needed to be in to play the part. Simply put, the performer had to change instruments every time that they changed keys. The practice of writing various transpositions for these two instruments lasted throughout the 20th century–long after both of these instruments became fully chromatic through the addition of valves–because of competing standards in which key the instrument would be tuned.

Modern professional trumpeters and hornists are masters of transposition. They choose the instrument on which they will perform based on timbral characteristics of each instrument, regardless of the transposition chosen by the composer. Modern trumpeters commonly use instruments pitched in B-flat, C, D, E-flat, and A and sometimes even F and G. Modern horns are built to include the standard F “side” of the horn, but by pressing a valve down they can switch to a B-flat “side” on a double horn, or even an E-flat or F (up an octave) “side” on a triple horn. You will encounter all of these transpositions when reading scores. If you are writing a modern *band* piece, it is common practice to write the trumpet parts in B-flat and horn parts in F. If you are writing a modern orchestral piece, it is simplest to just write trumpet parts in C and horn parts in F. The performer will decide which instrument, although if you desire a specific trumpet (e.g. cornet, flugelhorn, piccolo trumpet, etc.), you should ask a professional which transposition will work best.

#### Low brass

Luckily, all of the low brass instruments read in concert pitch, so writing for them is relatively simple. However, do not be confused when trombonists talk about their instrument as a B-flat instrument. The fundamental of the trombone is a concert B-flat, but it *always* reads from parts written in C. It is a non-transposing instrument.

The tuba often confuses students for the same reason. Tubists have a variety of tubas from which to choose, including instruments with fundamentals at B-flat, C, E-flat, and F. This does not change the key in which the tubists read; their parts should always be in concert pitch. Instead, they learn a new set of “fingerings” for each instrument. Note that this is opposite from how trumpets and horns approach transposition.

Before you begin, please remember that this unit is not meant to be a formal introduction to counterpoint. Because this is primarily a tonal harmony course, we are briefly dipping into the study of counterpoint to introduce voice-leading in its simplest form. I highly encourage you to study counterpoint fully at a later time (if you have not already), because it will change for the better the the manner in which you listen to, study, and perform music.

To begin studying basic counterpoint, we need to establish the fundamental concepts of intervallic consonance, intervallic dissonance, and the types of contrapuntal motion.

## Goals for this topic

From the following examples, determine: - which intervals are considered consonant and dissonant - which consonances are considered perfect and imperfect - what elements are necessary to create contrapuntal motion - a simple way to describe each of the four types of contrapuntal motion: parallel, contrary, static, and oblique

### Consonant and dissonant intervals

The next two examples show an example of each possible perfect and imperfect consonance. All other intervals are considered dissonant. Make a list of perfect consonances, imperfect consonances, and dissonances. Do any of the dissonances surprise you? If so, discuss why.

{% capture ex1 %}X:1 T:Perfect consonance examples M:4/4 L:1 K:C V:1 \_B|| G|| \_A,|| \_A|| ^F|| A|| ^G|| V:2 clef=bass \_B,|| C,|| \_A,|| \_D|| ^F,,|| D,|| ^G,||{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Imperfect consonance examples M:4/4 L:1 K:C V:1 G|| E|| \_C|| \_\_B|| ^D|| G|| ^B|| V:2 clef=bass \_B,|| C,|| \_A,|| \_D|| ^F,,|| E,|| ^G,||{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Classifying types of contrapuntal motion

{% capture ex3 %}X:3 T:Types of contrapuntal motion T:Each measure is an individual example. Do not consider motion between measures. M:4/4 L:1/2 K:C V:1 \_BF|| Ge|| C\_E|| \_AG|| w:parallel \_Bf|| Ge|| c\_A|| \_AG|| w:contrary \_B\_B|| GG|| \_E\_E|| \_A\_A|| w:static \_B\_B|| Ge|| \_E\_E|| \_AG|| w:oblique \_BA|| Ge|| \_E\_A|| \_AG|| w:similar V:2 clef=bass \_B,F,|| C,A,|| \_A,C|| DC|| \_B,F,|| C,B,,|| \_A,C|| DE|| \_B,\_B,|| C,C,|| C,C,|| DD|| \_B,F,|| C,C,|| \_A,C|| DD|| \_B,F,|| C,D,|| \_A,C|| D\_B,||{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

## Conclusions

### Consonant vs dissonant intervals

Consonant and Dissonant Intervals: - Perfect Consonance: - Perfect 5ths - Perfect Octave - Perfect Unison - (The perfect 4th was mentioned, but it was not in the examples.)

* Imperfect Consonance:
  + Major 3rd
  + Minor 3rd
  + Major 6th
  + Minor 6th
* Dissonance:
  + All other intervals, but the most common are:
    - Major 2nd
    - Minor 2nd
    - Perfect 4th
    - Augmented 4th
    - Diminished 5th
    - Major 7th
    - Minor 7th

Students familiar with modern music are often surprised to find that a perfect 4th is considered dissonant in this style. The first thing to understand is that the terms *consonant* and *dissonant* are subjective terms that are determined within a style. In this case, a perfect 4th undermines the melodic structure of tonality because it implies a weak inversion. Complete understanding of this idea requires a deeper knowledge of counterpoint and implied harmony, so at this point, I ask that you file this away for us to discuss when we get to tonal implications and usage of second inversion chords in Unit 7.

### Contrapuntal motion

At its most basic, classifying contrapuntal motion is fairly simple to understand. When we compare two melodic lines, there are five types of possible motion: - **parallel** - two lines that move in the same direction and have the same interval *size* - **similar** - both lines move in the same direction but have different interval sizes - **contrary** - two lines that move in opposite directions - **oblique** - one line stays the same and the other line moves in any direction - **static** - neither line moves - static motion supercedes parallel motion

Each of these types of motion compares the direction of each line (i.e. ascending and descending) and the size of the interval.

*NOTE: The full descriptions below of each type of non-chord tone are from the online textbook,* [*Open Music Theory*](http://www.openmusictheory.com)*, although each has been edited to suit this textbook’s terminology and purpose. If you have not had a chance to check out Open Music Theory in the Further Reading sections from the previous units, please take the time to do so. It is an excellent resource!*

## Chord tones versus non-chord tones (NCTs)

To this point in our harmonic analyses, we have looked at mostly simple textures that utilized steady, blocked chords. To make music varied and interesting, however, we need to be able to create a variety of melodic shapes and motives, and this requires using a mixture of pitches that are functional–meaning that they are part of the harmony–and non-functional embellishments. We call these embellishing pitches *non-chord tones (NCT)*, and understanding which pitches are functional is often the most difficult hurdle in harmonic analysis.

Much like determining the harmonic rhythm, finding NCTs can be difficult because it requires you to work through all possible combinations of the pitches within a given harmony and then choose the most likely combination. Even if you know that the harmony spans only two beats, it can be difficult to sort through all the possible combinations if the texture is complicated. Fortunately, the same strategies that work for determining the harmonic rhythm provide a foundation for determining NCTs. You can begin by looking at melodic patterns and bass-lines, and it is helpful to consider whether a note occurs in a strong or weak metric position. It is unusual for the functional tones to occur *only* on offbeats, as the ear is drawn to pitches when they occur on the beat.

Even for one experienced in finding patterns within the music, this still sometimes requires trial-and-error. When first learning how to identify non-chord tones, you may want to copy and rearrange the pitches on another staff (or lightly next to the chord if there is room,) to see what triads and seventh chords are even possible given the present notes. Usually this is enough to limit the possibilities to one or two chords. When it is not, you will then need to refer to your harmonic flowchart to see if there is some context that could provide a probable chord.

## Discussing and labeling non-chord tones

When developing a harmonic analysis, you should place parentheses around the note head of each non-chord tone and then label the NCT with its abbreviation. Each of the non-chord tones below will have a standard abbreviation written next to the definition. (For example, passing tones will be labeled using a “pt.”)

Although before we can find non-chord tones in music, we need a shared terminology that describes how they are constructed. There are a great variety of NCTs, but every type shares a basic framework that we classify by motion between the notes on either side of it. - the *preparation* - The chord tone that directly precedes the NCT. - Its relationship to the NCT will define the type of movement used to approach the NCT. - the *non-chord tone* - The NCT must not belong to the chord. This should be obvious given the name, but this is the most common mistake that students make when labeling NCTs. - the *resolution* - The chord tone that immediately follows the NCT. - Its relationship to the NCT will define the type of movement used to leave the NCT.

And while these three terms provide a framework through which we can classify the movement of all non-chord tones, there are other aspects of their function and characteristics that we may need to discuss. - Accented vs unaccented - An accented NCT occurs in a strong metric position (“on the beat”). - An unaccented NCT occurs in a weak metric position (“off the beat”). - On-chord vs off-chord - An on-chord NCT coincides with a change of harmony. - An off-chord NCT does not coincide with a change of harmony. - Chromatic vs diatonic - Diatonic NCTs use only the notes present in the key-signature whereas chromatic NCTs have an accidental. - As per usual, we will consider the leading tone in a minor key as diatonic. - All types of NCTs can be either chromatic or diatonic, although some are extremely rare (such as a chromatic suspension). - Ascending vs descending (*passing tones only*) - This describes the direction created by the passing tone when combined with the chord tones on either side. - Upper vs lower (*neighbor tones only*) - Neighbor tones can be divided into two categories based on whether they are above or below the chord tone that they are embellishing.

One note on these labels: Because some methods for musical analysis only focus on music of certain periods (e.g. the Classical era), they may be overly specific in describing certain non-chord tones in a way that does not fully address the nature of the non-chord tone. For example, some texts say that suspensions must be accented, but because accented refers to a metric position (‘on’ or ‘off’ the beat) rather than a harmonic position, this is not always true in later styles. This is likely always true in the music of Mozart or even Beethoven, but it is not always true for the music of Gustav Mahler or John Lennon. It would be better to say that suspensions are always *on-chord*, because this allows for a suspension to happen in a weaker metric position. Harmony and rhythm exist independently, so we should use labels that help us understand all types of tonal music.

## Passing tones, neighbor tones, and suspensions

**Analyze the following chorale. We will use this as a framework to add a variety of NCTs.**

{% capture ex1 %}X:1 T:A simple phrase M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] [EB]| [FA] [FD]| [DD] [CE]| H[C2F2]|] V:2 clef=bass [F,C]| [B,,D] [CC,]| [CF,] [D,B,]| [B,,G,] [G,C,]| H[A,2F,,2]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

**The following exercise incorporates multiple examples of three types of NCT to create an (overly) embellished example. They are:** - passing tone - neighbor tone - suspension

Identify each of the non-chord tones in the following example by comparing it to the unembellished example above. You should be able to deduce to which classification each non-chord tone belongs by comparing the name (i.e. passing, neighbor, and suspension) to the motion around the non-chord tone. As you do so, create a definition of each type of non-chord tone using the terminology that we discussed above. (e.g. preparation, resolution, accented, etc.)

{% capture ex2 %}X:2 T:With added suspensions, passing tones, and neighbor tones M:4/4 L:1/2 Q:1/4=80 K:F V:1 [FA]| [D/2G/2][D/2A/2] [EB]| [F/2A/2][F/2G/2] [F/2D/2][E/2D/2]| [DD] [CE]| H[C2F2]|] V:2 clef=bass [F,C]| [B,,D] [D/2C,/2][C/2C,/2]| [CF,] [D,B,]| [B,,/2G,/2][B,,/2A,/2] [G,C,]| H[A,2F,,2]|] w:F:I ii6 V7 \_ I IV6 ii6 \_ V I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

When we analyze non-chord tones, we *label* a single pitch that does not belong to the chord, however, we are actually *classifying* the motion between the non-chord tone and its surrounding pitches, and you can see this in these straightforward definitions: - A *passing tone* (PT) is a non-chord tone which is approached by step and left by step in the same direction. - A *neighbor tone* (NT) is a non-chord tone which is approached by step and left by step in the opposite direction. - A *suspension* (SUS) is a non-chord tone which is approached by static motion and resolves downward by step.

Let’s look at each of these in more detail. The following descriptions are lightly edited versions taken from *Open Music Theory*.

#### Passing tone (pt)

A passing tone is a melodic embellishment that occurs between two stable tones, creating stepwise motion. *It is approached by stepwise motion and left by stepwise motion in the same direction.* A passing tone can be either accented or unaccented as well as on-chord or off-chord.

The typical figure is *chord tone – passing tone – chord tone*, filling in a third (see example), but multiple adjacent passing tones can also be used to fill in the space between two chord tones, and these would be labeled by their number as appropriate–*double passing tone (dpt), triple passing tone (tpt), or quadruple passing tone (qpt)*. The only time you can have a *diatonic* double passing tone is between the chordal fifth and root of a triad (e.g. sol-(la-ti)-do within a I chord). You can have a double passing tone to fill in a third if there are chromatic tones, and all triple and quadruple passing tones require chromatic pitches.

#### Neighbor tone (nt)

Like the passing tone, a neighbor tone is a melodic embellishment that occurs between two stable tones; however, a neighbor tone occurs between two instances of the same stable tone. *It is approached by stepwise motion and left by stepwise motion in the opposite direction.* Also like the passing tone, movement from the stable tone to the neighbor tone and back will always be by step. A neighbor tone can be either accented or unaccented, but unaccented is more common. It can also be either on-chord or off-chord.

#### Suspension (sus)

A suspension is formed of three critical parts: the *preparation* (accented or unaccented), the *suspension* itself (accented), and the *resolution* (unaccented). The preparation is a chord tone (consonance). The suspension is *the same note* as the preparation and *will always be on-chord*, **which means that all suspensions require two chords**, because the preparation will be on a different chord than the NCT itself. The suspension then resolves downward by step to the resolution, which occurs over the same harmony as the suspension.

Of note, it is a common misconception among students that a suspension is only present if you see a *tied* note. This is not true; the tone can be re-articulated. It only needs to follow the pattern of - chord tone -> non-chord tone approached by static motion on a new chord -> resolution within the same chord

The suspension is in many respects the opposite of an anticipation (see the next topic, Unit 9b); if the anticipation is an early arrival of a tone belonging to the following chord, a suspension is a lingering of a chord tone belonging to the previous chord that forces the late arrival of the new chord’s chord tone. However, in composition and improvisation, the suspension must be treated with a great deal more care than an anticipation. The most common suspensions (and their resolutions) in upper voices form the following intervallic patterns against the bass: 9–8, 7–6, 4–3. (With the exception of 9–8, the pitch class of the resolution tone should never sound in another voice simultaneous with the suspended tone.)

Because suspensions can take many forms, we apply intervallic labels. When the suspension is in an upper voice, we always label the intervals of the suspension and its resolution against the *bass* meaning that the intervals will move from large to small (e.g. 4-3, 7-6, 9-8, etc.). When a suspended note is in the bass voice, however, we label the intervals against the most dissonant interval which means that the intervals will move from small to large (e.g. 2-3). When you measure a downward resolution in an upper voice against a lower voice, the intervals get smaller as the upper voice moves *closer* to the bass. When you measure a downward resolution against a higher voice, the intervals get larger as the bass moves *away* from the upper voice.

Of note, because we use the most dissonant voice to label suspensions in the bass, you will use the “2-3” label in the vast majority of this type of suspension. These intervals will be present for suspensions resolving to either the root or chordal third as long as the chord is complete. You are unlikely to encounter a suspension above a chordal fifth in the bass because of the usage rules of second inversion chords, and a suspension above the chordal seventh would just be the root of the chord–meaning that it is not a non-chord tone.

The most common suspensions are the 4-3, 7-6, 9-8 (2-1), and 2-3 suspensions, but others can and do occur regularly.

## Retardations (RET)

**The next example has taken the framework above and incorporated a new NCT: *the retardation*. How would you describe this? Which other NCT does a retardation resemble?**

{% capture ex3 %}X:3 T:With added retardations M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] “ret”[D/2B/2][E/2B/2]| [FA] [FD]| [DD] [CE]| “ret”[C/2E/2]H[C/2F/2]|] V:2 clef=bass [F,C]| [B,,D] [CC,]| [CF,] [D,B,]| [B,,G,] [G,C,]| H[A,F,,]|] w:F:I ii6 V7 I IV6 ii6 V I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusion (RET)

A retardation is essentially an upward-resolving suspension. It is almost always reserved for the final chord of a large formal division (or a movement), and it frequently appears simultaneously with a suspension (as seen in the picture above). Like suspensions, retardations must be accented and on-chord, yet unlike suspensions, it is not necessary to label the intervals against the bass, although you may do so if you wish.

## A few last notes

There are four other standard non-chord tones that we will discuss in the next topic, but we should clear up some common questions before moving on.

1. First, some non-chord tones can occur within a single harmony *or* across two harmonies, meaning the preparation, NCT, and resolution are contained within one chord or spread across two. But other NCTs are restricted to one or the other. For example, a passing tone can be either within a single chord or spanning two chords, but suspensions and retardations can *only* happen across two chords; it is not possible to have suspension or retardation within a single chord. Any NCT with restrictions such as this will be noted in their descriptions, and it is imperative that you learn the context for each of the non-chord tones, so that you can quickly identify these issues.
2. Once we have discussed all nine of the standard NCTs, you will be able to describe and analyze almost any combination of melodic intervals as they pertain to tonal harmony. Generally speaking, if you cannot come up with an analysis of a melody that accounts for each NCT into one of the nine categories, that means that you likely analyzed the harmonies incorrectly. As with even the most consistent of musical ideas, there will be occasional exceptions, but understanding your NCTs will be one of the easiest ways for you to make your analyses more effecient and effective.
3. As we learn each of these non-chord tones, you will begin to notice these patterns in music, even when no NCT is present. If you would like to use a motion description for a chord tone, such as passing or neighbor, you can replace the word *tone* with the word *figure*. So a “passing figure” is a pitch that is approached by step and left by step in the same direction, but all three of the pitches that make up the preparation, passing tone, and resolution are chord tones.
4. One of the most common questions about non-chord tones is whether a pitch should be written as a passing tone or a chordal seventh. For example, in the progression below, we have an imperfect authentic cadence, that starts as a simple triad, but then the alto voice moves to fa which could be analyzed as either a passing tone or a chordal seventh. So which would you choose? Is this a V chord with a passing tone or is this a V7 chord with no non-chord tones?

* In this particular case, I would consider fa as part of the chord, because it is functioning as a chordal seventh. The chordal seventh is a tendency tone that typically resolves downward by step, and it is doing so here. If it resolved in another way (e.g. up by step), it might be a melodic passing tone and would therefore be not functional.

{% capture ex4 %}X:4 T:V7 to I with ambiguous NCT M:4/4 L:1/2 Q:1/4=80 K:C V:1 [B/2G][B/2F][cE]|] V:2 clef=bass [G,,D][C,C]|] w:VorV7? I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

Regardless of whether you include the pitch as functional, the NCTs must always match the Roman numeral. In this scenario, if you choose to include the chordal seventh in your harmony, you only need to write the proper Roman numeral and inversion figure. If, however, you decide that the chordal seventh is just a passing tone, you must label it as a non-chord tone and write only V for the Roman numeral.

## A final reminder!

As we first begin to study non-chord tones, the most important thing to remember is what the name “non-chord tone” emphasizes. **NCTs must not belong to the chord.** This is one of the most common mistakes for beginning analysts.

### A Starting Place

In this course, we will be studying many styles of music, but all of these will have roots in the harmonic and melodic practices of the common practice period. The common practice period is generally considered to include Western art music from the Renaissance through the Romantic eras, but any music that that grew out of this tradition–including almost all popular music today–can be analyzed using the tools we will study for common practice harmony.

By the time musicians begin formally exploring music theory, they likely are familiar with basic music notation–treble and bass clefs, staves, ledger lines, and accidentals–due to time spent performing. If you are uncomfortable with any of aspect of these concepts, you can review by reading the explanations under the *Further Reading* section of [Discussion 1a](01-pitches-clefs/a2-pitchesclefs.html).

## Clefs

Even though most college music students are familiar with reading music, most are partial to the clef associated with their primary instrument or voice-part. It is vital that musicians be fluent in not only the two most common clefs–treble and bass–but also with two additional clefs: alto clef and tenor clef. Alto and tenor clefs are often used by instruments such as viola, cello, trombone, and bassoon. They alleviate the use of ledger lines in the extreme registers of an instrument and appear regularly in even the most elementary music.

### Exploring clefs

Treble clef is sometimes referred to as a *G-clef*, and bass clef can be called an *F-clef*. Alto and tenor clefs are known as *C-clefs*. So let’s piece together the notes and octave relationships between the clefs as well as why the clefs have these alternate names.

In the examples below: - the treble and alto clefs are in unison - the tenor and bass clefs are in unison - the treble/alto clefs are separated from the the tenor/bass clefs by one octave - middle C rests on the first ledger line below the treble clef staff

Knowing this, use these examples to find: - the order of pitch names for each clef’s lines and spaces. - why treble clef is a G-clef, why bass clef is an F-clef, and why alto and tenor clefs are C-clefs. - where middle C is on each clef. - any tips or tricks that may help in differentiating and reading clefs.

{% capture ex1 %}X: 1 T: Pitches and Clefs M: 4/4 L:1/4 K:C V:1 name=“Treble Clef” E A F B G ^C G,|] w: E A F B G C# G V:2 name=“Alto Clef” clef=“alto” E A F B G ^C G,|] w: E A F B G C# G V:3 name=“Tenor Clef” clef=“tenor” E, A, F, B, G, ^C, G,,|] w: E A F B G C# G V:4 name=“Bass Clef” clef=“bass” E, A, F, B, G, ^C, G,,|] w: E A F B G C# G{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusion

Clefs have secondary names because each clef is centered around the pitch in its name. The bass clef’s dots surround an F, and the two C-clefs are centered on middle C. Treble clef, however, not only encircles the G at the center of its spiral, but it evolved from a stylized *G*. For a well-researched, short article on the evolution of clefs, I suggest reading Jimmy Stamp’s [The Evolution of the Treble Clef](http://www.smithsonianmag.com/arts-culture/the-evolution-of-the-treble-clef-87122373/) from the Smithsonian website.

The octave relationship for each clef is the most important thing you can remember from this discussion, and the easiest way to demonstrate this is to look at where middle C sits on each clef. Below, you can see the note names for the lines and spaces of each clef, and middle C is highlighted at the beginning of each staff.

{% capture ex2 %}X: 2 T:Pitch Names for Each Clef M:C L:1/4 K:C V:1 name=“Treble Clef” C | E G B d f| F A c e|] w: midC E G B D F F A C E V:2 name=“Alto Clef” clef=“alto” C | F, A, C E G| G, B, D F|] w: midC F A C E G G B D F V:3 name=“Tenor Clef” clef=“tenor” C | D, F, A, C E| E, G, B, D|] w: midC D F A C E E G B D V:4 name=“Bass Clef” clef=“bass” C | G,, B,, D, F, A,| A,, C, E, G,|] w: midC G B D F A A C E G{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Tips and tricks

When asked about their methods, past students suggested working on clefs via: - Memorization - The most widely used method uses flash cards or other repetitive devices to practice identifying notes on each clef to ensure a quick and efficient memorization. - Relative note identifications - Some students remember one important note for each clef and then visually “count” through the alphabet upward or downward to find pitches in unfamiliar clefs. For example, you could memorize where C sits in each clef and count steps (letter names), or you could expand that concept to memorize how thirds are stacked to move around more quickly. While this is a reasonable method for familiarizing yourself with clefs, it will ultimately be too slow and inconsistent to be practical. - The final suggestion was to determine the visual relationship of your weaker clefs to your strongest clef, and then use this to read in the new clef. - For example, if you are primarily comfortable in treble-clef, you could remember that alto-clef moves all of the pitches down by a step relative to treble clef. (This ignores octave displacement, of course.) In this case, if you read alto clef as a treble clef but *up* a step, this compensates and gives you a quick visual method for reading the clef. - To demonstrate this method: if a note head is on the line where B would be in treble clef, you could “translate” that pitch into alto clef by moving up a step (or letter name) to find that it is C. - You would then need to find the visual relationships for each clef, because each will have a different visual distance and direction compared to your primary clef. - Like the relative note identification method above, this could be slow and inconsistent, but if one regularly transposes, this could be used effectively.

Thus far, we have focused on the building blocks for constructing music such as pitches, intervals, chords, and melodic interaction, but we have yet to look at how these elements combine to create harmony. To study harmony, we need a tool that describes chords and sonorities based on their function rather than their components.

To this point, we have used leadsheet notation to convey the essential components of a chord: root, bass note, quality, inversion, and any additional pitches. But a single leadsheet chord does not provide context about its role in the music.

Cmin7/E-flat

From this, we know that the chord has the pitches C, E-flat, G, and B-flat with the E-flat as the lowest voice, but we do not know how it relates to the chords around it. Is it stable, and does it sound final? Or is it unstable and pulling toward a different chord?

When music theorists want to discuss diatonic (key-based) function, we label chords using a Roman numeral system based on the chord’s position within a particular key.

## Goals for this topic

Using the examples below, determine: - what are the diatonic qualities of all triads in seventh chords in major and minor - If we consider these examples to be “diatonic,” does every quality occur naturally or do some require accidentals? - What is the relationship between chords in major and minor? - how Roman numerals are created and labeled - What information does each part (e.g. Roman numeral, lower-case vs. upper-case, inversion figures, etc.) of the Roman numeral convey? - Are the inversion figures identical to the figured bass discussed in the class reading from this unit? If not, how do they differ? - How do leadsheet notation and Roman numerals differ in the information that they convey?

**Note that the ABC notation used in these examples has limitations on what kind of text can be entered. In the Roman numeral system, everything other than the Roman numeral itself should be written as superscript.**

{% capture ex1 %}X:1 %%staffsep 75% T:Diatonic chord qualities with Roman numerals M:C L:1/2 K:C “triads”[CEG]“in major” [DFA]| [EGB] [FAc]| [GBd] [Ace]| [Bdf] [ceg]|| w:I ii iii IV V vi viio I “seventh”[CEGB]“chords”[DFAc]|“in major” [EGBd] [FAce]| [GBdf] [Aceg]| [Bdfa] [cegb]|| w:IM7 ii7 iii7 IVM7 V7 vi7 vii/o7 IM7 [K:Eb]“triads”[CEG]“in minor”[DFA]| [EGB] [FAc]| [G=Bd] [Ace]| [=Bdf] [ceg]|| w:i iio III iv V VI viio i [K:Eb]“seventh”[CEGB]“chords”[DFAc]| “in minor”[EGBd] [FAce]| [G=Bdf] [Aceg]| [=Bdfa] [cegb]|| w:i7 ii/o7 IIIM7 iv7 V7 VIM7 viio7 i7{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Altering Roman numerals for non-diatonic chord qualities T:(Each of these examples is in the key of C.) M:4/4 L:1 K:C V:1 [Ace]| [A^ce]| [\_Ac\_e]| [Aceg]| [\_Ac\_eg]| [^D^F^A]| w: vi VI bVI vi7 bVIM7 #ii{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X:3 %%staffsep 100% T:Using inversion figures with Roman numerals M:C L:1/2 K:C “triads”[CEG] [dFA]| [egB] [FAc]| [gBd] [AcE]| [BdF] [cEG]|| w:I ii6 iii6/4 IV V6 vi6/4 viio6/4 I6 “seventh”[CEGB]“chords”[dFAc]| [egBd] [FAcE]| [GBDF] [Aceg]| [BdfA] [cEGB]|| w:IM7 ii6/5 iii4/3 IVM4/2 V4/3 vi7 vii/o4/2 IM6/5{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

## Conclusions

You may already be familiar with the basics of using Roman numerals for labeling diatonic chords, but it is helpful to have a complete breakdown of the system into its fundamental components.

* *Root* - The number (e.g. one, two, three, etc.) associated with a Roman numeral denotes the scale degree on which the chord is built.
  + If there is no accidental in front of the Roman numeral, the chord is built off the diatonic scale degree.
    - The only exception to this rule is the viiø chord in minor; this chord is built off of ti (raised seventh scale degree), and this is considered the diatonic function. The naturally-occurring VII chord is used *much* less and has a more limited scope in common practice.
  + If there is an accidental in front of the Roman numeral, this affects only the root of the chord by raising or lowering it.
    - The viiø chord in minor does not require an accidental because it is assumed because of its diatonic function.
* *Chordal third* - The case (i.e. upper-case versus lower-case) of the Roman numeral denotes the quality of the chordal third.
  + All upper-case Roman numerals have a major third. This includes major triads, augmented triads, major major chords, and major minor chords.
  + All lower-case Roman numerals have a minor third. This includes all minor triads, diminished triads, minor minor chords, diminished minor chords, and diminished diminished chords.
* *Chordal fifth* - The chordal fifth is altered by adding either a o (the diminished symbol) for lowered fifths or a + for raised fifths.
* *Chordal sevenths* - To show a chordal seventh is present, you only need to use an inversion figure that implies a seventh chord (i.e. 7, 6/5, 4/3, or 4/2).
  + A seventh chord inversion figure with no alteration implies a minor seventh above the root. It may be helpful to think of this as the “default” chordal seventh.
    - Having a minor interval as default is different than chordal thirds and fifths, because both of those chord members have “defaults” of a major interval.
    - We do this for two reasons:
      * We cannot raise a M7 above the root; it just becomes the root.
      * A d7 would be lowered *twice* if we used a M7 as default, and we would have to devise a new system for showing this.
  + A M is added before the inversion figure for all major seventh chords, even though they do occur diatonically. This allows us to differentiate chord qualities clearly once secondary functions and mode mixture are introduced later in the course. Non-diatonic harmonies are common enough that the Roman numeral system must be able to clearly distinguish them while retaining its clarity.
  + The diminished symbol, o, is added before the inversion figure for fully diminished seventh chords. This also shows that the chordal fifth is lowered, the same as in a triad.
    - If you think of a m7 above the root as the default chordal seventh for inversion figures, then adding o lowers the chordal seventh by a half step.
    - As you know, half diminished seventh chords (diminished minor chords) have a lowered fifth above the root but a *minor* seventh, rather than the diminished seventh of a fully diminished seventh chord. For half diminished chords, we replace the o with a ø to show that the chordal fifth is lowered but the chordal seventh is a m7 above the root.

Remember that when you add an inversion to a seventh chord, you do not need a 7 anymore. The inversion implies the seventh.

By having each part of a Roman numeral describe an isolated chord tone, we are able to accurately describe any chord that can occur in our tonal harmony system, regardless of whether it has a standard function.

| Chordal member | Default implied pitch | To raise by semitone from default | To lower by semitone from default |
| --- | --- | --- | --- |
| root | diatonic scale degree | sharp symbol in front of Roman numeral\* | flat symbol in front of Roman numeral\* |
| third | based on case of Roman numeral | upper case (M3) | lower case (m3) |
| fifth | P5 above root | + after Rom num | o after Rom num |
| seventh | m7 above root | M before inversion figure | o before inversion figure\*\* |

\*For clarity’s sake, we **always** use a sharp or flat symbol to show that we are raising or lowering the root, even if you are actually adding a natural. When analyzing pieces that change keys–especially to distant keys–this makes it much easier to look for similar patterns, regardless of whether the key signature uses sharps or flats.

\*\*Because the diminished symbol o implies the interval of a d5 AND a d7, you must use the half-diminished symbol if you wish to alter the fifth but leave the chordal seventh as a m7 above the root.

### Add and sub

There are two more possible additions for Roman numerals, but these are advanced techniques are will not be necessary until Unit 19. For completeness, we will discuss them here, but if you would rather skip this for now, please do so.

The word add is used when a tone is a functional part of the chord but does not belong to a standard triad or seventh chord. A good example of this would be a triad that has a functional 9th above the root. For example, in C major, if a C major triad were to have a D as necessary to the function of that chord, it would be labeled Iadd 9. This clearly identifies the triad plus the additional ninth, but it also omits the chordal seventh. If it *were* a major seventh chord, you would not need use the add function, because a 9 would imply everything below it. So a IM9 is assumed to have 9th, 7th, 5th, and 3rd above the root.

The word sub is used when a tone *replaces* another chord tone. The replaced chord tone is always the closest chord tone below the subbed chord tone. For example, if the tonic triad in C major had a 4th above the root instead of the chordal third, you would label that as Isub4. This implies that the 4th replaces the chord tone directly below it, so this would be a triad with C, F, and G.

The simplest definition of music is “organized sound,” and we can use this definition as a launching point for discussing pitch collections and scales. If we accept that music is “organized sound,” then the method used to organize it will define the *style* of composition. For this course, we will study *tonal* music, because *tonal* describes the organizational method–or style–of this music.

## Tonal music

Tonal music is organized around a central tone called the *tonic*.

And once we have a central pitch around which we build a tonality, every pitch in the tonality is defined by its relationship to that pitch. It is these intervallic relationships that differentiate one pitch collection from another, and we can categorize each pitch collection by studying their commonalities and differences.

In Unit 1, we defined moveable-do solfege as a way for us to look at the relationships between a group of pitches that are organized around a central pitch. In doing so, we created a *scale*, even though we didn’t define it as such. Whenever you group any number of pitches, you create a *collection*. However, when you order a collection by the frequency of each pitch–or more simply stated, how high or low the pitches are–you create a scale. So a scale is *a collection of pitches that are organized in an ascending or descending form*, and consequently create a fixed intervallic pattern. A scale can encompass any tuning system or style of composition.

Certain scales are at the core of all common practice harmony, and as a music student, you are likely already familiar with these: *major, minor, modal, pentatonic, and chromatic*. Below, we discuss the diatonic scales (i.e. major and minor) and Topic 2b details the others. We will explore some extended scales in Unit 22.

### Diatonic music

For the majority of this course, we will be discussing *diatonic* music, which is a subset of tonal music. The term *diatonic* can have a variety of meanings depending on context, but for this course, we will be using this term to refer to music that: - is built around a tonic pitch - includes all seven pitch names (i.e. letters) - creates harmonic tension and release using tonic and dominant harmonies (more on this in Unit 6)

Put simply, our musical hierarchy is:

* *Music* - organized sound
  + *Tonal music* - music organized around a central pitch
    - *Diatonic music* - tonal music that uses all seven letter names only once and follows a specific order of intervals
      * *Diatonic scale* - a ascending (or descending) ordering of all seven pitches in a diatonic pitch collection, contained within one octave

## Goals for this topic:

As you listen through all of the examples below, you should: - describe the pattern that determines the pitches in the *major* scale and all forms of *minor* scales regardless of starting pitch - You can think of this question as how to describe the scale without using note names or solfege. - figure out why *natural, melodic,* and *harmonic* minors are named as they are - memorize the names for each scale degree (i.e. tonic) as well as the corresponding numeral notation - how the names for each scale degree are derived (e.g. How are dominant and subdominant scale degrees related?) - incorporate the Latin spelling for every solfege

### Important notes

The following examples demonstrate how the tune of *Happy Birthday* would be written if only using the notes from a particular scale. In most examples, scale degrees are numbered below each pitch as well as solfege using movable “do.” Additionally, scale degrees are named above the pitches for the examples in major and melodic minor. When determining your pitch collections, pay particular attention to the differences of the sixth and seventh scale degrees.

### Major

(Because ABC notation does not support scale degrees, I have placed a ^ in front of each scale degree. In normal scale degree notation, the ^ would appear *above* the numeral for each scale degree, not before it.)

{% capture ex1 %}X: 1 %%staffsep 100% T:Happy Birthday in G major M:3/4 L:1/4 Q:1/4=90 K:G “dominant”D/2>D/2| “submediant”E D “tonic”G| “leading tone”F2 D/2>D/2| E D “supertonic”A| G2 D/2>D/2| w:^5 ^5 ^6 ^5 ^1 ^7 ^5 ^5 ^6 ^5 ^2 ^1 ^5 ^5 w:sol sol la sol do ti sol sol la sol re do sol sol d “mediant”B G| F E “subdominant”c/2>c/2| B G A| G2|] w:^5 ^3 ^1 ^7 ^6 ^4 ^4 ^3 ^1 ^2 ^1 w:sol mi do ti la fa fa mi do re do{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Minor scales

There are three forms of the minor scale, and each has a specific role. As you listen to these three melodies, only one of them will sound as if it has no surprising pitches. Once you have found the example that doesn’t have a “surprise moment, consider the name of the mode. Does it give you some insight into why it sounds best playing this melody?

### Natural minor

{% capture ex2 %}X:2 %%staffsep 75% T:Happy Birthday in G natural minor T:using the parallel minor to G major M:3/4 L:1/4 Q:1/4=90 K:Bb D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| w:^5 ^5 ^6 ^5 ^1 ^7 ^5 ^5 ^6 ^5 ^2 ^1 ^5 ^5 w:sol sol le sol do te sol sol le sol re do sol sol d B G| F E c/2>c/2| B G A| G2|] w:^5 ^3 ^1 ^7 ^6 ^4 ^4 ^3 ^1 ^2 ^1 w:sol me do te le fa fa me do re do{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Harmonic minor

{% capture ex3 %}X:3 %%staffsep 75% T:Happy Birthday in E harmonic minor T:using the relative minor to G major M:3/4 L:1/4 Q:1/4=90 K:G B,/2>B,/2| C B, E| ^D2 B,/2>B,/2| C B, F| E2 B,/2>B,/2| w:^5 ^5 ^6 ^5 ^1 ^#7 ^5 ^5 ^6 ^5 ^2 ^1 ^5 ^5 w:sol sol le sol do ti sol sol le sol re do sol sol B G E| ^D C A/2>A/2| G E F| E2|] w:^5 ^3 ^1 ^#7 ^6 ^4 ^4 ^3 ^1 ^2 ^1 w:sol me do ti le fa fa me do re do{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Melodic minor

When first determining your basic rules for melodic minor, you may want to choose to ignore ‘le’ in measure 6. That pitch serves a harmonic goal as part of a *cadence*, rather than a melodic function.

{% capture ex4 %}X:4 %%staffsep 100% T:Happy Birthday in G melodic minor T:using the parallel minor to G major M:3/4 L:1/4 Q:1/4=90 K:Bb “dominant”D/2>D/2| “submediant”E D “tonic”G| “leading tone”^F2 D/2>D/2| E D “supertonic”A| G2 D/2>D/2| w:^5 ^5 ^6 ^5 ^1 ^#7 ^5 ^5 ^6 ^5 ^2 ^1 ^5 ^5 w:sol sol le sol do ti sol sol le sol re do sol sol d “mediant”B G| “subtonic”F HE “subdominant”c/2>c/2| B G A/4D/4”raised submediant”=E/4^F/4| G2|] w:^5 ^3 ^1 ^7 ^6 ^4 ^4 ^3 ^1 ^2 ^5 ^#6 ^#7 ^1 w:sol me do te le fa fa me do re sol la ti do{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

### Intervallic patterns

In diatonic music, each scale has seven pitches. All seven letters can be used once, and no letter can be used more than once. This creates a series of 2nds that create our scale.

Major scales have an intervallic pattern of:

*(W = whole-step, H = half-step, A = augmented 2nd)*

W - W - H - W - W - W - H

Natural minor scales have an intervallic pattern of:

W - H - W - W - H - W - W

Harmonic minor scales have an intervallic pattern of:

W - H - W - W - H - A - H

Melodic minor scales have both an ascending and descending form. The intervallic pattern for descending melodic minor is identical to a descending natural minor scale. (The necessity of this seemingly redundant pattern is discussed below under “Why we *need* three minor scales.”) The intervallic pattern for 4ascending melodic minor is:

W - H - W - W - W - W - H

### Labeling scale degrees

When discussing scales, it is helpful to have a method that refers to pitches without referencing a specific key. For example, the first “Happy Birthday” example on the previous page is written in G major, but there are eleven other tonics around which we could structure that melody’s intervallic structure. In order to reference the interval pattern rather than the actual pitches, we use *scale degrees*.

One common way to communicate pitches of the scale is to use scale degree numbers. We denote these by placing a caret ^ above the scale degree number. For example, the pitch that is a fifth above the tonic would be called fifth scale degree and would be written as ^5, although the caret would be above the numeral, not to the side.

A second common way to describe scale degrees is to use *solfege syllables*. In this system, each scale degree is assigned a single-syllable Latin word, and this can be helpful when sight-singing. The chart below shows all seven base solfege syllables and how each can be altered for raised and lowered pitches. If a solfege symbol is marked as “N/A,” this alteration is non-functional in tonal harmony.

| Scale degree | Solfege syllable | Raised | Lowered |
| --- | --- | --- | --- |
| ^1 | do | di | N/A |
| ^2 | re | ri | ra |
| ^3 | mi | N/A | me |
| ^4 | fa | fi | N/A |
| ^5 | sol | si | se |
| ^6 | la | li | le |
| ^7 | ti | N/A | te |

A final method for labeling scale degrees is to use the names of the functions of each pitch as it relates to tonic. These names evolved over centuries of theory treatises from scholars such as Rameau, Riemann, Secther, Schoenberg, and Schenker. We will not use these names often in this course, but knowing them can help understand harmonic function when that concept is introduced.

They are: 1. Tonic 2. Supertonic 3. Mediant 4. Subdominant 5. Dominant 6. Submediant 7. Leading-tone/Subtonic

Notice the relationship between any term and its counterpart as denoted by the prefix sub. The dominant is a fifth above the tonic; the subdominant is a fifth below the tonic. The mediant is a third above the tonic; the submediant is a third below the tonic.

The supertonic is a 2nd above the tonic, but because of the importance and function of the leading-tone, its scale degree name changes to reflect the difference between a major 2nd below the tonic versus the minor 2nd below the tonic. If the 2nd below the tonic is a whole-step, we call it the subtonic. If the 2nd below the tonic is a half-step, we call it the leading tone. This is true in both major and minor.

### Tonal centers and modes

We consider a key to be defined by its tonic, so if two scales share a tonic, they are considered to be the same key but different *modes* of each other. For example, G major and G minor are the same key, but different modes. This is confusing for many students, because they have always associated their concept of a key with its key signature.

### Why we need three minor scales

Most intermediate music students learn various forms of the minor scale, but they do not often give much thought as to why.

Natural minor is the most obvious. It uses all of the naturally occurring notes from the key signature.

We will discuss the role of harmonic minor more when we begin analyzing chords, but as the name implies, it is a form of minor that emphasizes the most common scale degrees from a harmonic standpoint.

The “Happy Birthday” examples above are perfect for exploring the importance of melodic minor. By keeping the interval sizes from “Happy Birthday” but changing the pitches to fit the various forms of minor, you can hear three similar but distinct versions of “Happy Birthday.” When a student first listens to the natural minor version, they often feel that the first te does not work with the rest of the tune, and in the harmonic minor version, the augmented 2nd that occurs between ti and le is jarring. On the other hand, the melodic minor version sounds entirely correct (although some may not like the darker tone of a traditionally “happy” song.)

This easily highlights the role of melodic minor – to create melodies in minor. By having both an ascending and descending version, we can resolve the sixth and seventh scale degrees upward and downward by relying on the tendency of those scale degrees. Te and le both have a strong downward pull and almost always resolve downward. Ti and la both have a strong upward pull and tend to resolve upward. These are general rules and are occasionally broken, but I encourage you to play with the example below to hear how “strange” the piece becomes if you do not allow the sixth and seventh scale degrees to account for their resolutions. (Try putting la in for every sixth scale degree for the most obviously jarring version.)

{% capture ex8 %}X:8 %%staffsep 100% T:Happy Birthday in G melodic minor T:using the parallel minor to G major M:3/4 L:1/4 Q:1/4=90 K:Bb D/2>D/2| E D G| ^F2 D/2>D/2| E D A| G2 D/2>D/2| w:^5 ^5 ^6 ^5 ^1 ^#7 ^5 ^5 ^6 ^5 ^2 ^1 ^5 ^5 w:sol sol le sol do ti sol sol le sol re do sol sol d B G| F HE c/2>c/2| B G A/4D/4=E/4^F/4| G2|] w:^5 ^3 ^1 ^7 ^6 ^4 ^4 ^3 ^1 ^2 ^5 ^#6 ^#7 ^1 w:sol me do te le fa fa me do re sol la ti do{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

This text assumes that you are already familiar with the basics of rhythmic notation, so we will be skipping most of the basic rhythmic terminology. If you would like to learn about these terms (or review), I have included some materials from *Open Music Theory* in the [Further Reading](04-intro-rhythm/a2-simplemeter.html).

## Rhythmic review

Rhythm is the temporal aspect of music; it is how we organize the sounds and silences of music within time. At its most basic, rhythmic notation tells us when a sound or silence starts and ends, but musical rhythmic notation tries, and mostly succeeds, to show higher levels of organization to make understanding the groupings within the music more understandable to the musician.

First, a few basic terms: *Meter* is the manner in which we organize strong and weak pulses in music over time, and it is from this grouping that we determine the length of each *measure*. Western music typically uses a *time signature*–represented at the beginning of the music as two stacked arabic numbers–as a shorthand to quickly convey the meter to a trained musician. At its most basic, time signatures tell us two things: - how we divide the meter into regular or irregular pulses called *beats* - how many of these *beats* are in the measure

If we imagine meter as a hierarchy, the *measure* is the top level and *beats* are how we divide the measure. Beats are then divided into *divisions*, and *divisions* can be further divided into *subdivisions*.

Finally, please note that meter is somewhat subjective and can be greatly altered by many factors, especially tempo. Where one listener might listen to a piece with four quarter-notes per measure and feel that the quarter notes are the beat, another listener may listen to the same piece and hear the beat in a slow two with the half-note as the beat.

## Simple meters

A *regular* meter is one in which every *beat* is the same length. There are two types of regular meters, and the following example looks at the first of type of regular meter: the *simple* meter.

### Goals for this topic

Using the following examples, determine: - the characteristic that all *simple* meters have in common - what the top and bottom numbers mean in a simple time signature - what *duple*, *triple*, and *quadruple* mean when describing a meter - “theoretically ideal” rhythmic notation of beaming in simple meters - a list of common meters in *simple duple*, *simple triple*, and *simple quadruple* - the common beat-counting system that we’ll be using in this course (written in the “Simple Quadruple” example)

{% capture ex1 %}X:1 T:Common examples of simple duple meters with correct beaming T:Meter changes are noted at the end of the previous line M:2/4 L:1/4 K:C G G | G/2G/2 (3G/2G/2G/2|G/4G/4G/4G/4 G/2G/4G/4|| [M:2/2][L:1/2] G G | G/2G/2 (3G/2G/2G/2|G/4G/4G/4G/4 G/2G/4G/4|| [M:2/8][L:1/8] G G | G/2G/2 (3G/2G/2G/2|G/4G/4G/4G/4 G/2G/4G/4|| [M:2/16][L:1/16] G G | G/2G/2 (3G/2G/2G/2|G/4G/4G/4G/4 G/2G/4G/4||{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Common examples of simple triple meters with correct beaming T:Meter changes are noted at the end of the previous line M:3/4 L:1/4 K:C G G G| G/2G/2 G/2G/2 (3G/2G/2G/2| G/4G/4G/4G/4 G/4G/4G/2 G/2G/4G/4|| [M:3/2][L:1/2] G G G| G/2G/2 G/2G/2 (3G/2G/2G/2| G/4G/4G/4G/4 G/4G/4G/2 G/2G/4G/4|| [M:3/8][L:1/8] G G G| G/2G/2 G/2G/2 (3G/2G/2G/2| G/4G/4G/4G/4 G/4G/4G/2 G/2G/4G/4|| [M:3/16][L:1/16] G G G| G/2G/2 G/2G/2 (3G/2G/2G/2| G/4G/4G/4G/4 G/4G/4G/2 G/2G/4G/4||{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X:3 T:Common examples of simple quadruple meters with correct beaming T:Meter changes are noted at the end of the previous line M:4/4 L:1/4 K:C G G G G| z/2G/2 G/2G/2- G/2G/2 (3G/2G/2G/2|G- G/2G/2 G/4G/4G/4G/4 G/2G/4G/4|| w:1 2 3 4 & 2 & \_ & 4 la li 1 \_ & 3 e & a 4 & a [M:4/2][L:1/2] G G G G| z/2G/2 G/2G/2- G/2G/2 (3G/2G/2G/2|G- G/2G/2 G/4G/4G/4G/4 G/2G/4G/4|| w:1 2 3 4 & 2 & \_ & 4 & a 1 \_ & 3 e & a 4 & a [M:4/8][L:1/8] G G G G| z/2G/2 G/2G/2- G/2G/2 (3G/2G/2G/2|G- G/2G/2 G/4G/4G/4G/4 G/2G/4G/4|| [M:4/16][L:1/16] G G G G| z/2G/2 G/2G/2- G/2G/2 (3G/2G/2G/2|G- G/2G/2 G/4G/4G/4G/4 G/2G/4G/4||{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

{% capture ex4 %}X:4 T:Some common beaming exceptions in simple meters M:4/4 L:1/4 K:C G/2G/2- G/2G/2 G G| G/2 G G/2 G G|| w:Ideal| Common G- G/2G/2 G- G/2G/2| G>G G>G|] w:Ideal| Common|{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Conclusions

This is always an interesting class discussion, because creating objective definitions depends on the students differentiating their opinions from the underlying principles of the concept.

While most students intuitively understand the concept of a simple meter, it is often difficult to agree on the common characteristic of all simple meters. When asked to identify what all simple meters have in common, students often focus on the visual or mathematical representation of the time signature–for example, “The top number of the time signature is divisible by two.” Not only is this not true for all simple meters (e.g. 3/4 or 5/4) as shown in Examples 4a, it still would not differentiate this class of meters from compound meters. 6/8 and 12/8 are both compound time signatures that have a top number that is divisible by two.

The common characteristic of all simple meters is how the beat is divided. *Simple meters are any regular meter in which the beat is divided into two equal parts.*

### Duple, Triple, and Quadruple

When looking at the above examples, simple meters can be divided into collections of duple, triple, and quadruple meters: - simple duple meter: 2 - ex: 2/4, 2/2, 2/8, 2/16 - simple triple meter: 3 - ex: 3/4, 3/2, 3/8, 3/16 - simple quadruple meter: 4 - ex: 4/4, 4/2, 4/8, 4/16

While this is correct for the meters above, it does not provide a definition of what these numbers mean. *These words–simple, triple, quadruple, and so on–are used to signify how many beats are in a measure.*

### Simple time signatures

Most students correctly identify the function of the top and bottom numbers of the simple time signatures (but struggle with the same concept for compound meters).

For simple meter time signatures: - the top number represents the number of beats in the measure - the bottom number denotes the rhythmic value of the beat - if a 4 is on the bottom, the beat is represented by a quarter note - if an 8 is on the bottom, the beat is represented by an eighth note

To easily figure out the bottom number’s rhythmic value, I tell students to imagine that the bottom note becomes the denominator (lower number) of a fraction under a numerator of 1. A bottom number of 4 becomes 1/4–a quarter. A bottom number of 2 becomes 1/2–a half.

### Beat-counting system in simple meters

It seems that for every unique syllable, there is a beat-counting system for affixing syllables to beats, divisions, and subdivisions. Each of these have their strengths and weaknesses, but for this theory course, we will be using the following for simple meters: - beat numbers for each beat (e.g. 1, 2, 3, etc.) - & for the division (e.g. 1-& 2-& etc.) - e (pronounced ‘ee’) and a (pronounced ‘ah’) for the first level subdivisions (e.g. 1-e-&-a 2-e-&-a)

While this system can blend together aurally if said quickly, its primary benefit is that it has a unique syllable for each level through the first subdivision, and this makes communicating easier with higher specificity. For example, it is specific to ask, “Is the G4 on the ‘e’ of beat four a non-chord tone?” and this does not require further information.

### Theoretically ideal rhythmic notation versus common practice

The two examples above demonstrate something I term “theoretically ideal” rhythmic notation versus two counterparts of the same rhythm beamed in a more commonly used manner. For these: - *Theoretically ideal* rhythmic notation never hides a beat under a note length longer than the beat, and instead uses tied notes to represent longer note values. - There are many common exceptions, most notably half notes and whole notes in relatively short measures, but this depends on the meter and context. - Theoretically ideal *beaming* applies to any note length that can be connected by beams–eighth notes, sixteenth notes, and further subdivisions.

This is very much inline with with this text’s general intention. Well-engraved music is meant to look pleasing, but it also should be easy for a performer to read. This often leads to grouping rhythmic patterns according to non-rhythmic ideas: lyrics, spacing measures across the page, phrasing, a limited number of systems, etc. *Theoretically ideal* rhythmic notation would never obscure a beat in order to provide the easiest reading of harmony within a score. Of course, no musician will ever use this in its strictest form because it would become difficult to read in many situations; imagine not using a whole note in 4/4 time and instead using four tied quarter notes.

That being said, it is important for students of music to begin trying to understand how grouping and beaming decisions are made, because in harmonic analysis, it is easy to sometimes miss voices because of obscured beats. It is also an excellent thought exercise to help students begin demonstrating mastery of meters and rhythmic values.

In music, a sequence occurs when a musical pattern is established then repeated at various transpositions. Sequences can be any combination of the following categories: - melodic, harmonic, or both - ascending or descending - diatonic or chromatic - single or multiple parts within each repeated segment

Sequences work because they rely on one of the most fundamental human characteristics: our ability to identify patterns. All music relies on a listener’s familiarity with the tendencies within a style, but these tendencies can be broken if a composer is able to create a new pattern to guide the listener. Once a musical pattern is established, it will sound “right” to a listener, even if this pattern defies standard tonal conventions.

## Terminology of a sequence

For our discussions, we must differentiate between the overall pattern of the sequence and the individual segments within the sequence. We will use the term *sequence* to refer the whole, but we will use the word *iteration* to discuss an individual segment within the sequence. You can think of the iteration as one complete “building block” that is transposed repeatedly to create the sequence.

## Melodic sequences

We will begin studying sequences by looking at melodic sequences because they demonstrate the basic principles without the complications of multiple voices. Look at the following melodic patterns; each one contains a few iterations at the beginning of a melodic sequence. Complete the pattern through the designated ending pitch and then discuss the repetition using the following terms: - ascending or descending - diatonic or chromatic - intervals of transposition - length of pattern - single or multiple parts within each repetition

Of note, when describing melodic sequences to another person, you can assume that the reader is looking at the music and therefore can see the entire first iteration. This means that you should not have to describe pattern of the iteration. Instead, we focus our description on *how the pattern is transposed*, not on describing the intervals within the *initial* segment.

{% capture ex1 %}X:1 T:Melodic sequences M:2/2 L:1/8 Q:1/4=70 K:C CDEC DEFD| x8| x8| x4c4|| cBcG BABF| AGAE x4| x8| x4C4|| cBcG BABF| \_BA\_BF x4| x4G4|| c’gae fcdA| x6C2|| c’bc’g a^gae| fefc x4| x8| x4C4|| cBcG AGAE| dcdA BABF| x8| x8| g8||{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

The terminology for describing sequences should be familiar because each term is used in a similar manner across all aspects of music, however, each term has some specific connotations when applied to sequences. - Ascending or descending describe the direction of the transpositions, not necessarily each interval within the pattern. - The interval(s) of transposition are most easily found by looking at the relationship between the first pitch of each iteration. Remember that as long as you know the starting pitch, you can extract all of the intervals within an iteration by using the intervals from the *first* iteration. - The length of the sequence should be obvious simply by looking at the music, however, so it is more helpful to focus on the length of the iterations. You should use the smallest common identifier for one iteration.For example, if the first iteration lasts an entire measure or more, you will describe it using a number of measures (e.g. one measures, two measures, etc.), but if a single iteration does not last a full measure, you will describe it by the number of beats it lasts. - Some iterations may have multiple parts, so you will need to look closely at the entire pattern to make sure that you do not have more than one transposition. For example, if your pattern is transposed down by a third then up by second, you will need to describe both parts in your description.

The discussion of chromatic and diatonic sequences, however, requires clarification. - A true **diatonic pattern** only uses notes within the key signature so they do not require a quality when discussing the transposition. For example, it is incorrect to describe a diatonic pattern using, “The pattern repeats in ascending *major* 3rds,” because diatonic patterns will have a mix of major 3rds and minor 3rds depending on which scale degree the iteration starts. Instead, we would say, “The pattern is transposed in diatonic ascending 3rds,” because this tells the reader to go up a 3rd and use whatever note is in the key signature. - Conversely, **chromatic patterns** *do* require a quality on the transposition for the interval, because the pattern repeats *exactly* using the same intervals from the initial iteration. If we isolate the third sequence from the melodic examples (see example below), we have a fixed intervallic pattern – in this case, descending m2, ascending m2, descending P4 – that is then repeated by transposing that *exact intervallic pattern* down a m2. In short, a chromatic pattern is assumed to transpose every part of the pattern exactly at a fixed interval(s) unless otherwise noted.

{% capture ex10 %}X:10 T:Strict chromatic sequence M:2/2 L:1/8 Q:1/4=70 K:C cBcG BABF| \_BA\_BF A^GAE| \_AG\_A\_E G4||{% endcapture %} {% include abc-example.html number=“10” abc=ex10 %}

The fifth example above is the most difficult to complete and classify, because it mixes elements from both diatonic and chromatic sequences. It has a diatonic transposition, but each iteration can only be defined by a fixed intervallic structure. So we would describe this as a diatonic sequence that descends in 3rds, while each iteration is four pitches with the intervals of descending m2, ascending m2, and descending P4. Notice that the interval of transposition is found by comparing the first pitches of each iteration, *not* the interval between the last pitch of an iteration to the first pitch of the next iteration.

{% capture ex11 %}X:11 T:Diatonic transposition with a chromatic pattern M:2/2 L:1/8 Q:1/4=70 K:C c’bc’g a^gae| fefc d^cdA| BABF G^FGD| E^DEB, C4||{% endcapture %} {% include abc-example.html number=“11” abc=ex11 %}

## Harmonic sequences

Sequences occur harmonically as well, and when they do, they can supplant standard function or inversion conventions. As mentioned in the introduction, sequences work because they establish a pattern for the listener and then fulfill this new goal. Look at the following example of a two voice pattern. The first bar establishes tonic, and then a sequence begins in the second measure. After listening to it, discuss with your classmates whether it *sounds* functional. If you were going to describe this to another person, how would you describe it? Once you finish your discussion, propose a harmonic progression that fits the melody.

{% capture ex2 %}X:2 T:A two voice sequence M:4/4 L:1/2 K:C V:1 c f-| f e-| e d-| d c-| c B| c2|] V:2 clef=bass C, A,| G, G,| F, F,| E, E,| D, D,| C,2|] w:C:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

While there are some variations on how you could harmonize this sequence, it is possible to make a chord progression that has diatonic chords with roots separated by a P5. I have suggested a version of this below. Using my progression, try adding a third voice as an alto line. As you do this, remember that the sequential pattern will not start until the second measure, so the first measure can just fill out missing chord tones. Your line does not have to have all stepwise motion like the outer two voices do, but it should follow some sort of repeating pattern.

{% capture ex3 %}X:3 T:Harmonizing a two voice sequence M:4/4 L:1/2 K:C V:1 c f-| f e-| e d-| d c-| c B| c2|] V:2 clef=bass C, A,| G, G,| F, F,| E, E,| D, D,| C,2|] w:C:I IV6 V7 I6/4 IVM7 viio6/4 iii7 vi6/4 ii7 V6/4 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

The next example uses my suggested alto voice. It provides the required missing chord tones for each chord in this progression.

{% capture ex4 %}X:4 T:Filling in the sequence M:4/4 L:1/2 K:C V:1 [cE] [fc]| [Bf] [ec]| [Ae] [Bd]| [Gd] [Ac]| [cF](cantusFirmus.html) [GB]| [E2c2]|] V:2 clef=bass C, A,| G, G,| F, F,| E, E,| D, D,| C,2|] w:C:I IV6 V7 I6/4 IVM7 viio6/4 iii7 vi6/4 ii7 V6/4 I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

In your classification of the two-voice progression above, you likely described each line individually (e.g. descending diatonic 2nds that last one whole note), or you may have described the intervals between the two lines for each measure (e.g. a diatonic 7th resolving to diatonic 6th, then repeating after transposing down a diatonic 2nd). Neither of these is sufficient, however, once we add a third voice.

Instead, we classify *harmonic* sequences by describing the movement of the *roots* of each chord. We do *not* label harmonic sequences by inversions or the bass line. If we were to identify sequences by bass lines, all sequences that created a particular style of bass line (e.g. descending by stepwise motion) would be grouped together, even if they shared no harmonic similarities. (You can see this concept in the next two examples below.) Taking this into account, the description of the sequence in the example above would be: - A diatonic harmonic sequence with root-movement by descending 5th that alternates between root-position seventh chords and second-inversion triads.

## Complex harmonic sequences

The above sequence has only one interval and direction in its root movement pattern, a descending P5. Similar to the final example of the melodic sequences above, though, it is also possible for harmonic sequences to have two or more parts within each repetition. Look at the example below, and classify it using our terms from above: - ascending or descending - diatonic or chromatic - intervals of transposition - length of pattern - single or multiple parts within each repetition

{% capture ex5 %}X:5 T:A multi-part sequence M:4/4 L:1/2 K:C V:1 [eG] [Bd]| [cE] [GB]| [AC] [EG]| [AF] [BD]:| V:2 clef=bass C G,| A, E,| F, C,| F, G,:| w:C:I V vi iii IV I IV V{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

Hopefully you were able to identify that the sequence only covers the first three measures, the final measure is simply a way to allow the pattern to repeat smoothly. For the sequence, there are two possibilities to describe it. You could consider each measure a pattern in which case you would say that this is a diatonic sequence that descends by 3rd. If you consider the pattern to be a half note, though, it has multiple parts. It is a diatonic sequence of triads that moves down by 4th and then up by 2nd. Either is correct, but the second version communicates a clearer picture of the pattern.

How does your description of the sequence change if we change some of the voices to alter the chords’ inversions as in the example below?

{% capture ex6 %}X:6 T:Using inversions to create a smooth bass line M:4/4 L:1/2 K:C V:1 [eG] [Gd]| [cE] [EB]| [AC] [CG]| [AF] [BD]:| V:2 clef=bass C B,| A, G,| F, E,| F, G,:| w:C:I V6 vi iii6 IV I6 IV V{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

## Commonly used sequences

#### Seventh chords following the circle-of-fifths

While any sequence that establishes a pattern and has clear voice-leading can function, there are common sequences that many composers have relied upon. We discussed the first of these in [Unit 7a](07-harmonic-functions/a1-diaprogcirclefifths.html) when exploring how voice-leading led to the standard circle-of-fifths progression. Now that we understand the structure of sequences, how would you describe this sequence?

{% capture ex7 %}X:7 T:Circle of fifths sequence of triads M:4/4 L:1 K:C V:1 [GE]| [EG]| [EA]| [FA]| [BG]| [cG]|] V:2 clef=bass [C,C]| [E,B,]| [A,,C]| [D,D]| [G,,D]| [C,E]|] w:C:I iii vi ii V I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

#### Parallel 6 chords

Sequences can also be used to explain how non-diatonic progressions function in a diatonic context. One common sequence occurs when first-inversion chords are used in succession to create a stepwise bass line. A *parallel 6 sequence* is any sequence with repeated first-inversion triads, most commonly moving downward by step. Notice that this does not create objectional parallel voices as long as the root of the chord stays above the chordal fifth. If these two voices are inverted, the result will contain parallel perfect fifths. To label a sequence of parallel six chords, label each chord with its Roman numeral and inversion figure and then place a bracket under the entire sequence with a label of “parallel six sequence.”

{% capture ex8 %}X:8 T:Parallel 6 chords M:4/4 L:1/2 K:C V:1 [eg] [gd]| [fc] [eB]| [dA] [cG]| [BF] [cE]|] V:2 clef=bass C B,| A, G,| F, E,| D, C,|] w:C:I V6 IV6 iii6 ii6 I6 viio6 I{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

#### The Pachelbel sequence

Another of the most commonly used sequences is known as the Pachelbel sequence.

{% capture ex9 %}X:9 T:Pachelbel’s sequence M:4/4 L:1/2 K:C V:1 [eG] [Bd]| [cE] [GB]| [AC] [EG]| [AF] [BD]:| V:2 clef=bass C G,| A, E,| F, C,| F, G,:| w:C:I V vi iii IV I IV V{% endcapture %} {% include abc-example.html number=“9” abc=ex9 %}

This sequence takes its name from the German Baroque composer, Johann Pachelbel, who composed a canon using this sequence as its foundation. Since then, the harmonic progression has become a common structure on which to build multiple styles of music. The comedian Rob Paravonian satired many of these takes in his now famous “Pachelbel Rant.” **(Caution: contains strong language)**

Further to our discussion of the importance of patterns in music, please view the following TED Talk by Dr. Scott Rickard. He used mathematics to try to create music without any repetition, and the results are…interesting.

In discussing key signatures, we found that, if we repeatedly ascend via the the interval of the P5, we eventually cycle through all twelve pitch classes before repeating. And if we alter a particular one of those perfect 5ths by a half step–creating a diminished 5th after moving through the first seven letter names–the cycle repeats back on itself and creates the diatonic collection of seven pitches that we associate with Western diatonic tonality.

We can also apply this effect to pitches by stacking them on top of each other to create basic harmonies. Listen to the next example which stacks diatonic 5ths–meaning 5ths that reflect the key signature used for this tonal center–to create a series of perfect 5ths. As you listen, you will probably hear each of these dyads as having an “open” or “undefined” sound. Feel free to experiment using the text entry box below the example to see if you can insert a note into those open 5ths that creates a pleasing sound.

{% capture ex1 %}X:1 %%staffsep 100% T:Diatonic 5ths in the Major Scale M:C L:1/2 K:C [CG] [DA]| [EB] [Fc]| [Gd] [Ae]| [Bf] [cg]|| w:P5 P5 P5 P5 P5 P5 d5 P5{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

As you probably noticed, you can create a variety of interesting harmonies, but the ones that felt the most familiar occurred when placed a pitch in each 5th that divided them equally. And in doing so, you created the basic harmonic structure for all diatonic music: *the triad*.

## Building diatonic triads

All diatonic triads have exactly three pitches, although chordal members may be doubled and certain chord members can occasionally be omitted (and therefore implied) depending on the context. We name the chord members by the distance above the bottom pitch **when the chord is stacked in thirds**: - the lowest pitch is called the *root* of the chord - the pitch that is a 3rd above the root is called the *chordal third* - the pitch that is a 5th above the root is called the *chordal fifth*

This can be confusing to beginning theory students, because we refer to intervals, scale degrees, and chordal members using the same ordinal numbers–thirds, fifths, etc.–and most often do not use the word “chordal.” As you become more experienced in describing these things, you will be able to discern the meaning from context, but if you would like to avoid confusion for now, you can preface the ordinal number with the word “chordal” until you are comfortable.

### A note on terminology

As dyads have two pitches, the word “triad” implies *any* collection of three pitches. In diatonic music, however, we use this word to refer to a certain intervallic structure, so until we reach the unit on post-tonal harmony, you may assume that the word “triad” refers to the stacked thirds of diatonic harmony.

## Triad qualities

If the study of the evolution of music, you will find that early harmony focused on perfect intervals similar to this example, but diatonic harmony as we know did not truly begin until music began regularly featuring a third chordal member. By stacking two intervals of a third, we create a *triad*, which contains not only the two thirds, but also the interval of a fifth between the outer pitches. Any harmonic system which relies on stacking thirds is called *tertian harmony*.

{% capture ex2 %}X:2 %%staffsep 100% T:Diatonic triads in the Major Scale M:C L:1/2 K:C [CEG] [DFA]| [EGB] [FAc]| [GBd] [Ace]| [Bdf] [ceg]|| w:M m m M M m d{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

Triads are important to almost all of Western music and form the basic unit in diatonic (key-based) harmony. While our ultimate goal is to describe how triads *function* harmonically, it is important that we are able to identify the structure of triads themselves independent of their diatonic functions, so we will begin by studying their intervallic structure.

Using the next example: - determine what role each chord member – root, third, and fifth – plays in determining the quality of a triad - find all three intervals contained in a *root-position* triad for each chord quality

{% capture ex3 %}X:3 T:Triad qualities M:2/4 L:1/2 K:C clef=bass “Augmented (A)”[\_B,,D,^F,]| “Major (M)”[\_B,,D,F,]| “Minor (m)”[\_B,,\_D,F,]| “diminished (d)”[\_B,,\_D,\_F,]||{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

Your first goal should be to come up with a way to define each triad’s *quality*. To begin, you may classify triadic qualities by dividing them into two groups based on the defining chord members of the triads.

When looking at a diatonic triad in root position: - If the chordal fifth is either a diminished or augmented fifth, then the triad is labeled as *diminished* or *augmented* respectively. - Diminished triads always have a minor 3rd between the root and chordal third. - Augmented triads always have a major 3rd between the root and chordal third. - If the chordal fifth is a perfect fifth, the chordal third determines whether a triad is *major* or *minor*. - Major triads have a M3 above the root. - Minor triads have a m3 above the root.

From this, we can create a couple of simple groupings based on the chord members: - Between root and chordal 3rd - Augmented and major triads always have a M3 (or inversion) - Minor and diminished triads always have a m3 (or inversion) - Between root and chordal fifth - Major and minor triads always have P5 (or inversion) - Diminished triads always have a d5 (or inversion) - Augmented triads always have an A5 (or inversion)

Therefore, if a triad is in root position, you can determine triad qualities by the measuring the intervals of the stacked thirds.

* Major: M3 + m3
* Minor: m3 + M3
* Diminished: m3 + m3
* Augmented: M3 + M3

## Triad inversions and their labels

Because triads have three pitches, there are three possible configurations that depend on which note of the triad is in the lowest voice. We will call these *inversions*, but they are sometimes referred to as *positions*. The system that we use to label inversions relies on the intervals within the triad.

Using the next example, you should: - determine the naming conventions of inversions - know the shorthand method for labeling inversions - develop a method for determining the chord quality of a triad that is not presented in root position (stacked as two thirds on top of each other.) - find the rest of the interval *sizes* between chord members of a triad (Hint: This may involve moving some chord members up or down an octave) - thirds (2) - fourth (1) - fifth (1) - sixths (2) - relate these interval sizes to our system for labeling triad inversions - provide inversion figures for root position, first-inversion, and second-inversion triads

NOTE: Because ABC notation is not capable of using superscript, the inversion figures in the next example are notated as fractions. If you were to write these by hand or use music notation software, you would notate all inversion figures in superscript as stacked numbers without a dividing line. For example, a major chord in first inversion would be written as M6

{% capture ex4 %}X:4 T:Triad inversions T:1) Inversion names are listed above the staff T:2) Inversion figures are listed below the staff T:——— M:2/4 L:1/2 K:C “Root-position”[\_Bdf]| “First-inversion”[\_BDF]| “Second-inversion”[\_BdF]|| w:5/3 6~(6/3) 6/4{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

From the simple presentation of the above example, you should have realized that you cannot identify the inversion of the chord until you know the root. The simplest method for finding the root for any triad is to re-arrange the pitches until you have a triad that is stacked using only thirds. To be clear, this means no fourths, no sixths, and everything within a octave. You can even eliminate any duplicate pitches. Once you have this simplified arrangement of pitches, you can easily determine the root and quality of the chord using the method above.

For inversions, it is not necessary to know each interval within a triad, but instead, you only need to identify the chordal member in the bass.

* Root position: 5/3
  + the root of the chord is in the bass
  + The 5 and 3 refer to the simple intervals above the bass
* First inversion: 6/3 (shortened to 6)
  + the 3rd of the chord is in the bass
  + The 6 and 3 refer to the simple intervals above the bass
* Second inversion: 6/4
  + the 5th of the chord is in the bass- The 6 and 4 refer to the simple intervals above the bass

Of note, there are six different possible intervals in a triad, depending on the inversion: two thirds, two sixths, one fourth, and one fifth. These intervals always exist between the same two chord members. - The thirds exist between the root/third and third/fifth. - The sixths appear when you invert either of the thirds, so between the third/root and fifth/third. - The fifth always exists between root/fifth. - The fourth is the inversion of the fifth, so between fifth/root.

### Triad voicings

Now that you understand the basic of triads and their inversions, we have to account for the variety of ways that they appear in music. When analyzing music, you must account for doubled pitches, implied harmonies, and a variety of spacings across the range of the performers; all of which can make it difficult to find the basic structure of the triad when looking at a musical score.

We will start by dealing with the issue of spacing, and to do so we must understand how the *inversion* interacts with the chord’s *voicing*.

Look at the following example, and compare the closed and open voicings listed there. You should: - be able to succinctly describe the differences - create a process to convert any inverted and/or open-voiced triad into a root-position triad in closed voicing

{% capture ex5 %}X:5 T:Triad voicings M:2/4 L:1/2 K:C V:1 “Closed”z| “Closed”[\_BF]| “Open”[\_Bf]| “Open”[fdF]| V:2 clef=bass [\_B,,D,F,\_B,]| [D]| [\_B,,D]| [F,\_B,]|{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Conclusions

As students develop the process for finding any inversion, they usually work through the following ideas: - Attempt #1: Open voicing is spread out. - True, but this is a subjective measure. What constitutes “spread out?” - Attempt #2: Closed voicings use only simple intervals and open positions have compound intervals. - This is interesting in that it works if the chord only has no repeated pitches, but does not hold up if a chord has repeated notes or more than four distinct pitches. - Attempt #3: - Closed voicings contain all chord members within one octave. - This is almost there , but does not explain how a chord with more than four pitches can be in closed position. - Attempt #4: Open voicing skips one of the voices. - This definition is almost there, but the term “voices” is problematic because “voices” does not relate directly to a chord.

A complete definition combines these ideas. - Closed voicing stacks all pitches of a chord in an ascending order and does not skip a chordal member. - Open voicings can have chord members stacked in any order and skip chord members. - All open voicings will cover more than one octave because of this.

### *Root* versus *bass*

Understanding the difference between the terms *root* and *bass* is the last piece of information necessary to find the quality of any chord; students often confuse the two. The term *bass* **always** refers to the lowest voice of any chord. The *root* is the lowest member of the chord **if the chord is in root position**, meaning that the triad is stacked as two thirds. If a chord is in root position, the *root* and *bass* will be the same pitch, however if a triad is in first or second inversion, the *root* and *bass* will be different pitches.

### Finding a chord quality while inverted

Combining a knowledge of inversions and voicings is critical in correctly identifying chord qualities. Teachers often suggest to students that they can find chord qualities by putting a chord in root position, but a chord in root position can be spread across multiple staves and still difficult to parse. We really mean that they should put the chord in root position *and* closed voicing. This allows the student to look at the interval qualities and determine the quality of the triad based on their knowledge of triadic interval structures.

I also suggest that you look at the method for identifying triads from the *Open Music Theory*. You can find this listed under the [Further Reading](03-triads-7chords-leadsheet//a2-triads.html) for this topic.

Before we move on to fully analyzing harmonic function, we must define the stylistic rules of the music we will be studying. If you remember from our discussion of laws, rules, and strategies, rules are necessary to create a style. They are the binding agents that create a genre, but they also provide enough flexibility for composers within a style to carve out a unique voice.

For our beginning exploration of tonal harmony, we will be studying basic diatonic harmony in a chorale style. We will use this not because it is “superior” to any other style, but because it is relatively straightforward in its approach when compared to styles of music that came later. There are countless styles of tonal music that have evolved over the last four centuries, but a chorale style gives us the best starting place to study this evolution. So as we progress through rules that might seem outdated, do not lose sight of the *process* that we are creating. If you understand why each decision is made in this style, you will be able to intuit the next leap forward. And as we add complexity, you will eventually be able to apply these principles to *any* style of tonal music, even those that do not employ the underpinnings of tonic-dominant relationships.

## Voice-leading errors

**In the following example, each staff system highlights a different voicing error.** - Compare the “good” chords to the “bad” chords to come up with descriptions of the first two basic voicing rules of *doubling* and *spacing*. - Because *range* is a simple maximum and minimum, I have listed conservative estimates for each voice part. - These can vary widely depending on the skill level of the intended performers but will be sufficient for our early exercises in part-writing.

{% capture ex1 %}X:1 %%staffsep75%% T:Voicing four-part harmony M:2/4 L:1/2 Q:1/4=80 K:C V:1 “#1-Doubling”[cE] [GE] [eE] [cE]|| [\_BE] [cE] [\_BE] [\_BE] [\_BE]|] “#2-Spacing”[cE] “(Range is ignored for this”[cE] “example)”[c’E] [c’e] [c’e]|] “#3-Conservative Ranges”[Cg]| [G,d]| x| x|] w:soprano alto V:2 clef=bass [C,G,] [C,G,] [C,G,] [C,C]|| [C,G,] [C,\_B,] [C,E,] [C,\_B,] [G,,G,]|] w:Good Good Bad Good Good Good Bad Bad Bad [C,G,] [C,,G,] [C,G,] [C,G,] [C,G]|] w:Good Good Bad Bad Good x| x| [GC,]| [DE,,]|] w:tenor bass{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

To this point, everything that we have discussed has been based on a two-voice model, but to move into full diatonic harmony, we need to add inner voices and fully flesh out the harmonies. When doing this, there are certain rules that create better voice-leading and voicings when followed, but as with all stylistic guidelines, please note that these rules are generally strong suggestions rather than hard and fast rules. Good composers bend or break these rules if it better serves their ideas.

#### Doubling

When voicing triads in four-part harmony, at least one note must be doubled.

1. Doubling the root is usually the ideal choice.
2. Doubling the fifth is the second best option.
3. Doubling the third is generally *unacceptable*, although there are certain corner cases in which this can be necessary. As a rule of thumb, do not double the third unless you are working on a chord in which you’ve already been told that doubling the third is the best option.
4. If you need to omit a voice, the fifth is the only option, because the root and third are required to define the chord. Diminished triads are the only diatonic harmony which functionally benefit from a fifth, but even in these situations, the fifth might be the best omission if necessary.
5. You can triple the root if necessary, but this voicing lacks the depth of a chord with a fifth and can create a difficult voicing to continue writing afterwards. This is most commonly used as an ending chord of the piece (often after a V7).

Doubling in a seventh chord is similar, but because you have four notes for four voices, there is less freedom. 1. There must always be a root, third, and seventh in the chord, because without any of them, the chord is no longer a functional seventh chord. 2. If necessary, you can omit the fifth. 3. If the fifth is ommitted, the root is the only chord tone that can be doubled. Do not double the third or the seventh.

#### Spacing

Spacing is relatively straightfoward, but it can be difficult to create consistent rules based on the examples. Your final conclusions should be: - The bass *can* be as far from the tenor as needed. - Between the soprano, alto, and tenor voices, adjacent voices cannot be more than an octave apart. Meaning that the: - Tenor and alto *cannot* have more than an octave between them. - Soprano and alto *cannot* have more than an octave between them. - Tenor and soprano *can* have more than an octave between them. - When the tenor and soprano are within an octave of each other, we call this a *closed voicing*. - When the tenor and soprano are more than an octave apart, we call this an *open voicing*.

In general, a good voicing will mimic the overtone series on which our harmony is created. This details of this concept are discussed in Unit 11, but a general rule of good voicing is to use wider intervals between lower voices and narrower intervals between high voices.

#### Range

The ranges for each voice in the examples are conservative, but will serve us well in our beginning part-writing. These are highly dependent on the intended performers.

#### Voice-crossing

There was no easy way to notate this in the examples, but you should avoid crossing your voices unless absolutely necessary. It is almost never absolutely necessary and often creates voice-leading and range issues. As you grow in your part-writing, you may find an occasional reason to cross voices, but do not unnecessarily complicate your first attempts.

Egon explained this best in one of the greatest 80’s movies, so bonus points for anyone that understands this reference. 

# Class discussion

* Cadences are like the many different endings to a scentence or speech puncuation.
* It’s not about if we can lable chords, but can we lable function.
* Tonic is stable, Dominant is less stable as it feels like it eventually needs to resolve to **I**. Pre-dominants want to resolve to **V**.

**Cadence Types** - PAC: **V** to **I** with both chords in root position. Soprano has to have *do* on **I** chord. (Dominant function chords to I) - IAC: Just break one of the rules from PAC. ex: **vii** to **I**. Or *mi* in the soprano line on **I** chord. (Still must be a dominant function chord to I) - HC: Lands on the **V** chord and doesn’t resolve any farther (in root position). Before the **V** any chord can preceed it. **V7** can still count as a half cadence. It is just very uncommon as the **V7** has a strong pull to **I**. Can never be **viiº** as there are tendency tones that need to resolve. - PC: **IV** to **I**. Both are in root position. There are no other variations of this. One of the voices will have the pedal *do* across both chords.  
- DC: **V** to **vi**. The bass has *sol* and *la*. It you take away the *la* you end up with a PAC. Both chords have to be in root position. **V7** to **vi** is easier to voice. Here the **vi** is functioning as the **I** so we double the root (which is the third if still thinking of it as the **vi**).

These cadences can be found in a progression, but if it is not at the end of the phrase, it isn’t called a cadence. IAC is like a semi colon or comma. DC is like a question mark. PAC is very final so a period.

# Further reading

## From *Open Music Theory*

### Cadences

A *cadence* is a point of arrival that punctuates the end of a musical unit, such as a phrase, theme, large formal section, or movement. A cadence is at once a harmonic, melodic, rhythmic, and formal event, but cadences tend to be grouped according to different ways in which harmony and melody articulate that point of arrival.

### Authentic and half cadences

These unit-ending points of arrival are first grouped into *authentic cadences* and *half cadences*. An authentic cadence occurs when a formal unit ends with the progression **D5–T1** (**V(7)–I**, *sol* to *do* in the bass voice). If the melody accompanying this harmonic progression arrives on *do*, it is called a *perfect authentic cadence*; it the melody ends on *mi* or *me* (or more rarely *sol*), it is called an *imperfect authentic cadence*.

Phrases that end on **V** without progressing to **I** are called *half cadences*. These cadences typically contain *re* in the melody, though *ti* and *sol* are also possible points of melodic arrival. The **V** is almost invariably a triad, rather than a seventh chord, and it is always in root position (**D5**).

Differentiating between *perfect authentic cadences* (PAC), *imperfect authentic cadences* (IAC), and *half cadences* (HC) by ear and with a score is essential both to formal analysis and model composition.

### Simple, compound, and double cadences

Writers of Italian keyboard treatises like [Furno](http://faculty-web.at.northwestern.edu/music/gjerdingen/partimenti/collections/Furno/regoleP5.htm) and [Fenaroli](http://faculty-web.at.northwestern.edu/music/gjerdingen/partimenti/collections/Fenaroli/Regole/regoleP3.htm) (and, more recently, American historical theorists like [Robert O. Gjerdingen](http://faculty-web.at.northwestern.edu/music/gjerdingen/index.htm)) differentiate cadences according to the voice-leading found over the dominant harmony. These distinctions do not replace the above PAC/IAC/HC distinctions; rather they add another level of detail that is particularly helpful in model composition. These voice-leading distinctions provide three more cadence categories to complement PAC, IAC, and HC: the *simple cadence*, the *compound cadence*, and the *double cadence*.

A *simple cadence* occurs when the dominant harmonic function is articulated by a single chord—either a triad or a seventh chord. The simple cadence can be used in a PAC, IAC, or HC construction, though the seventh-chord version is typically only found in authentic cadences.

A *compound cadence* occurs when the bass note *sol* of the cadential dominant is repeated, often with the second *sol* an octave lower than the first. The compound cadence comes in three specific forms.

The first type of compound cadence involves a 4–3 suspension—*do* to *ti*—over the *sol* bass of the dominant harmony. In a four-voice texture, the other two voices sustain a fifth above the bass and an octave above the bass. The *thoroughbass* figure is typically the abbreviated 4–3, which stands for 8/5/4–8/5/3 in four voices. The 4–3 suspension can occur over the cadential dominant of a PAC, IAC, or HC.

4–3 compound cadence.

4–3 compound cadence.

4–3 compound cadence with full thoroughbass figures.

4–3 compound cadence with full thoroughbass figures.

The second type of compound cadence adds a *mi/me* to *re* voice (6–5) to the above 4–3 suspension. In a four-voice texture, the bass is doubled. The typical thoroughbass figure is 6/4–5/3, leading to the common name for this progression, the *cadential six-four*. The complete figure is 8/6/4–8/5/3. The cadential six-four can occur over the cadential dominant of a PAC, IAC, or HC.

Cadential six-four.

Cadential six-four.

Cadential six-four with full thoroughbass figures.

Cadential six-four with full thoroughbass figures.

The last type of compound cadence is a special case of the cadential six-four, where the fourth voice introduces a seventh over the second dominant chord, rather than simply doubling the bass for both chords. This compound cadence type requires four voices and complete thoroughbass figures of 8/6/4–7/5/3. This figure rarely occurs over the dominant of a half cadence and is instead reserved primarily for authentic cadences.

Cadential six-four with seventh.

Cadential six-four with seventh.

A *double cadence* is a four-stage pattern over the cadential dominant used almost exclusively in perfect authentic cadences. Though it had expired from common use by the time of Mozart and Haydn, it was a staple for earlier *galant* composers and *Classical* treatises on composition and accompaniment. The four-stage pattern over the dominant is 5/3–6/4–5/4–5/3. In four voices, the bass is also doubled, or a seventh can be applied to any *chord of the fifth* (i.e., not the 6/4).

Double cadence.

Double cadence.

### Voice-leading in strict keyboard style

In strict melodic keyboard style, always end an idealized phrase with a perfect authentic cadence (PAC). Approach the melody’s final *do* by step whenever possible, from *re* or *ti*, preferably from *re*. When using compound or double cadences, use the orientation of upper voices shown in the above figures (transposed to the appropriate key, of course).

In *basso continuo* style, the top voice can end with any member of the tonic triad. As much as possible, use the voices provided in the figures above, but invert them (move the tenor line to the top, making the melody and alto the alto and tenor, for example). Simply make sure that if *ti* occurs in the top voice before the final tonic chord, it resolves its tendency up to *do*.

In either case, pay special attention to the cadential six-four version of the compound cadence. Despite forming a consonant triad with the bass, both the sixth and the fourth of the first chord act like suspensions, and therefore *must resolve down by step* and be prepared smoothly (by common tones or steps). This is true no matter which part is in the melody, alto, or tenor.

# Class discussion

**Tendency tones** - Root in bass goes to root of next chord - Thirds move up by step to root of next chord - Fifths move down by step to root of next chord - Sevenths move down by step to third of next chord

**Notes on predominant and dominant chords** - viio can also be thought of as a V7 with no root. The voice leading functions the same way in both chords. - IV can be thought of as a ii7 with no root. Their voice leading functions in the same way. Keep in mind that the fa in IV resolves up to sol the same way it would in a ii7, and *not* down to mi.

Here’s our nifty progressions flowchart, both in major:

iii7 -> vi7 -> [ii7 or IVM7] -> [V7 or vii%7] -> I -> (any)

IVM7 goes to I (plagal cadence); V7 goes to vi7; iii7 sometimes goes to IVM7; vi7 sometimes goes to V7.

And minor:

IIIM7 -> VIM7 -> ii%7 or iv7 -> V7 or viio7 -> I -> (any)

Everything that happens in major, just change the chord quality and it works in minor.

**Notes** - Notice that the dominant chords are almost the same in both qualities. The only difference is the seventh of the seven chord. - All of these chords will also occur as triads. The sevenths have been included in the chart for memorization purposes. - There are also *lateral progressions*, where a predominant or dominant chord will go to the other chord in its category rather than proceeding to a dominant or tonic respectively. (I would have included this in the chart but ran up against the limitations of text formatting.) - Exceptions (notated in major for simplicity, but these happen in minor too) - V -> vi: not always as a cadence, but don’t use this if you don’t have to - IV -> I: almost always appears a cadence - vi -> V: this can happen, but the vi should usually be thought of as a tonic function. Avoid using this. (uncommon) - iii -> IV: part of the Pachelbel’s Canon progression. It is dificult to use without creating voice leading issues. Don’t use it. (rare)

# Further reading

## From *Open Music Theory*

Analyzing harmony in a piece or passage of music involves more than labeling chords. Even the most basic analysis also involves *interpreting* the way that specific chords and progressions function within a broader context. Ultimately, no analysis is complete until individual musical elements are interpreted in light of the work as a whole and the historical setting in which the piece occurs. But this resource simply walks through the steps of performing a basic harmonic analysis, interpreting each chord and chord progression in light of the musical phrase in which it occurs.

The first step in a harmonic analysis is to *identify phrases*. For the most part, that means beginning by identifying *cadences*. However, not every type of phrase ends with a cadence, so sensitivity to theme types is important. In classical instrumental music, that means listening for [period- and sentence-like structures](classicalThemes.html). In Classical or Romantic music with text, that means listening in particular for the ends of poetic lines and melodic phrases.

Once you have identified the musical phrases, it can be helpful to perform a harmonic reduction (thoroughbass reduction, for example) for each phrase. Below the score/thoroughbass line, write the appropriate Roman numeral, **T/S/D** label for each chord, and/or an uninterpreted functional bass symbol for each chord (**T1 T3 S4** etc.). [This handout](images/Handouts/HarmoniesByBassScaleDegree.pdf) can help you determine the functions of chords in the thoroughbass reduction.

Next identify the general harmonic structure of each phrase. Typical phrases in classical music will do one of the following:

* prolong tonic without a cadence (a classical *presentation* phrase, for example)
* progress toward an authentic cadence (ending with **V(7) I**, **D5 T1** in functional bass)
* progress toward a half cadence (ending with **V**, **D5** in functional bass)

If the phrase prolongs tonic (no cadence), label the *entire* phrase **T–––.**

If the phrase ends with a cadence, identify the *cadential progression*. This includes the last chord of the tonic zone, optionally followed by a subdominant chord or zone (most often a single chord), and a required dominant zone (most often a single chord or compound cadence formula). Half-cadence phrases end there. Authentic-cadence phrases continue on to a final tonic zone (usually a single chord).

The the **(P) D T** of the cadential progression should be labeled as such. Once the cadential progression is identified, everything before it is labeled as tonic prolongation. Regardless of whether it is contrapuntal prolongation, a subsidiary progression, or a combination of the two, it will be labeled **T–––.** (See [Harmonic syntax – prolongation](http://openmusictheory.com/harmonicSyntax2.html) if those terms are unfamiliar to you.)

Thus a phrase ending with a half cadence will have a functional analysis that looks like:

T—————— (P) D

A phrase ending with an authentic cadence will have a functional analysis that looks like:

T—————— (P) D T

Following is an excerpt from the opening of Haydn’s Piano Sonata in C Major, Hob. HVI:21, I. Chords are labeled with Roman numerals and a **T/S/D** functional label for each chord. The tonic prolongation is shown below that with a T followed by a line for the duration of the tonic zone. The cadential progression is comprised of the last tonic chord (m. 4) through **S D T** to the **PAC** in m. 6.

*Harmonic syntax* concerns the norms or principles according to which harmonies (chords) are placed into meaningful successions. These norms include progressions that are more or less common than others. Those norms generate expectations for listeners familiar with the style: if **IV–V** is more common than **IV–VI**, the appearance of a **IV** chord generates an expectation that the next chord is more likely to be **V** than it is to be **VI**.

In Western classical music, harmonies generally group into three *harmonic functions* — tonic (T), subdominant (S), and dominant (D) — and these functions group together chords that progress to and from other chords in similar ways. For example, since **II** and **IV** are both subdominant chords, they will participate in many of the same kinds of chord progressions, and at times can be substituted for each other with only a minimal change to the musical effect.

On a local level (chord-to-chord progressions), we can summarize the tendencies of these functions with the cycle **T–S–D–T**. That is, harmonies tend to progress through a cyclical progression of those three functions:

**T → S → D → T →** and so on . . .

That does not rule out T progressing to D, D progressing to S, etc. But it does mean that those progressions tend to be less common, at least in classical music.

Higher-level musical structures also impact the norms according to which these harmonic functions progress. For now, we will consider one higher-level structure that influences chord-progression tendencies — the phrase — and we will limit our study to isolated, complete, self-sufficient phrases. This is an idealized, oversimplified setting — like strict voice-leading — that is useful for learning the basics. Some such phrases even exist in real music! But most of the time there are a number of competing factors that influence the chord-progression strategies employed by a composer at any given moment. However, the idealized phrase is a helpful starting point. Future study will explore how classical composers employ harmonic progressions in larger musical works that combine multiple phrases (which are not self-sufficient) into larger themes and movements.

## The idealized phrase

The *idealized phrase* (also called the *phrase model*) is a single musical phrase that progresses through an entire cycle of harmonic functions, beginning and ending on tonic. (Strict voice-leading exercises are such phrases.) These phrases begin with a point of stability (tonic), move away from that stable point, and then eventually lead to a point of high tension and resolution (an *authentic cadence*). This pattern of stability–instability–stability, or rest–motion–rest, with a single goal at the end, should be familiar both from species counterpoint and from strict keyboard-style voice-leading. (This pattern also governs large-scale formal structures in classical music.)

The simplest phrase that exhibits this complete harmonic cycle is a tonic-dominant-tonic progression: **I–V–I.** This phrase begins and ends with the most stable harmony (**I**), and includes an *authentic cadence* (**V–I**). The **V** is the high point of instability, containing the tendency tone (*ti*) that most strongly points to the final point of arrival (*do*, or tonic).

This harmonic cycle can be expanded by inserting a subdominant chord, a destabilized tonic chord, or both, as in the following examples:

**I IV V I**  
**I II V I**  
**I VI V I**  
**I VI II V I**

In *functional bass* terms, any harmonic progression that follows the pattern

**T1 → (S\_) → D5 → T1**

can serve as the basis for a complete idealized phrase. (Harmonies in parentheses are optional.)

Phrases are seldom 3–5 chords long, however, and a harmonic function can be expressed by more than a single chord. Thus we can understand the harmonic functions not simply as chords, but as *zones* of varying length in a phrase, which can be created by a number of chords or short chord progressions. More generally, then, our idealized musical phrase contains a single progression of functional zones **T → (S) → D → T**, begins with **T1**, and ends with an authentic cadence (**D5–T1**), as seen in the example below.

## Triggering and prolonging harmonic functions in an idealized phrase

To establish, or trigger, a harmonic functional zone, composers tend to use *a fixed scale degree in the bass*. In other words, tonic tends to be triggered by **T1** (always **I**), subdominant by **S2** or **S4** (including a variety of **II** and **IV** chords, in in root position or inversions, with and without sevenths), and dominant by **D5** (**V**, with or without a seventh, or a [*compound cadence*](cadenceTypes)). These four categories of chords — **T1**, **S2**, **S4**, and **D5** — are called *functional chords* (because they trigger the function) or *cadential chords* (because they can participate in a cadence).

Other chords are often called *contrapuntal chords* or *embellishing chords*, and are typically used to *prolong* a function throughout the zone.

Functional prolongations are shown in a harmonic analysis by writing/typing T, S, or D underneath the individual chord labels (Roman numerals or functional bass) and extending a line from the beginning of the functional zone to the end.

The following excerpt is from Mozart’s Piano Sonata in A Major, K. 331, I., mm. 1–4, with a harmonic reduction and analysis provided below the original score. Such an analysis is called an *interpreted* harmonic analysis, because the harmonies are interpreted according to the way they behave in the phrase, rather than merely labeled. In this phrase, note the following:

* The tonic zone is triggered by a root-position tonic triad (**I** or **T1**).
* Contrapuntal dominant chords (**D7** — first-inversion dominant chords) create a passing bass motion between the opening **I** chord, the **vi** in m. 3, and the return of **I** in m. 4.
* The [cadential progression](harmonicAnalysis) begins in m. 4 with the move from **I** to ii6 (**S4**) and then to the cadential six-four and dominant triad (**D5**). Note that the entirety of the cadential progression in m. 4 is made up of *cadential chords* — chords with fixed scale degrees in the bass.
* In contrast, the entire tonic-prolongation zone is made up of *contrapuntal chords* — variable scale degrees in the bass — with the exception of the **I** chord that triggered the tonic function.
* The **vi** chord is a root-position chord, but still an embellishing chord, while the ii6 is an inverted chord, but still a functional/cadential chord. The difference is not the inversion, but the scale degree of the bass.

Not all classical phrases as neatly fit the general trends outlined in this resource. As discussed in [Style and tendency](tendency), the principles of harmonic syntax are both reliable and bendable/breakable, and it is often the music that bends/breaks the “rules” in interesting ways that we care about the most. So in your own analyses, keep these principles in mind as *general* principles, and simultaneously look for where composers meet these expectations as well as where they break them.

For more details on the triggering and prolonging of harmonic functions in a classical phrase, see [Harmonic syntax – prolongation](harmonicSyntax2).

# Class discussion

**How do we harmonize a melody?** - Pick a key - Figure out the harmonic rhythm - Determine where and what type your cadences are (type determined by notes in melody. Ex: in C, if our last notes in the soprano are B and C we can’t have a plagal cadence because there is no ti in IV) - Harmonies (using circle of fifths progressions) - Bassline - Inner voices

**When in doubt: K.I.S.S.** - Focusing on smooth voice leading, correct doubling, and correct tendency tone resolutions will make this process a lot easier! If your voice leading is good, you avoid dealing with a lot of errors because they’re symptoms of bad voice leading

**A first attempt at part-writing** - Possible progression: I - ii - V7 - I - As you fill in notes, be making sure all chord members are present. Triads always need the third. Seventh chords always need the third and the seventh. - Voicing of the last chord (C’s in SAB, E in T) isn’t ideal. It’s very spread out and there’s a third between B and T, which can make the chord sound muddier than if it were somewhere between the upper three voices. This happened because of repeated tones in previous chords - When determining your voicings, think of the harmonic series! There’s a lot of space between the lower notes but there’s progressively less the higher you go. If you try to emulate this in your voicings, you’ll end up with better sounding, stronger parts that are less prone to errors

# Class discussion

**Written pitch**: what is written on the page. If you’re playing a transposed instrument, the note you are playing will be transposed too.

**Sounding pitch**: the “actual” note being played. Concert A is concert A no matter what instrument you’re playing.

**Concert pitch**: interchangeable with sounding pitch. Basically means “in C.” This is the baseline point of reference for everything else.

Remember that the process of transposition relies on compensation. If an instrument is pitched lower, its written pitches are *higher* than concert pitch. Ex: Bb trumpet’s written C is concert Bb.

**Ranges** There is a range and transposition handout to print out that is very handy! It is in lesson 12a. It has very conservative ranges though for Brass instruments. It has nice normal ranges for everything.

**Transposition hints** You can organize various instruments according to how their music is written: - **C instruments**: written/sounding pitches match! These are the easy ones. - **Octave displacing instruments**: instruments play up or down an octave from what is written. Generally high instruments get written an octave lower(to sound higher), and low instruments get written an octave higher (to sound lower) (think about compensation like we talked about earlier!). - **Bb instruments**: transpose(sounds) down a M2 from written pitch. Some instruments (like tenor sax) have an additional octave displacement.You have to write a step higher,so it sounds a step lower. - **Eb instruments**: transposition is based around M6. Some instruments have octave displacements, and Eb clarinet is transposed up a m3 from written. This one is the only exception of transposing up. Baritone sax has a pretty easy trick for transposing it! - Quick way to remember what keys the saxophones are in: organize them ascending to descending and they will alternate Bb and Eb (soprano, alto, tenor, bari). Or think of soprano/tenor and alto/bari as pairs. - **F instruments**: transpose down a P5 from written pitch. - Others - **Clarinet in A**: down a m3 from written pitch - **Alto flute**: written in G, transpose down a P4 from written pitch. (will not have to deal this semester with this)

# Class discussion

**Homophony vs Polyphony** - Homophonic textures is created when one or multiple voices are all singing around the same central idea. - Polyphony is present when inner voices other than the melody are present and have rhythms and pitches that are more contrasting from the main melody.

**Define counterpoint:** - Strict voice leading; lots of rules to follow? (On the right track: it’s definitely a very strict system) - *Studying melody*, specifically studying melody that is *two melodies happening at the same time*

**Intervals** - Harmonic Interval: An interval created from two notes that are vertically stacked - Melodic Interval: An interval created from two notes that are adjacent (one note after the other) - Perfect consonances: P1, P5, P8 - Imperfect consonances: M3, m3, M6, m6 - A note: “consonant” and “dissonant” in this style = “allowed” and “not allowed.” P5s, P8s, M3s, etc. are allowed, whereas P4s are not.

**Types of contrapuntal motion** - Parallel: same direction of melodic interval, same size harmonic interval (not necessarily the same *quality*) - Contrary: opposite direction of motion, intervals don’t matter - Oblique: one voice is stationary, the other moves - Static: no movement in either voice - Similar: same direction, different harmonic interval sizes

# Further reading

## From *Open Music Theory*

### Types of contrapuntal motion

There are four types of contrapuntal motion between two musical lines. Differentiating these four types of motion is essential to generating good voice-leading, both strict and free.

In *parallel motion*, two voices move in the same direction by the same generic interval. For example, the following two voices both move up by a step. Note also that both dyads form the same generic interval (sixth). This will always be true when two voices move in parallel motion.

Example of parallel motion: C–A to D–B.

Example of parallel motion: C–A to D–B.

In *similar motion*, also called *direct motion*, two voices move in the same direction, but by different intervals. For example, the following two voices both move down, but the upper voice moves by step while the lower voice moves by leap. Note also that the two dyads are different generic intervals. This will always be the case with similar or direct motion.

Example of similar motion: C–G to A–F.

Example of similar motion: C–G to A–F.

In *contrary motion*, two voices move in opposite directions—one up, the other down.

Example of contrary motion: C–E to A–F.

Example of contrary motion: C–E to A–F.

In *oblique motion*, one voice is stationary, while the other voice moves (in either direction). The stationary tone may or may not be rearticulated.

Example of oblique motion: C–G to B–G.  
or  
Example of oblique motion: C–G to B–G.

## Class discussion

There are three parts: Preparation (before non chord tone), the non-chord tone itself, and the resolution (note after the non-chord tone). - The preparation and resolutions are always chord tones. If there are multiple non-chord tones, it means you have analyzed something an the pattern is wrong.

Non-chord tones can be: - Accented vs unaccented - On-chord vs off-chord - Chromatic vs diatonic - Ascending vs descending (passing tones only) - Upper vs lower (neighbor tones only)

**Passing Tone (PT)** Is approached by step and left by step in the same direction. Ex: Both preparation and resolution are moving down(or the opposite direction).

**Neighbor Tone (NT)** Is approached by step and left by step in the opposite direction. Ex: The preparation moves down and the resolution returns back up(or the opposite for each).

**Suspension (SUS)** Is approached by static motion and resolves downward by step. **All suspensions require two chords** as the preparation will be on a different chord than the NCT itself. You have to have this downward motion. If you don’t, you may have to alter the chord when inserting a suspension. We label how suspensions resolve with its intervalic label. Anything above the bass voice, you write the interval of the two notes of the suspension against the bass note.Ex: C in the bass with a D to C resolution in the alto voice is a “Sus 9-8.” If this example occurs in the tenor voice, it is considered 2-1. The most common suspensions are 4-3, 7-6, 9-8.

If the suspension is in the bass, you measure it against the most dissonant voice. They will always be labeled 2-3 because there will always be a second. Also note that the numbers get bigger when labeling. (4-3 vs 2-3)

**Retardation (RET)** Is approached by static motion and resolves upward by step. You can think of it as a suspension that resolves up. It follows all of the same rules. These are much **less** common.

## Class Discussion

TBD

# ## Further Reading

## From *Open Music Theory*

### Notes

When written on a staff, a note indicates a pitch and rhythmic value. The notation consists of a *notehead* (either empty or filled in), and optionally can include a *stem*, *beam*, *dot*, or *flag*.

### Staff

Notes can’t convey their pitch information without being placed on a staff. A staff consists of five horizontal lines, evenly spaced. The plural of staff is *staves*.

### Clefs

Notes *still* can’t convey their pitch information if the staff doesn’t include a clef. A clef indicates which pitches are assigned to the lines and spaces on a staff. The two most commonly used clefs are the *treble* and *bass* clef; others that you’ll see relatively frequently are *alto* and *tenor* clef.

### Grand staff

The grand staff consists of two staves, one that uses a treble clef, and one that uses a bass clef. The staves are connected by a curly brace. Grand staves are used frequently for notating piano music and other polyphonic instruments.

### Ledger lines

When the music’s range exceeds what can be written on the staff, extra lines are drawn so that we can still clearly read the pitch. These extra lines are called *ledger lines.* In the example below, From Haydn’s Piano Sonata in G (Hob. XVI: 39), A-flat5 occurs just above the treble staff in the right hand, and G3 and B3 occur just below the treble staff in the left hand.

### Accidentals

Accidentals are used to indicate when a pitch has been raised or lowered. They are written to the *left* of the pitch.

* When you lower one of the white notes of the piano by a semitone, you add a flat.
* When you raise one of the white notes of the piano by a semitone, you add a sharp.
* When you raise a note that is already flat by a semitone, you add a natural.
* When you lower a note that is already flat by a semitone, you add a double flat.
* When you raise a note that is already sharp by a semitone, you add a double sharp.

The example below shows the symbols for flat, natural, sharp, double sharp, and double flat, respectively.

# Class discussion

*Note that the seventh dimnished chord and major V in* ***minor*** *needs the leading tone (ti) in diatonic harmony.*

**What does Cmin7/E-flat tell us?** - First inversion, E-flat is in the bass - All 4 chord members (C Eb G Bb) - We *do not* know what key we are in and how this chord functions within the key. It is completely removed from form

**Roman numerals** - The roman numeral itself identifies the root. You can tell what note the root is because its number correlates directly to its scale degree. For example, in C major vi indicates an A minor chord because A is the sixth scale degree in that key. As we’ll see in a second, the root can be altered just like the other chord members - Uppercase/lowercase identifies the third in relation to the root (major/minor) - 5ths are assumed perfect unless there’s a +, a half-diminished, or a diminished sign in the superscript - The diminished sign is special because it indicates that both the fifth and seventh are lowered. You can tell the difference from the half-diminished sign because the latter has a slash through it (it’s cut in “half”) - 7 by itself = dominant 7th. Can be altered with M, a half-diminished, or a diminished sign - Sometimes chords like IV7 are notated without the clarification that it’s a major seventh chord–you’re expected to know because a major seventh is diatonic. However, when we get past the Classical era this method breaks down because all kinds of crazy stuff starts happening with harmony from the Romantic era onward

**Altering Roman numerals for non-diatonic chord qualities** - Can have any triad in any key as long as you know how it relates to the key - Accidental in front alters the chord from its diatonic version. Ex: in C major, bVI = Ab major chord - Only sharps and flats are used this way–no naturals. Even in sharp keys, you would use a flat sign to indicate a lowered chord. Likewise, a sharp indicates a raised chord even in flat keys

# Further Reading

## From *Open Music Theory*

## Labeling chords

There are two ways in which we will label chords according to function. The first is to label chords with Roman numerals, thoroughbass figures, and functional labels. When doing so, place the appropriate Roman numeral *below* the bass line, the thoroughbass figure *above* the bass line (since it represents the upper voices), and place a functional label **T**/**S**/**D** below the Roman numeral (no **Tx**; simply call a **VI** chord **T**). For now this label can simply apply T, S, or D to individual chords; in the future, we will alter this practice slightly in order to show [functional prolongation](harmonicSyntax2.html). The first example shows individual chord functions, and the second example shows functional prolongation.

The second way to label a harmonic progression is what Quinn calls *functional bass*. Functional bass symbols combine a chord’s function (**T**, **S**, **D**, or **Tx**) with an Arabic numeral denoting the scale degree of its bass note. A tonic chord with *do* in the bass is **T1**, a dominant chord with *ti* in the bass is **D7**, etc. If the bass note is chromatically altered, use a **+** or **–** to denote raised or lowered (*la* and *ti* in minor do not count, since *le*, *la*, *te*, and *ti* all belong to minor, but you can use +/– for clarity if you like). And if there is a chromatically altered note anywhere in the chord, put the functional bass symbol inside square brackets: **[S6]**, **[S+4]**, **[T–7]**, etc. (See [Chromatically altered subdominant chords](alteredSubdominants.html), [Applied chords](appliedChords.html), and [Modal mixture](modalMixture.html) for more information on common chromatically altered chords.)

Quinn also advocates using what I call *interpreted functional bass*. This nomenclature uses the same symbols, but uses parentheses to denote [*contrapuntal prolongation*](http://openmusictheory.com/harmonicSyntax2.html) and lower-case postscripts to explain the contrapuntal role of the embellishing chord (p for passing, n for neighbor, i for incomplete neighbor, d for divider, e for embellishing — all of these refer to the voice-leading pattern in the bass voice). Following is an example of interpreted functional bass.

In this text, we primarily use the first method of Roman numerals and (prolonged) harmonic functions, since it is the most common in North American music theory. However, functional bass can be helpful for identifying categories of chords that belong together. For example, in a dictation or transcription task, we might hear *re* in the bass but not know what specific chord it is. If context tells us it is likely a dominant chord, rather than subdominant, we can label it **D2**. This rules out **II** (a subdominant chord) but keeps open multiple dominant options like **V6/4** or **VII6** until we are able to make a final determination. Similarly, when composing, there are patterns that might take an **S4**, with the specific chord (**IV** or **II6**) determined by voice-leading rather than harmonic syntax, but where a **D4** chord (**V4/2**) would be syntactically inappropriate, regardless of voice-leading.

Thus, when referring to specific chords, we will use Roman numerals to label the chords and functional labels to interpret their role in context. When referring to broader categories of chords, we will more often use functional bass.

## Class discussion

**Pentatonic Scales Tricks**

-Take out the tri-tone notes (Degree 4 and 7) from the major scale for major pentatonic.

-Minor pentatonic can be remembered as taking out scale degree 2 and 6.

-Major and Minor are the same pitches, but just organized in a different order (different starting point). They are modes of each other.

**Bobby McFerrin Video**

He could demonstrate that the pentatonic scale can be used independently and easily taught.

Even though it is missing the two notes that we considered important scale degrees, if can still be expressive and interesting (and it is in our bones).

# Further Reading

## From *Open Music Theory*

A scale is a succession of pitches ascending or descending in steps. There are two types of steps: *half steps* and *whole steps*. A half step (H) consists of two adjacent pitches on the keyboard. A whole step (W) consists of two half steps. Usually, the pitches in a scale are each notated with different letter names, though this isn’t always possible or desirable.

### The major scale

A major scale, a sound with which you are undoubtedly familiar, consists of seven whole (W) and half (H) steps in the following succession: W-W-H-W-W-W-H. The first pitch of the scale, called the *tonic*, is the pitch upon which the rest of the scale is based. When the scale ascends, the tonic is repeated at the end an octave higher.

Here is the D major scale. It is called the “D major scale” because the pitch D is the *tonic* and is heard at both ends of the scale.

The major scale

The major scale

### Scale degrees and solfège

While ISO notation allows us to label a pitch in its specific register, it is often useful to know where that pitch fits within a given scale. For example, the pitch class D is the first (and last) note of the D-major scale. The pitch class A is the fifth note of the D-major scale. When described in this way, we call the notes *scale degrees*, because they’re placed in context of a specific scale. Solfège syllables, [a centuries-old method of teaching pitch and sight singing](http://en.wikipedia.org/wiki/Solfège), can also be used to represent scale degrees (when used in this way, this system is specifically called movable-*do* solfège).

Scale degrees are labeled with Arabic numerals and carets (^). The illustration below shows a D-major scale and corresponding ISO notation, scale degrees, and solfège syllables.

### The minor scale

Another scale with which you are likely very familiar is the minor scale. There are several scales that one might describe as *minor*, all of which have a characteristic third scale degree that is lower than the one found in the major scale. The minor scale most frequently used in tonal music from the Common Practice period is based on the *aeolian mode* (you’ll read more about modes later), which is sometimes referred to as the *natural minor* scale.

The natural minor scale consists of seven whole (W) and half (H) steps in the following succession: W-H-W-W-H-W-W. Note the changes in solfège syllables.

If you sing through the above example, you’ll notice that the ending lacks the same sense of closure you heard in the major scale. This closure is created in the major scale, in part, by the ascending semitone between *ti* and *do*. Composers often want to have this sense of closure when using the minor mode, too. They’re able to achieve this by applying an accidental to the seventh scale degree, raising it by a semitone. If you do this within the context of the natural minor scale, you get something called the *harmonic minor* scale.

Now the last two notes of the scale sound much more conclusive, but you might have found it difficult to sing *le* to *ti*. When writing melodies in a minor key, composers often “corrected” this by raising *le* by a semitone to become *la* when approaching the note *ti*. When the melody descended from *do*, the closure from *ti* to *do* isn’t needed; likewise, it is no longer necessary to “correct” *le*, so the natural form of the minor scale is used again. Together, these different ascending and descending versions are called the *melodic minor* scale.

When ascending, the *melodic minor* scale uses *la* and *ti*.

When descending, the *melodic minor* scale uses the “natural” *te* and *le*.

Truth be told, most composers don’t really think about three different “forms” of the minor scale. The *harmonic minor* scale simply represents composers’ tendency to use *ti* when building harmonies that include the seventh scale degree in the minor mode. Likewise, the *melodic minor* scale is derived from composers’ desire to avoid the melodic augmented second interval (more on this in the [intervals](intervals.html) section) between *le* and *ti* (and some chose not to avoid this!). In reality, there is only one “version” of the minor scale. Context determines when a composer might use *la* and *ti* when writing music in a minor key.

## Class Discussion

#### Fix mm. 5 in Common Examples of simple quadruple meters with correct beaming (4 la li).

**What is rhythm?** - A division of the beat. (What’s a beat? A division of time…etc etc forever and ever) - *Rhythm is the temporal aspect of music*

**What does rhythm communicate?** - “When you play what” - “How long you play what when you play it” - “When and when not”…sound and silence…when things start and stop (*especially* the “and stop” part)

**What do time signatures represent?** - Meter! - Meter -> Beats -> Division -> Subdivision

**What’s a measure?** - A defined space that can only hold as many beats as the meter allows - A meter is defined by the beats!

**What is a regular meter?** - Can be divided into two? (Nope, too specific) - Beats are divided evenly? *Something* is divided evenly? - *All the beats are the same length* - Examples: 4/4 and 3/4 are regular, whereas 5/8 is irregular…unless the tempo is eighth note = whatever

**What is a simple meter?** - Any time signature that has a 2, 3, or 4 in the denominator? (No: on the right track, though!) - Beats hold equal value (No: this is a regular meter) - Number of beats in measure = numerator? (Not quite: getting into the top/bottom number meanings, though) - *Basic division of a beat is 2*

**What do the top and bottom numbers mean in a simple time signature?** - Top = number of beats in a measure - Bottom = note value that “gets” the beat - What do we mean by “get?” How do we explain this to beginning musicians? - “How many” (top) and “what kind” (bottom) - Think of it as an actual fraction. Replace the top number with a 1 and it will reveal what kind of note is the beat

**What do duple, triple, and quadruple mean when describing a meter?** - *How many beats are in a measure.* Duple has 2, triple as 3, etc. Phrasing is “simple x,” for example 4/4 is simple quadruple.

**What is the “theoretically ideal” rhythmic notation of beaming in simple meters?** - Ideal: show where the beats are, common: easier to sight read? (Yes…though the second part’s subjective) - Why is this helpful in a theory class with a lot of analysis? - Can clearly see every beat, makes it easier to discuss - Being able to see every beat can make it easier to stack chords when analyzing. You can see all the notes in each beat, so you are less likely to miss a sustained note from a previous beat.

**A list of common meters in simple duple, triple, and quadruple:** - Quadruple: 4/32, 4/1 - Basicaly: you can have “simple x-uple” for any numbers of beat! Simple quintuple, simple octuple, etc.

**The common beat-counting system that we’ll be using in this course:** - 1 e & a 2 e & a …

# Further Reading

## From *Open Music Theory*

Rhythm refers to the combination of long and short durations in time. Durations are notated with either unfilled or filled noteheads. Unfilled noteheads can appear with or without a stem; filled noteheads always appear with a stem. Flags can be added to the stems of filled noteheads; each flag shortens the duration by half.

### Rests

Rests represent silence in musical notation. For each durational symbol there exists a corresponding rest.

### Dots and ties

Dots and ties allow for basic durations to be lengthened. A dot occurs after a pitch or a rest, and it increases its duration by half. For example, if a quarter note is equivalent in duration to two eighth notes, a dotted quarter note would be equivalent to *three* eighth notes. Generally, undotted notes divide into two notes; dotted notes divide into three. Thus, undotted notes are typically used to represent the beat level in simple meter, while dotted notes are used to represent the beat in compound meter.

Multiple dots can be added to a duration. Subsequent dots add half the duration of the previous dot. For example, a quarter note with two dots would be equivalent in duration to a quarter, eighth, and sixteenth note.

A *tie* lengthens a duration by connecting two adjacent identical pitches. Ties are used to either sustain a pitch beyond the length of a single measure, or to make a particular rhythmic grouping in a measure more clear.

In the example below, the duration of the first pitch is longer than a single measure, so it is represented by tying the dotted half note, which lasts the full measure, to the first beat of the subsequent measure.

### Meters

Meter involves the way multiple pulse layers work together to organize music in time. Standard meters in Western music can be classified into *simple meters* and *compound meters*, as well as *duple*, *triple*, and *quadruple* meters.

Duple, triple, and quadruple classifications result from the relationship between the counting pulse and the pulses that are *slower* than the counting pulse. In other words, it is a question of *grouping*: how many beats occur in each bar. If counting-pulse beats group into twos, we have duple meter; groups of three, triple meter; groups of four, quadruple meter. Conducting patterns are determined based on these classifications.

Simple and compound classifications result from the relationship between the counting pulse and the pulses that are *faster* than the counting pulse. In other words, it is a question of *division*: does each beat divide into two equal parts, or three equal parts. Meters that divide the beat into two equal parts are *simple meters*.

There are three types of standard simple meters in Western music:

* simple duple (beats group into two, divide into two)
* simple triple (beats group into three, divide into two)
* simple quadruple (beats group into four, divide into two)

In a time signature, the *top number* (and the top number only!) describes the type of meter. Following are the top numbers that always correspond to each type of meter:

* simple duple: 2
* simple triple: 3
* simple quadruple: 4

## Notating meter

In *simple meters*, the bottom number of the time signature corresponds to the type of note corresponding to *a single beat*. If a simple meter is notated such that each quarter note corresponds to a beat, the bottom number of the time signature is 4. If a simple meter is notated such that each half note corresponds to a beat, the bottom number of the time signature is 2. If a simple meter is notated such that each eighth note corresponds to a beat, the bottom number of the time signature is 8. And so on.

## Beaming

It’s important to remember that notation is intended to be read by performers. You should always strive to make your notation as easy to interpret as possible. Part of this includes grouping the rhythms such that they convey the beat unit and the beat division. *Beams* are used to group any notes at the beat division level or shorter that fall within the same beat.

In this example, the eighth notes are not grouped with beams, making it difficult to interpret the triple meter.

If we re-notate the above example so that the notes that fall within the same beat are grouped together with a beam, it makes the music much easier to read.

### Borrowed divisions

Typically, a meter is defined by the presence of a consistent beat division: division by two in simple meter, and by three in compound meter. Occasionally, composers will use a triple division of the beat in a simple meter, or a duple division of the beat in a compound meter.

*Triplets* are borrowed from compound meter, and may occur at both the beat division and subdivision levels, as seen below.

Likewise, *duplets* can be imported from simple meter into a compound meter.

## Hearing meter

For a more detailed explanation of meter with an emphasis on hearing and recognizing standard meters, see the following two videos:

Meter - counting pulse from Kris Shaffer on Vimeo.

Meter - grouping and division from Kris Shaffer on Vimeo.

Following are the musical examples referenced in the above videos:

“Come Out Clean,” Jump Little Children

“With or Without You,” U2

“The Tourist,” Radiohead

## Examples

### Simple duple meter

Symphony No. 5, Movement IV., Ludwig van Beethoven

“Idioteque,” Radiohead

Sonata No. 1 in F Minor, Op. 2, No. 1, Movement I., Ludwig van Beethoven

### Simple triple meter

String Quartet No. 15 in D Minor, K. 421, Movement III., Wolfgang A. Mozart

Symphony No. 90 in C Major, Hob: I:90, Movement III., Joseph Haydn

### Simple quadruple meter

“With or Without You,” U2

“Come Out Clean,” Jump Little Children

“Shh,” Imogen Heap

# Class Discussion

***Melodic sequences***

**Diatonic vs. chromatic** - Diatonic is entirely in the key. The first example is completely in C, so it’s diatonic. When a sequence is diatonic you don’t label the quality of the interval of transposition because it will vary between each scale degree - For chromatic sequences, you have to label the interval *with* its quality because that determines the “key” - Always be thinking about the smallest possible pattern to identify! In example 4, the sequence can technically be a whole beat *or* half a beat. However, it is suggested to ID it as being half a beat because that’s simpler (especially if you’re expected to write out the rest)

**Ascending vs. descending** - Intervals within the pattern will be ascending or descending, but the only thing we care about is the interval transposition, or the *overall* motion between each sequence. The second example is a descending sequence because the overall transposition is down by a second

Some sequences will have qualities of diatonic and chromatic sequences. Ex. 5’s inner intervals are fixed, the same as in a chromatic sequence, but the interval of transposition is a “diatonic third,” descending in thirds down the C major scale.

**How to label sequences:** put a bracket over the top of the areas you want to ID as a sequence, then draw arrows pointing from the one on the left to the one on the right. Over the top of the arrow, indicate whether it’s ascending/descending with an up or down arrow, and also include a number (and quality, if the sequence is chromatic) to ID the interval of transposition.

***Harmonic sequences***

**A two voice sequence** - Is this example functional? Can you harmonize the example (come up with a progression for it)? Can we have a cadence as we normally would? - Sequences don’t have to follow functional tonal harmony rules, which is why it’s okay for us to have a V6/4 as our penultimate chord in this example. It’s like how passing chords don’t have to follow circle-of-fifths progression rules, except it’s all the time - Adding the alto voice - This also ends up being a sequence! From the second measure, the pattern is down a third + up a second, or an overall transposition interval of a second

**Common sequences** - Parallel 6 chords - Made entirely of first inversion chords. Goal is a smooth + strong bassline - Always descending - Pachelbel’s sequence - Suuuuuuuper prevalent, you hear it everywhere - This is the reason we have iii -> IV in our chord progression chart! This progression works in Pachelbel’s Canon in D and is used widely even today

# Class Discussion

Tertian Harmnoy: Harmony based on stacked thirds. *(diatonic triad, stacked thirds, is not necessarily the same as a “triad”-implies any collection of three pitches)*

**ID Triads?** - M: M3 + m3 (P5 outside) - m: m3 + M3 (P5 outside) - d: m3 + m3 (d5 outside) - A: M3 + M3 (A5 outside)

Note that all 3rds are either major or minor! Don’t even worry about diminished thirds.

Additional tips: - Knowing your scales can help identify triads, especially in a key with lots of sharps or flats where many of the possible altered notes are double sharps or flats. - Possible groupings for memorization - M and A both “start” with a M3, m and d both start with a m3 - M and m are more familiar whereas A and d are newer and “weirder,” have altered 5ths

**ID inversions?** - Root position: starting point (stacked thirds) - Determine the quality of the third and the quality of the fifth to find the quality of the chord. - 1st inversion: take the root and move it to the top (3rd is on the bottom) - 2nd inversion: take the third and move it to the top (5th is on the bottom)

* The only thing that determines your inversion is the lowest/bass pitched note. *(note that when actually labeling inversions, the numbers will be superscript and stacked)*

**ID closed vs open voicing?** - Closed voicing = closest notes can be notated together on a staff, open = spread out? (No: “spread out” is not specific enough) - Closed voicing = voices within a 4th, open = voices larger apart than a 4th? (On the right track, but not quite!) - Closed voicing = within an octave, open voicing = greater than an octave?

These are all good guesses, but closed voicing means stacking all chord members in ascending order without skipping over any of them. Open voicing is anything *but* that.

* Open voicing = does not have the first/third/fifth in the same octave.
* Closed is in the same octave and stacked as closely to the bottom as possible. There are no skipped pitches.

Voicing is important because it changes how the listener hears something. Open has a more broad and expansive sound while closed is more final.

# Further Reading

## From *Open Music Theory*

A chord is any combination of three or more pitch classes that sound simultaneously.

A three-note chord whose pitch classes can be arranged as thirds is called a *triad*.

To quickly determine whether a three-note chord is a triad, arrange the three notes on the “circle of thirds” below. The pitch classes of a triad will always sit next to each other.

A triad (A, C, E) on the diatonic circle of thirds.

A triad (A, C, E) on the diatonic circle of thirds.

## Identifying and labeling triads

Triads are identified according to their *root* and *quality*.

### Triad roots

To find a triad’s root, arrange the pitch classes on a circle of thirds (mentally or on paper). The root is the *lowest* in the three-pitch-class clump. Expressed another way, if the circle *ascends* by thirds as it moves clockwise, the root is the “earliest” note (thinking like a literal clock), and the other pitch classes come “later.”

A triad (A, C, E) on the diatonic circle of thirds.

A triad (A, C, E) on the diatonic circle of thirds.

Once you know the root, you can identify the remaining notes as the *third* of the chord (a third above the root) and the *fifth* of the chord (a fifth above the root).

### Triad qualities

To find a triad’s quality, identify the interval between the root and the other members of the chord. There are four qualities of triads that appear in major and minor scales, each with their own characteristic intervals.

* major triad: M3 and P5 above the root (as in *do–mi–sol*)
* minor triad: m3 and P5 above the root (as in *do–me–sol* or *la–do–mi*)
* diminished triad: m3 and d5 above the root (as in *ti–re–fa*)
* augmented triad: M3 and A5 above the root (as in *me–sol–ti*)

Four qualities of triads.

Four qualities of triads.

### Building a triad

To build a triad on the staff, identify the root, quality, and bass note from the lead-sheet symbol. The root and quality will tell you what three pitch classes belong to the triad. For example, **C+** tells you the root is C, and the quality is augmented. Since the quality is augmented, there is a major third above the root (E) and an augmented fifth above the root (G-sharp). Since there is no bass note appended to the lead-sheet symbol, the bass note is the same as the root: C. Write a C on the staff (in any comfortable register), then write the other chord tones (E and G-sharp) *above* the C (see the Caug triad in the above figure).

For **Cm/E♭**, the root is C, and the quality is minor. Since the quality is minor, there is a minor third above the root (E-flat) and a perfect fifth above the root (G). The slash identifies E-flat as the bass note. Write the E-flat on the staff. Then write a C and a G above it to complete the chord (again, see above).

When all the members of the triad are as close to the bass note as they can be, the chord is in what is called *close position* (C, Cm/E♭, and Cdim/G♭ above). When there are spaces between chord tones, the chord is in *open position* (Caug above). (In certain musical situations, only one of those positions will be useful or desirable.)

### Listening to triads

Each triad quality has its own distinct sound, and to an extent that sound is preserved even when the chord is *inverted* (when the pitch classes are arranged so that a pitch class other than the root is in the lowest voice). As you practice identifying and writing triads, be sure to play the triads, both to check your analysis/writing and to develop the ability to identify chord qualities quickly by ear.

### Inversions

Both bass lines and root progressions are important for the study and mastery of tonal harmony. Most of our work will focus on the bass lines, and what follows will help you analyze the root progressions present in any figured bass line. In other words, this will help you perform a Roman numeral analysis of a figured bass line.

Note that on the charts below, generic capital Roman numerals are provided.

### Chords of the fifth

In any chord of the fifth (“root position”: 5/3 or 7/5/3 chord), the bass note and the root of the chord are the same. The Roman numeral to be assigned to any chord of the fifth, then, is the scale degree of its bass note. If *do* is in the bass, the bass is scale-degree 1, and the Roman numeral is **I**. If *re* is in the bass, the Roman numeral is **II**. And so on.

### “First-inversion” chords of the sixth

Chords of the sixth that take the figures 6/3 or 6/5/3 are *first-inversion* chords. They are so named because the third of the chord (the next chord member above the root) is in the lowest voice. However, thinking about inversions while performing an analysis can be cumbersome. It is often simpler to remember that if the figure is 6/3 or 6/5/3 (or an abbreviation such as 6 or 6/5), *the root of the chord is the sixth above the bass*. If *mi* is in the bass, and the figure is “6,” the root is *do*, and the Roman numeral is **I**. If *fa* is in the bass and the figure is “6/5,” the root is *re*, and the Roman numeral is **II**. And so on.

### “Second-inversion” chords of the sixth

Chords of the sixth that take the figures 6/4 or 6/4/3 (or an abbreviation such as 4/3) are *second-inversion* chords. They are so named because the fifth of the chord (the second member of the chord above the root) is in the lowest voice. Again, it is often simpler to remember that for 6/4, 6/4/3, and 4/3 chords, *the root is the fourth above the bass*. If *re* is in the bass, and the figure is 4/3, the root is *sol*, and the Roman numeral is **V**.

### “Third-inversion” chords of the sixth

Chords of the sixth that take the figure 6/4/2 (or its abbreviation 4/2 or simply 2) are *third-inversion* chords. Their root is a second, or a step, above the bass. The most common 4/2 chord has *fa* in the bass, and *sol* is its root, making its Roman numeral **V**.

# Class Discussion

Asymmetric and irregular meters mean the same thing, but calling them “irregular” might make them easier to understand from the drop. An asymmetric/irregular meter is any meter where the beats have varying lengths, seen clearly in the first example where we proceed through 5/8, 7/8, and 8/8.

In ths first ex with the different x/8s, we can even do different groupings within these three time signatures.

**Do we still use notation from regular meters when we’re in an irregular meter?** (simple meters tell length of beat, compound meters tell length of division) - Irregular meters use the same rules as compound meters. This is because the division is the same in meters like 5/8 but the beats, by definition, are not the same

**Mixed meter** - Mixing meters within the same piece!

**Polymeter** - More than one meter happening at the same time. While mixed meter has everybody switching b/w meters together, polymeter has two or more groups playing in different meters simultaneously.

**Implied polymeter** - What it says on the tin: the polymeter is not explicitly written in time signatures, but the way the music itself is written implies that it’s happening anyway

**Polyrhythm** - Unlike polymeter, which happens at the bar level, polyrhythm is the same concept happening at the beat level

# Class discussion

**What do we mean by “advanced modulatory techniques?”** - Things are going to get wayyy more flexible! And therefore they’re gonna get really weird - Modulations to very distant keys are possible - Techniques like pivot chords are going to get bizarre in what chords are actually involved, but the baseline rules will stay the same: pivot chords happen in the middle of a phrase, direct/phrase modulations happen between phrases

**Modulation #1** - This ex is weird because where we hear the modulation is really ambiguous, and you can make an argument for modulating on the bVI or the bII in the second phrase - This and #2 are examples of mode mixture pivot chords! In this technique, we pivot on a borrowed chord. Just like a regular pivot modulation, these generally happen in the middle of a phrase because you need a functional progression on both sides

**Modulation #3** - Where does this modulation actually happen? Is it a pivot or a phrase modulation? - Pivot modulation. Remember that there’s a difference b/w a deceptive *cadence* and a deceptive *progression*. We can’t do a direct modulation after a deceptive progression because there’s no cadence–the phrase hasn’t ended. - We modulate on the vii07 in the seventh measure! It’s just a respelling of the vii04/2 in the second measure. This is called an *enharmonic modulation*: by respelling the chord, it takes on a function in the new key. In this case, we’ve pivoting on the respelled vii07 - When writing the pivot, the chord will be spelled in one of the two keys. This means you have to figure out what the inversion would be in the other key. For this example, you would write vii04/2 in the top half of the bracket, and vii07 in the bottom half of the new key. Seeing both chords are vii07, we will know that you are saying the chords are enharmonically equivalent and that you correctly ID’d the technique - You can also modulate using a secondary vii07 - Common respelled chords: augmented triads (used as V chords) and Fr+6 (respelled as the Fr+6 of the key a tritone away from the home key–sees VERY little use because this isn’t as flexible)

**Modulations #5 and #6** - Another enharmonic modulation, this time respelling a V as a Ger+6 in the new key by respelling the seventh. In this example, a G7 is respelled as a Ger+6 in the key of B major just by respelling the F as an E# - In example 5, the Ger+6 has a predominant function. It comes right before I6/4 - V, which are lumped together and have a dominant function - When writing out the pivot bracket where the Ger+6 is in the home key, like in example 6, we would label the chord Ger+6 in the top bracket *even though* it has been respelled. By putting Ger+6 in the top half of the bracket and V7 in the bottom half, we actually inform whoever is looking at our analysis that we understand it has been respelled - The progression must be functional on both sides for a pivot modulation, but that’s especially true for these weird modulations that pivot on a chord with different functions in each key. For example, in example 6 the Ger+6 has a predominant function, but when it is respelled as a V7 it has a dominant function

# Class discussion

**Augmented sixth chords** - Not based in tertian harmony, so their “Roman numerals” are written differently than normal - They’re called augmented sixth chords because they contain an augmented sixth - The primary reason for these is voice leading–the raised tone moves up, the lowered tone moves down. Both tones will proceed to the root of the next chord - a default +6 chord will proceed to V and has **predominant function**

**Think of the components of these chords using scale degrees!** - Italian (It): b6, #4, 1 (x2) - German (Ger): b6, #4, 1, b3 - French (Fr): b6, #4, 1, 2 - Ger+6 and Fr+6 are just It+6s with extra stuff!

Italian is the “basic” flavor: it just contains all the notes that all the +6 chords have. In my experience, I actually had more trouble IDing It+6 chords than the other two because I psyched myself out looking for a fourth tone that obviously was not there. So, be aware that It+6s are going ot have a different shape than Ger+6 and Fr+6.

Speaking of shape, Ger+6s will usually appear in the same shape as a V6/5, while Fr+6 will usually appear in the same shape as a V4/3. The default shape for a It+6 is like a V6. (V(7) is used as a filler for simplicity: remember that these all have predominant function.ex: Ab C Eb F# can be renamed as Ab C Eb Gb to make a Ab7 chord instead of Aug6 chord)

The “inversion” doesn’t affect how we label these. No matter which note is in the bass, it’s always written as the default (x)+6. This is because the chord is *not* made up of stacked thirds, so our inversion labeling system doesn’t translate properly.

Common fix for Ger+6 resolution: have it go to a I6/4! Also be aware that composers may enharmonically write any of the tones for voice leading purposes (again, the primary use of these chords is just cool-sounding voice leading)

**Augmented sixth chords resolving to a non-dominant harmony** - By writing some notes enharmonically, we can basically sub in one dominant chord for another. In the example we did in class (in C), the respelled Ger+6 translated to a Db7, which still moved nicely over to V7. - Process: writing out the full chord (Db F Ab B) and respelling the B as a Cb. Cb wants to resolve down to the B in the next chord, and the F carries through to be the seventh. - If you keep the chord as written, we have our normal +6 chord function: the actual +6 resolves outward to the root of the next chord. So our original +6 chord from the example resolves to a C major chord. - Labeling: instead of using our “in the key of” secondary dominant labeling, the slash indicates “going to” and you write the scale degree below the slash. The Ger+6 in this example would be written as Ger+6/^1 (remember the caret should be written above the number) - In this instance, Ger+6/^1 actually has *dominant* function, rather than predominant. It subs in for V7 and proceeds straight to I. Think of respelling the chord as a Db7! Ger+6s can have dominant function…but only sometimes

**This was a lot of info, so here’s the most important things to remember:** - Tones of each kind of +6 chord - How the different tones resolve - Function(s) of a +6 chord

# Class discussion

**Key signature vs. key** - You don’t have to change key signatures to modulate. Think of a piece in sonata-allegro form: it will rapidly modulate during the development, but we don’t get a key signature change for each one. - Tonic defines key. Key signatures are shorthand for the benefit of the performer, they have nothing to do with the actual key

**Key relationships** - Each key has five closely related keys: the key with one more sharp, the key with one more flat, and the relative minor keys of all three. - Ex: the closely related keys to C major are F and G major + A, D, and E minor. The minor keys are relative to the major keys, which include C major and the keys one sharp and one flat in either direction.

**Tonicization vs. modulation: How do we tell the difference?** - Signaling is the same for both: look for accidentals, namely raised notes (ti in the temporary/new key, fi in the current key) - Placement: is the new key area happening at the end of a phrase or is it in the middle? Furthmore, what is *around* it? If we stay in the new key, we’ve modulated, but if it’s temporary it’s tonicization. - In the second example we listened to in class, we have a V/VI - VI progression to the first fermata. However, the chords after it are still in the key of I. This indicates that we haven’t changed keys. If we had, the following chords wouldn’t make as much sense in I because they’re actually in the key of VI - Ear training is vital. We talked about it a lot in class, but being able to follow *do* as it moves between keys will speed up the process of figuring out whether we’re tonicizing or modulating - Be aware that the actual *look* of the music can be deceiving. In the Chopin example we went over in class, he starts tonicizing Bb major. Since the example is in G minor, Bb major’s relative minor, putting in a V/III requires no accidentals. Hunting for accidentals is a good start for finding secondary dominants and/or modulations, but as with most theory things…it doesn’t always work

If it establishes the new key it’s a modulation. However, this requires multiple things: you have to have a cadence, and you have to stay in the new key. “Does the phrase feel solid and stable in a new key?” is a really subjective question, though, which is how arguments/debate arise.

# Class discussion

How do we know if a note is a non-chord tone?

Rhythms and placement in the bar. If the notes are on the downbeat or repeated many times, it is likely a chord tone.

Do the notes fit if we stack thirds?

Function!

Look for non-chord tone patterns and how they move. Think neighbor tones or suspensions etc.

## Extended Tertian Harmony and Non-chord tones

Extended harmony is anything beyond the seventh in a triadic chord. This includes 9ths, 11ths, and 13ths. Labeled G9, G11, and G13 (for dominant chords). - G9 is G,B,D,F,A - G11 is G,B,D,F,A,C - G13 is G,B,D,F,A,C,E

If a non-chord tone doesn’t fit within our given possibilities, it’s most likely an extension. Your options for non-chord tones are: - passing tone - neighbor tone - escape tone - appogiatura - suspension - retardation - pedal tone (pedal point) - anticipation

If you have what looks like a G7, and you see an A, but it doesn’t fit into any of these non-chord tone motion options, you have a G9.

### Dominant Ninth Chords

What are the differences between these chords? 1. V9 - when you have just a 9 next to the V, it includes all the triadic tones up to the ninth. - in C, spelled G,B,D,F,A. 2. Vadd9 - “add” means to add a note to the triadic harmony, in this case, you’re adding the 9th. - in C, spelled G,B,D,A. - also often grouped like G,A,B,D. - this is not the same as sub. - sub means to substitute a chord tone with the given note. 3. V9 65 - still spelled like a V9 but in first inversion (of seventh chord inversions). - if the ninth is on the bottom, it’s probably not a ninth, but a pedal tone. 4. Vsub13 - sub effects a chord tone, while add doesn’t. - though spelled the same as a iii6, it functions as the dominant so it is labelled Vsub13 (or Vsub6). - in C, spelled G,B,E.

A V9 chord is the combination of a V7 and a G#%7. In A, the lower 4 notes are E,G#,B,D (V7). The upper 4 notes are G#,B,D,F#. - when spelling dominant extentions use the diatonic scale degrees in the key of the tonic.

**ALL OF THIS BEING SAID,** the ninth chord is a last resort. It is rare in the type of music that this system of tonal analysis was created to analyze. Extentions are used mainly for jazz, which is far out of our fixed system of analysis.

Whether you analyze a tone as an extention or non-chord tone is up to how you hear it. Just make sure you label the tone to match what your analysis says.

In the case of a b9, (in A minor) the chord symbol would be a E7(b9). In the roman numeral analysis you would write V9, because the b9 is naturally occuring in the key. It is altered in the parallel major (how we label dominant extentions) so it is labelled as E7(b9) in chord symbols.

# Class discussion

Mode mixture, modal interchange, and borrowed harmony all = the same thing

Mode mixture is just borrowing chords from parallel modes. Remember that parallel modes all share the same tonic. For example, we’ll be dealing with all C scales, not every no-accidentals scale

V and vii0 are technically borrowed from the major key, we just use them in minor because it sounds pretty (stronger resolutions and actual dominant function)

**Variations between parallel major and minor** - Notice the voice leading is the *same*! This is why we say major and minor aren’t really different keys at all: their function is exactly the same. Be thinking about voice leading and harmony rather than the actual notes

**Borrowing chords from the parallel minor (in C)** - What do we have to do to alter ii to ii0? - Change the A in the tenor to an Ab. This is *le*, which makes our tenor line stronger because le has a stronger resolution down to sol than la (half step rather than whole step) - What do we have to do to alter vi to VI? - Alter the E in the alto to an Eb, and the A’s in the tenor and bass to Ab’s. - *Do not* raise the C in the soprano to a C#. While that would create an A major chord, what we actually want is an Ab major chord because that’s what is diatonic to C minor, the mode we’re borrowing from. - When we’re borrowing chords, if the root is altered you need to indicate it by putting an accidental in front. For example, the altered vi we went over in class would be written as bVI…very nicely eliminating the confusion of what chord it’s actually supposed to be. The A major chord would actually be a V/ii. - We did a Picardy third. This is when everything is in minor but you end on the major I.

**More borrowing from the parallel minor** - vii%7 to vii07: pretty standard, stronger resolution because we have le instead of la - vii%7 to bVII7: weird to hear because we’re so used to ti -> do resolutions, so have te instead sounds “wrong” - V7 to v7: “this one just sucks, right?” - We need ti in order to have dominant function! Ti is your best friend who makes things actually sound nice - If you’re going to do mode mixture, be sure to be consistent with altered tones. If you used both V7 and bVII, it will sound like you couldn’t make up your mind. Either use ti both times or te both times - IV6 to iv6: sounds cool, but funky because the bassline has an A2 in it. Funnily enough it goes really well with a bVII though - vi to bVI: IT SOUNDS GOOD! Cannot go wrong with The Batman Chord, especially as part of a deceptive cadence. Sounds epic

**Note:** this last bit was an exercise in messing around and hearing different colors, not a model for how you should do assignments. Some of these swaps just sound really, really bad and/or are a nightmare to deal with.

*Le* and *me* are going to be your most borrowed tones, though *le* is more common.

# Class discussion

**Refresher: what is a pitch class (pc)?** - A number to represent all enharmonic equivalents of a pitch. We use 0 to e - Remember 10 and 11 are represented as t and e

**Refresher: what is a pitch class set (pcs)?** - A collection of pitch classes. Each group size has a different name (refer to the chart in 22b)

**Notating pitch class sets** - Many of the examples on your homework will be *unordered* pitch class sets. Despite this name, we need a standard system for writing these so we can easily make them *ordered* later. - Undordered pc sets are notated with parantheses around the set and commas between each pc. Examples: (0,1,5,t) and (Bb,C,D,G). Like two points on a graph are notated before you actually graph them.

**Modulo 12 arithmetic** - 12 is the magic number in this system! Everything is based around 12. Just like how you know that the clock resets when you go from noon to 1 P.M., the number above e/11 in this notation roll back around to 0, 1, 2, etc. - If you have a number above 12, you subtract 12 from it to get the number that’s actually within the bounds of our system.

**Notating transposition** - We are solely in fixed zero now. - We have the pitch class set (E,F,G,Bb). Using traditional transposition methods, transpose up a P4 to get (A,Bb,C,Eb) - If we convert our first pcs to integer notation, we get (4,5,7,t). Add 5 to each number (subtracting 12 from any numbers over e), and we have (9,t,0,3). Convert the second set back to note names, and you will find it’s the same as the second set the first time we transposed in our traditional method. - The numbers in integer notation represent intervals from 0. 5 = P4 because F is a P4 (5 half steps) from C (0) - You would notate this process like this: T5(E,F,G,Bb) = (A,Bb,C,Eb) OR T5(4,5,7,t) = (9,t,0,3). T5 just means that we are transposing by adding 5, and it is fixed to the front of the original set to show that it is the one we’re manipulating.

**Transposing downward** - Same process as above, but instead of adding numbers we subtract them! - In Mod12, you can also add 12 to a negative number to get a pc within the bounds of our notation system.

**Normal form/normal order** - Normal form/order is an ascending arrangement of a pcs where the outside interval is smallest. This is very different from tertian harmony, where we’re concerned with stacking in thirds. - Let’s use (1,7,t). Think about this process like using a clock face: you can only go clockwise, which means you can shuffle which nubmer is first in the set as long as the set remains in the same order. You can have (7,t,1) but you can’t have (1,t,7) because t is out of ascending order. - We can have (1,7,t,), (7,t,1), or (t,1,7). We’re looking for the smallest outside interval, which we do by subtracting the last integer from the first one in the set. t-1=9, 1-7=6, and 7-t=9. Since the middle one has the smallest interval, the normal form for (1,7,t) is [7,t,1]. - Square brackets and commas denote normal form. - *Always* put things in ascending form before you put them in normal or prime form. This form allows us to go through the process of finding the smallest outside interval, so it’s important that we start out using it.

**Breaking ties for ordering pitch class sets** - What do we do if we do all our subtracting and end up with two of the same result?? - Go one more number in from the right with the remaining possibilities to break the tie! Obviously there was no tie to break with (1,7,t), but if we wanted to break the tie between the two 9 answers we would go 7-1=6 and 1-t=3 respectively.

**Developing a method for normal form using (3,e,5,2,8)** - Put in ascending order: (2,3,5,8,e). Any ascending order is fine, but I usually start with the smallest number on the left because it makes sure I don’t get mixed up - Get all our different ascending forms: - (2,3,5,8,e) - (3,5,8,e,2) - (5,8,e,2,3) - (8,e,2,3,5) - (e,2,3,5,8) - Subtract the outside numbers (last number - first number): - e-2=9 - 2-3=e - 3-5=t - 5-8=9 - 8-e=9 - Subtract the next smallest intervals for the tiebreakers (second to last number - first number): - 8-2=6 - 3-8=7 - 5-e=6 - Subtract the next smallest intervals for the second tiebreakers (third to last number - first number): - 5-2=3 - 3-e=4 -The normal form for this pentachord is [2,3,5,8,e]. Remember that we’re subtracting the same number every time–we’re just changing what we’re subtracting it *from*

Completely symmetrical pitch class sets don’t have a normal form, so we would just write it in ascending form with the smallest number at the bottom.

# Further reading

## From *Open Music Theory*

### Transposition

In post-tonal music, transposition is often associated with motion: Take a chord, motive, melody, and when it is transposed, the aural effect is of *moving* that chord, motive, or melody in some direction. That’s the effect here, in two disconnected passages from Debussy’s, *La cathédrale engloutie*:

The opening motive — comprising the notes B, D, E, or {11, 2, 4} — is transposed four semitones higher in m. 18, representing the cathedral’s slow ascent above the water. Transposing something preserves its intervallic content, and not only that, it preserves the specific arrangement of that thing’s intervals. When we hear the passage at m. 18 above, we recognize its relationship to the passage in m. 1 because the same intervals return, but starting on a different pitch.

Transposition is an operation — something that is *done* to a pitch, pitch class, or collection of these things — or alternatively a *measurement* — representing the distance between things. We represent it as *Tn*, where *n* represents the ordered pitch-class interval between the two things. To transpose something by *Tn*, add *n* to every element in that thing (mod 12). Given the collection of pitch classes in m. 1 above and transposition by *T4*:

The result is the pitch classes in m. 18. *T4* {11, 2, 4} = {3, 6, 8}.

Alternatively, to determine the transpositional relationship *between* two things, subtract the first thing from the second. If the numbers that result are all the same, the two things are related by that *Tn*.

This is how I arrived at the *T4* arrow label in the musical example above, by “subtracting” the pitch class integers of m. 1 from the pitch-class integers in m. 18.

### Normal Form

Normal order (sometimes called normal form) has a lot in common with the concept of triad “root position.” Among other things, root position is a standard way to order the pitch-classes of triads and seventh chords so that we can classify and compare them easily. Normal order does the same, but in a more generalized way so as to apply to chords containing a variety of notes and intervals.

Normal order is the most compressed way to write a given collection of pitch classes. Often, you’ll be able to determine normal order intuitively using a keyboard or a clockface, but it’s good to learn a process that will always give you the correct answer.

1. Write as a collection of pitch classes (eliminating duplicates) in ascending order and within a single octave. There are many possible answers.
2. Duplicate the first pitch class at the end.
3. Find the largest ordered pitch-class interval between adjacent pitch classes.
4. Rewrite the collection beginning with the pitch class to the right of the largest interval and write your answer in square brackets.

For example, given {G-sharp4, A2, D-sharp3, A4}:

1. *Write as a collection of pitch classes (eliminating duplicates) in ascending order and within a single octave.* {8,9,3}
2. *Duplicate the first pitch class at the end.* {8,9,3,8}
3. *Find the largest ordered pitch-class interval between adjacent pitch classes.* In this case, the largest interval is between “9” and “3.”
4. *Rewrite the collection beginning with the pitch class to the right of the largest interval and write your answer in square brackets.* [3,8,9]

Occasionally you’ll have a tie in step 3. In these cases, write the ordering implied by each tie and calculate the interval from the first to the penultimate pitch class. The ordering with the smallest interval is the normal order.

# Class discussion

**What is a collection?** - A collection is an organized group of pitches. It’s kind of a squares and rectangles situation. All scales are collections, but not all collections are scales.

**What is a mode?** - Related to major scales, modes are based around the various scales degrees of a major scale. For example, E Phrygian is the same key signature as C major but starts on the third scale degree - If thinking in terms of what is altered from the original key is more helpful, you can instead think of E Phrygian as having a lowered 2, 3, 6, and 7. Each mode has its own lowered (or raised) scale degrees

## Seven note collections

**All our modes:** - Ionian (major) - Dorian: 2nd degree of major scale/lowered 3 and 7 - Phrygian: 3rd degree of major scale/lowered 2, 3, 6, and 7 - Lydian: 4th degree of major scale/raised 4 - Mixolydian: 5th degree of major scale/lowered 7 - Aeolian (natural minor) - Locrian: 7th degree of major scale/lowered 2, 3, 5, 6, and 7 - Lydian Dominant: half Lydian, half Mixolydian/raised 4, lowered 7. You can remember this scale’s relation to Mixolydian because of “dominant”/V because Mixolydian is based around the fifth scale degree

## Five note collections

**Major pentatonic** - 1, 2, 3, 5, 6/do re mi sol la

**Minor pentatonic** - 1, b3, 4, 5, b7 - Related to the major pentatonic scale in the same way that the regular major and minor scales are related: minor pentatonic is just major pentatonic starting on la

**Hirajoshi pentatonic** - 1, 2, b3, 5, b6/do re me sol le - Major pentatonic using minor notes

## Six note collections

**Whole tone scale** - Every note is a whole step apart. There are only two unique whole tone collections: C D E F# G# A# and Db Eb F G A B. You can start on any of the notes within these collections, but the cycle of the two will be the same - There’s no possible center to a whole tone scale because there are six notes in it and they are all a whole step apart. This gives it its characteristic off-kilter feeling - Whole tone scale don’t have a standard mode of notation but will always have a diminished third somewhere - Another way to think of these is as two interlocking augmented triads. For example, with the first whole tone collection (C D E F# G# A#), it is made up of the two augmented triads C E G# and D F# A# - Pretty common in music because composers like to do cool and fancy stuff with them

**3+1 and 1+3 Hexatonic** - Based on interval patterns. 3+1 trades off between a minor third and a half step between each note, and 1+3 trades off between a half step and a minor third between each note - The 3 actually means three half steps, but it may be easier to think of it as a minor third instead - These scales have 4 unique collections which you can look at in the textbook because I don’t want to write them all out here sorry - As an example, though, each collection can be used for either scale. Starting on a note that is followed by a half step, you start a 1+3 hexatonic scale. Starting on one followed by a minor third, you start a 3+1 hexatonic scale - We always label these scales in ascending form!! You might be asked to build a descending one of these, so make sure the interval pattern is correct

## Eight note collections

**Ocatonic (also called a diminished scale)** - Happen either half-whole (HW) or whole-half (WH) - Start on one note and alternate between half and whole steps (for a HW octatonic) or between whole and half steps (for a WH octatonic) - 3 unique octatonic collections. Just like the hexatonic and whole tone scales, you can start on any pitch within the collections to get a different scale - Stravinsky likes these! They have the potential to sound really spooky and weird

# Further reading

## From *Open Music Theory*

Folk, pop, classical, and modern composers often organize pitch materials using scales other than major and minor. Some of these scales, like the various diatonic *modes* and the pentatonic collection, are relatively familiar to most listeners. Others — such as octatonic, whole-tone, and acoustic collections/scales — are more novel, and usually (but not always) found in twentieth- and twenty-first-century compositions.

When characterizing many of these new musical resources, the word “collection” is often more appropriate than “scale.” A *collection* is a group of notes — usually five or more. Imagine a collection as a source from which a composer can draw musical material — a kind of “soup” within which pitch-classes float freely. Collections by themselves do not imply a tonal center. But in a composition a composer may establish a tonal center by privileging one note of the collection, which we then call a *scale*.

### Diatonic Collection (modes)

The *diatonic collection* is any transposition of the 7 white keys on the piano. Refer to these collections by the number of sharps and flats they contain: the “0-sharp” collection, the “1-sharp” collection, and so on. The “2-flat” collection, for example, contains the pitch classes {F, G, A, B-flat, C, D, E-flat}.

When these collections gain a tonic note, they morph into scales, which by tradition we name according to the “modal” system established in centuries ago. (Note that while these modes share their names with the modes of the Medieval Christian church, they function quite differently. The similarity is principally one of name.)

One way to look at these “modes” is to think of the seven white keys of the piano {C, D, E, F, A, B}. These notes, when starting on different pitches, create the different modal scales. By taking each note of the seven-white-key collection, and treating it as as the tonic, all seven modal scales can be played. Ionian treats C as tonic, Dorian treats D as tonic, Phrygian treats E as tonic, Lydian treats F as tonic, Mixolydian treats G as tonic, Aeolian treats A as tonic, and Locrian treats B as tonic:

Ionian mode (major scale): *do re mi fa sol la ti do*

Dorian mode: *do re me fa sol la te do*

Phrygian mode: *do ra me fa sol le te do*

Lydian mode: *do re mi fi sol la ti do*

Mixolydian mode: *do re mi fa sol la te do*

Aeolian mode (natural-minor scale): *do re me fa sol le te do*

Locrian mode (uncommon outside jazz): *do ra me fa se le te do*

Like the major and minor scales, these intervallic relationships can be transposed to any tonic pitch.

### Pentatonic Collection

*Pentatonic collections* are five-note *subsets* of the diatonic collection. Here’s a quick way to create a pentatonic collection: (1) List the notes of a major scale. (2) Remove scale degress 4 and 7. (E.g., the pentatonic collection {C,D,E,G,A} corresponds to scale degrees 1,2,3,5,6 of the C major scale.)

Removing scale degrees 4 and 7 results in a collection with no half steps. As a result of its “halfsteplessness,” any member of the collection easily functions as a tonal center. For example, given the 0-sharp pentatonic collection, there are five unique scales formed when each of the collection’s pitch classes become a tonic: C pentatonic (C,D,E,G,A), D pentatonic (D,E,G,A,C), E pentatonic (E,G,A,C,D), and so on.

The black keys on the piano also form a pentatonic collection:

## Whole Tone Collection

This is a group of notes generated entirely by whole tones: {0,2,4,6,8,10}, for example.

There are only two unique *whole-tone* collections. WT0 contains pitch classes {0,2,4,6,8,10}, while WT1 contains pitch classes {1,3,5,7,9,11}. In other words, WT0 contains the pitch classes {C, D, E, F-sharp, G-sharp, B-flat}, while WT1 contains pitch classes {C-sharp, D-sharp, F, G, A, B}.

### Octatonic Collection

Called octatonic because it has eight pitch classes, the *octatonic collection* is full of compositional potential and has been used by many composers to a variety of ends. An octatonic collection is easily generated by alternating half steps and whole steps. Using pitch class numbers, one example is {0,1,3,4,6,7,9,10}.

The interval content of this collection is very homogenous, and this intervallic consistency leads to one of its most interesting properties. When we transpose the above collection by 3—adding 3 to each of the integers in the collection—{0,1,3,4,6,7,9,10} becomes {3,4,6,7,9,10,0,1}. Comparing the two shows that these collections are exactly the same! In fact, you would come up with the same collection if you transposed it by 6 or 9 as well.

Olivier Messiaen called such collections “modes of limited transposition.” (The whole-tone scale is also a mode of limited transposition.) And as a result of the property, there are only three unique octatonic collections. We name these arbitrarily as OCT(0,1), OCT(1,2), and OCT(2,3). The numbers to the right of “OCT” are pitch classes within that scale. (E.g., the {0,1,3,4,6,7,9,10} collection I discussed above is OCT(1,2).) We can also call them C–C♯ octatonic, C♯–D octatonic, and D–E♭ octatonic.

### Other Collections and Scales

There are many, many other collections and scales used by composers and musicians in the twentieth- and twenty-first centuries. Messiaen, for example, described five more [modes of limited transposition](http://en.wikipedia.org/wiki/Modes_of_limited_transposition), and there are other smaller collections that have the same property. [Acoustic scales](http://en.wikipedia.org/wiki/Acoustic_scale), formed from the first seven unique partials of the overtone series, are common in the music of Debussy, Bartok, and Crumb — ocassionally as a representation of nature. Jazz musicians have an entire set of scales used for improvisation. Non-Western musics often have unique systems of scales and collections, such as the rāgas used in Indian classical music.

More generally, any large set of pitch classes that form the basis for a passage may function as a collection, even if it has no familiar name. Most often, music theorists refer to these collections with pitch-class set notation.

*This resource was created by Brian Moseley and contains contributions from Meredith Cahill, Elise Campbell, and Kris Shaffer.*

# Class discussion

# Further reading

## From Open Music Theory

### Periods

A period is one type of theme, like the [sentence](sentence.html), common to the Classical style.

The period is generally eight measures long and contains two four-measure phrases, called *antecedent* and *consequent*.

The period is characterized by balance and symmetry. Its antecedent phrase is initiated by a basic idea that recurs at the beginning of the consequent phrase. Unlike the sentence, which exhibits a single cadence, the period contains *two cadences*, a weak one to end the *antecedent* and a strong one to end the *consequent*.

#### Antecedent phrase (mm. 1–4)

Unlike the sentence, which contains a basic idea followed by a repetition, the two measure basic idea that begins the a period’s antecedent is always followed by a two-measure *contrasting idea* (CI). That contrasting idea supports a cadential progression that ends the antecedent with a weak cadence, either a HC or an IAC.

Antecedent: Haydn, Piano Trio in C major, Hob. XV:27, III, mm. 1-4

Note the contrast created between the basic idea and contrasting idea. While the BI ascends, outlining the tonic triad with leaps to each of its members, the CI descends stepwise leading to a weak I:HC. The emphasis on tonic in the melody of the BI is accompanied by a tonic prolongation in the harmony (a variant of the [*Romanesca* schema](schemataOpensAndCloses.html)):

**I V6 VI III**  
or  
**T(1 D7p x6 3)**

Supporting the CI is an expanded cadential progression:

**III IV V6/5/V V**  
or  
**T3 S(4 [+]) D5**

#### Consequent phrase (mm. 5–8)

Consequent phrases always begin with a restatement of the BI, occasionally varied, and end with a CI. A consequent phrase’s CI often resembles the antecedent’s, but slightly altered to accommodate a stronger cadence. It is also common for a consequent phrase’s CI to be entirely new. While a sentence can close with a number of cadence types, the period’s consequent phrase always ends with a PAC:

Antecedent + Consequent: Haydn, Piano Trio in C major, Hob. XV:27, III, mm. 1-8

In this example, the BI is restated exactly at the beginning of the consequent. The concluding CI is a slight variation of the end of the antecedent, altered here to create a PAC.

# Class discussion

Harmonization of “Inserting secondary dominant functions into various root movement patterns”

Progression I, vi7, V7/ii, ii, V7/V, V7, I

Soprano: C, C, C#, D, D, D, C Alto: E, G, G, F, F#, G, E Tenor: G, A, A, C, C, B, G

Bass notes (found from inversion): C, A, A, D, D, G, C

Any major, minor, or dominant quality can be tonicized. For leading tone chords, check previous page chpt.15a.

Inserting secondary dominants helps to create smooth bass lines.

(Following to be used for example 3 on previous page - DO NOT ALTER)

{% capture ex1 %}X:1 T:Creating a step-wise bass line M:4/4 L:1/2 K:C V:1 [cE][dE]| [eE][eG]| [fA][dA]| [d2G]| [c2E]|] V:2 clef=bass [C,G,][B,,^G,]| [A,,C][G,,C]| [F,,C][^F,,C]| [G,,2B,]| [C,2G]|] w:C:I x vi x IV x V7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## More Secondary Dominant Functions

Any chord can have secondary function, not just dominants and leading-tones.

The V/IV in C is a C major chord. The only reason to label a C chord as V/IV is if the V is a V7. This makes a V7/IV, spelled CEGBb, or I7. BUT you will NEVER see a I7. It’s function is the dominant of F, or the IV, so we write it as V7/IV. This is the same idea as the V/V being a II, but you will never write it as a II because that’s not how it functions.

### Secondary Dominant chords for functions other than Dominant

This can include: - V/vi - V/ii - V/I (don’t write) - etc.

The chord guide chart has secondary function replacements for each chord.

Diatonic Harmony: iii - vi - ii - V - I

Chromatic Harmony: V/vi - V/ii - V/V - V/I - V/IV - these can all be 7th chords as well - in that case, the V/IV only functions as a 7th chord - the V/V is included as a pre-dominant function

When can we use a secondary dominant funtion? - to prepare for a modulation - when there’s a circle of fifth progression - *where there are chords* - the only chord you can’t decorate is a diminished chord - every other chord can be tonicized

The root movement is the same whether you use diatonic or chromatic harmony.

#### Example In Ab

Where can you insert a secondary dominant?

iii - vi - ii - V - I

Cm - Fm - Bbm - Eb - Ab - On the Fm chord iii - V/ii - ii - V - I

Cm - F - Bbm - Eb - Ab - chromatic harmonies like to move in half-step motion. - flats resolve down - sharps resolve up

With the V/ii - ii (F - Bbm), the chordal third of the V/ii resloves to the the root of the ii. If the secondary dominant is a seventh chord (V7/ii), the chordal seventh resolves to the third of the ii chord. - this is because half-step motion likes to resolve

Take the progression V7/V - V7 - I in C (D7 - G7 - C). The chordal third of the D7 (F#) resolves up to the root of the V7 (G). - this is F# moving upward in half-step motion

The chordal seventh of the D7 (C) resolves down to the third of the V7 (B). - more half-step motion

#### Example In C: Inserting Secondary Dominant Functions

Given…

Soprano: C5 - C5 - C5 - C5 - D5 - D5 - D5 - C5

Alto: E4 -

Tenor: G3 -

Bass: C3 - C3 - A2 - A2 - F2 - F2 - G2 - C3

Roman Numerals: I - x - vi - x - IV - x - V7 - I - any place there is an *x* in the progression there can be a secondary dominant

Fill it in…

Lead Sheet: C - E7/B - Am - C7/G - F - D7/F# - G - C

Soprano: C5 - D5 - C5 - C5 - D5 - D5 - D5 - C5

Alto: E4 - E4 - E4 - E4 - F4 - D4 - F4 - E4

Tenor: G3 - G#3 - A3 - Bb3 - A3 - A3 - B3 - G3

Bass: C3 - B2 - A2 - G2 - F2 - F#2 - G2 - C3

Roman Numerals: I - V^4/3/vi - vi - V^4/3/IV - IV - V^6/V - V7 - I - notice that any accicentals only move in the half-step motion of their tendancy - sharp accidentals resolve up - flat accidentals resolve down

# Class discussion

## Secondary Dominant Chords

**In a minor key, are i and iv diatonic or chromatic?** - They are diatonic! They show up naturally in minor keys. If we were to have a iv in a major key, that would be a chromatic chord. Any chord that is modified from how it would appear naturally in the major or minor key is chromatic.

**A standard progression: I - vi - ii - V - I (in C)** - Remember: fa does *not* always go to mi. In this progression, if you have F and G in the alto voice for ii and V, fa should go to sol. This is because in circle-of-fifths progressions, thirds always resolve up to the root of the next chord.

**Altering ii - V** - The mystery chords are V and I in G major. All we did was alter the key signature for the second two chords. The key signature is a stand-in for adding an accidental (raised third) to ii.

**Changing ii to a dominant chord** - In order to get the same effect we got in the last example, we need to add an accidental. Raise the third in ii to get…a V/V! This is called *tonicization*. - Tonicization = extending harmony to treat any non-tonic chord as a tonic. Another way to think of this is just us temporarily creating a tonic. Remember, V/V - V movement is really just V - I in the key of V. - Slashes below the staff = “x **of** x.” Slashes above the staff = “x **over** x.” It can be confusing, but try not to mix them up! Remember that Roman numerals label function, whereas chord symbols label the actual notes within a chord. - Unlike tertiary function chords, secondary dominants *replace* function, rather than extend/embellish it. I6/4 is always paired with V because it extends dominant function, but V/x is always paired with x because we are temporarily going to x’s key area. One way to remember this is that we are temporarily phasing over to a *secondary* key.

**Do not** tonicize ii0 in minor or vii0 ever. There is no diminished key and trying to do this for our part writing in this class is a bad idea. However, in analyses later in the semester you might see a composer do this because the Romantic period was really crazy.

**Secondary dominant seventh chords (same progression as before, but with ii7)** - This process is the same as for turning a regular ii into a V/V, but we end up with a V7/V instead! - *How do I tell what inversion a secondary function chord is in?*: The inversion figures will always be attached to the Roman numeral to the left of the slash, as seen with V7/V. They go with the “upper” Roman numeral because the “lower” one is just a shorthand for a key in relation to the key we are already in. - As we’ll see in coming lectures, this process can used to tonicize any major or minor triad.

**How do we determine V/V in different keys?** - Literally ask “what is the V of V” and go from there - Relate V/V to something you’re already very familiar with: ii! In a way, V/V is really just a fancy ii. They share the same root and usually share the same function. The only difference is V/V’s raised third - If thinking about solfege works better for you, you can use the above point but think about sol and re instead. If you see re and fi together, you’ll know it’s likely a V/V - These chords are weird and require added accidentals so double-checking (or even triple-checking) them is always a good idea!! Make sure what you ID’d matches up with what you wrote out in the staff.

# Further reading

## Class discussion

**Things to consider before you start part writing** - Harmonic Rhythm; pitches could switch between being a chord tone and a NCT depending on the harmonic rhythm - Chords/progression - Cadence - Key; Where are the important notes? What notes are on the strong beats?

**Doubling** - No doubling thirds - The fifth can be omitted and the root tripled, but you *must* have the third to indicate the quality of the chord. - Seventh chords - The fifth can also be omitted in a seventh chord, but you have to have the root, third, and the seventh. - No doubling thirds or sevenths (because the further you are into the overtone series, the worse it will sound as they are tendency tones). You will also have to resolve those tones and if they resolve the same way, those voices are now locked together/pattern.

**Spacing** (SATB = Soprano, Alto, Tenor, Bass) - SAT need to be within an octave of their adjacent voices. There can be more than an octave between S and T, but not S and A or A and T - Closed position: less than an octave between S and T. Open position: more than an octave between S and T - B can be as far away or as close to T as you want. It doesn’t matter, but it sounds nice when you have bigger intervals on the bottom.

**Range** - “A little above the staff to a little below the staff in all the named clefs” - S: middle C to G on top of the treble clef staff - A: G below middle C to D in the treble clef staff - T: C3 to G above the bass clef staff - B: E below the bass clef staff to D above the bass clef staff - S and T ranges are the same, just an octave apart. The top of A and B ranges are an octave apart. Be mindful that the bottom of A and B are *not* an octave apart.

**Voice crossing** - Voice crossing is when one voice moves to be above or below another. - Don’t do it. Never ever. Do not do voice crossing ever.

# Further reading

## From *Open Music Theory*

### Chord voicing

In strict keyboard-style writing, there are four voices: the bass line (which is usually a given in *basso continuo* style), and three *upper voices*: the *melody* or *soprano*, the *alto*, and the *tenor* (from highest to lowest). Since all three upper voices must be played by a single hand, they should never span more than an octave.

The melody always has an upward-pointing stem. Alto and tenor share a downward-pointing stem. If the alto and tenor share a note, that note receives a single downward-pointing stem. (See m. 1 of the example below.) If melody and alto share a note, that notehead is double-stemmed. (See m. 4 of the example below.)

When choosing the notes to place in the upper voices above a figured bass, use the bass and figures to determine the pitch classes present in the chord. (When realizing an *unfigured bass*, you must determine appropriate figures before realizing.) If the chord is a four-note chord, use each chord member once, including the bass (exceptions will be noted later). If a chord has three pitch-classes (a triad, for instance), use each pitch-class once, and “double” one of them according to the following principles:

* If the figure is 6/4, 5/3, or other chord of the fifth, double the bass pitch class.
* If the figure is 6/3 and the bass is a *fixed scale degree* (*do*, *re*, *fa*, or *sol*), double the bass pitch class.
* If the figure is 6/3 and the bass is a *variable scale degree* (*mi*/*me*, *la*/*le*, or *ti*/*te*) or a chromatically altered pitch, double one of the upper voices at the octave or unison.
* Generally, do not double a variable scale degree or a chromatically altered pitch.

### Tendency tones

A *tendency tone* is a pitch (class)—usually represented as a scale degree—that tends to progress to some pitch classes more than others. Sometimes this tendency is absolute within a style, but more often it is context-dependent.

The most prominent tendency tones in Western tonal styles are *ti* (not *te*) and *le* (not *la*).

Generally speaking, when *ti* appears it tends to be followed by *do* in the same voice. In a harmonic context, this tendency is strongest when *ti* occurs in a dominant-functioning chord, and the “resolution” of that tendency comes upon change of function (to tonic or predominant).

Likewise, when *le* appears, it tends to be followed by *sol* in the same voice. This tendency is less dependent on function.

Exceptions to these tendencies include:

* When *ti* is in the middle of a stepwise descent (*re*–*do*–*ti*–*la*–*sol*, for example), it can progress down by step. (Note that *step inertia* here diminishes the effect of an “unresolved” tendency tone. Because there are two conflicting tendencies in play, in this case, either can be “resolved” unproblematically.)
* When *ti* is in an inner voice, it can progress down to *sol* if necessary to accomplish good voice-leading in the other voices and ensure complete chords. This is called a *frustrated leading-tone*.
* When *ti* is a functional dissonance of a tonic-functioning chord (see below) it should progress down by step.

### Functional dissonances

Some tendencies, such as the tendency for *le* to progress down, are relatively context-independent. Others are heavily contextualized. The primary contextual tendency for how melodic notes progress is the concept of *functional dissonance*.

Keep in mind from the [Harmonic functions resource](harmonicFunctions.html) that chords tend to cluster in one of three functional groups (**T**, **P**, or **D**) When pitches fuse into a chord expressing one of these three functions, the pitches that comprise that have certain tendencies of progression that they may or may not have in other contexts.

Following are the scale degrees which act as dissonances for their respective functions:

| function | dissonances |
| --- | --- |
| T or Tx | 7, 5 when 6 is also present |
| P | 3, 1 when 2 is also present |
| D | 4, 6 |

In purely diatonic music (triads and seventh chords, no chromatics), these will include *the seventh of every seventh chord*, *the fifth of viiº or VII* (*fa*), and *the fifth of III or iii* (*ti/te*).

Keep in mind that only sometimes do these functional dissonances express themselves in chords or intervals that are acoustically dissonant. However, they do introduce a degree of tension that, like an acoustically dissonant interval in species counterpoint, requires a smooth introduction and a specific resolution.

When one of these scale degrees is present in a chord with the corresponding function, the dissonant scale degree has a strong tendency to *resolve down by step over the next change in function*. In strict composition, we will *always* follow these tendencies.

In strict keyboard style, these functional dissonances should be “prepared” (approached) by common tone or by step. Thus, though they are proper members of the chord, melodically they will look like one of the three dissonance types of species counterpoint: a *passing tone* or *neighbor tone* dissonance that is approached by step, or a *suspension* dissonance that is approached by a common tone. The suspension type is preferred.

Once a functional dissonance is introduced, it must be resolved down by step in the same voice when the function changes. The dissonance can also be *transferred* to another voice before resolution—for instance, if there are multiple chords in a row exhibiting the same function, a dissonance that appears in the alto can be transferred to the tenor in the following chord, and then resolve in the tenor when the function changes. (It is more typical, and smoother sounding, to transfer dissonances between inner voices or from an inner voice to an outer voice than from an outer voice to an inner voice. Once a dissonance appears in the melody or bass, where it is more noticeable, it tends to resolve in that voice.)

Functional dissonance resolutions often cause conflicts with other principles of voice leading. Except in special cases such as *schemata* (standard patterns that are common enough to sound appropriate, even if they follow different rules), the functional dissonance resolution takes precedence over other principles such as the *law of the shortest way*, contrary motion with the bass, and preferring common tones and steps to melodic leaps. A dissonance resolution is never an excuse for illegal parallels, and only rarely will lead to non-standard doublings.

Seventh chords are most easily thought of as an extension of triads, and our labeling system reflects this. In the same that we create a triad by stacking two 3rds, we create a seventh chord by adding another 3rd on *top* of a triad. They are called seventh chords because this new pitch creates an interval of a 7th between the chordal root and the new pitch.

{% capture ex1 %}X:1 %%staffsep 100% T:Diatonic Seventh Chords in the Major Scale M:C L:1/2 K:C [CEGB] [DFAc]| [EGBd] [FAce]| [GBdf] [Aceg]| [Bdfa] [cegb]|| w:MM mm mm MM Mm mm dm{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

Because they are stacked thirds, seventh chords are still considered tertian harmony. They are prevalent in almost all styles of Western music, and we have developed many systems to describe how they *function* harmonically. Again though, we must first be able to classify and label them in an structural manner that does not rely on key-based functions. We name the chord members by the distance above the bottom pitch **when the chord is stacked in thirds**: - the lowest pitch is called the *root* of the chord - the pitch that is a 3rd above the root is called the *chordal third* - the pitch that is a 5th above the root is called the *chordal fifth* - the pitch that is a 7th above the root is called the *chordal seventh*

### Seventh chord inversions

All seventh chords have exactly four unique notes, although certain chord members can occasionally be omitted (and therefore implied) depending on the context. With four pitches, there are four possible configurations that depend on which note of the triad is in the lowest voice. Like triads, we call these *inversions*, and we use the same shorthand system to label inversions that we used with triads.

## Goals for this topic

Using the examples below: - determine what role each chordal member (e.g. root, third, fifth, etc.) plays in determining the quality of a seventh chord - How does this relate to triads? - find all six intervals between the chordal members of a root-position seventh chord for each of the following chord qualities: - *major seventh, minor seventh, dominant seventh, half-diminished, fully-diminished* - explain how we determine both words of each of the alternate names for seventh chords - *Major major* (MM), *major minor* (Mm), *minor minor* (mm), *diminished minor* (dm), and *diminished diminished* (dd) - find the following interval sizes between chordal members of a seventh chord (Hint: This may involve moving some chord members up or down an octave) - seconds (1) - thirds (3) - fourths (2) - fifths (2) - sixths (3) - sevenths (1) - relate these intervals to our system for labeling seventh-chord inversions - provide inversion figures for root-position, first-inversion, second-inversion, and third-inversion seventh chords - be able to explain how to turn any inverted and/or open-voiced seventh chord into a root-position seventh chord in a closed voicing

### Seventh chord qualities

{% capture ex2 %}X:2 T:Seventh chord qualities M:2/4 L:1/2 K:C “Major seventh (MM)”[DFAc]| “Dominant seventh (Mm)”[D^FAc]| “Minor seventh (mm)”[DFAc]| “half-diminished (dm)”[DF\_Ac]| “fully-diminished (dd)”[DF\_A\_c]||{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Seventh chord inversions

Because ABC notation is not capable of using superscript, the inversion figures in the next example are notated as fractions. If you were to write these by hand or use custom notation software, you would notate all inversion figures using superscript. For example, a dominant seventh chord with C as a root would be written as C7

{% capture ex3 %}X:3 T:Seventh chord inversions T:1) Inversion names are listed above the staff T:2) Inversion figures are listed below the staff T:——— M:2/4 L:1/2 K:C “Root position”[D^FAc]| “First-inversion”[d^FAc]| “Second-inversion”[d^fAc]| “Third-inversion”[D^FAC]|| w:7~(7/5/3) 6/5~(6/5/3) 4/3~(6/4/3) 4/2~(6/4/2){% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Seventh chord voicings

{% capture ex4 %}X:4 T:Seventh chord voicings M:2/4 L:1/2 K:C V:1 “Closed”[dFAc]| “Closed”[Ac]| “Open”[dF]| “Open”[dFAC]| V:2 clef=bass z| [DF]| [A,,C]| [D,,D,]|{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Conclusions

A seventh chord is a diatonic chord containing four pitches stacked in thirds.

There are 5 types of seventh chords, and we will be using both of the commonly used terms for them: - *Major major* (abbreviated MM) or *major seventh chord* - *Major minor* (abbreviated Mm) or *dominant seventh chord* - *Minor minor* (abbreviated mm) or *minor seventh chord* - *Diminished minor (abbreviated dm) or* half-diminished seventh chord\* - *Diminished diminished* (abbreviated dd) or *fully-diminished seventh chord*

These terms are interchangeable but they are typically used in different circles. We will refer to them as the pedagogical name (e.g. major major, etc.) and common name (e.g. major seventh chord, etc.).

The pedagogical names are useful in illustrating the structure of a seventh chord and is unsurprisingly often used by theory teachers. The first word represents the quality of the base triad on which the seventh chord is built (e.g. major triad on bottom), and the second word describes the interval between the root and the chordal seventh. This description explains the nature of the pedagogical categorization–it mixes a chord quality with an interval quality. The first word always describes the triad (the bottom three pitches) while the second word describes the *interval quality* between the root and the seventh chordal member. This interval is always assumed to be a 7th.

* Major major (major seventh chord): major triad + M7
* Major minor (dominant seventh chord): major triad + m7
* Minor minor (minor seventh chord): minor triad + m7
* Diminished minor (half-diminished seventh chord): diminished triad + m7
* Diminished diminished (fully-diminished seventh chord): diminished triad + d7

Building on your knowledge of inversion figures from triads, it should be possible to derive the seventh chord system. Like triad inversions, they: - use the intervals above the *bass*, not the *root* of the chord. - are written in superscript next to your chord quality (or Roman numeral when we get there). - have abbreviated versions that will be used rather than writing out every interval

There are four possible inversions for seventh chords. Below, you will find their abbreviated forms (most commonly used) and their full interval forms in parentheses. Remember that when written by hand or in music notation software, you will stack the numbers and *not* include a slash between them. - Root position: 7 (7/5/3) - First Inversion: 6/5 (6/5/3) - Second Inversion: 4/3 (6/4/3) - Third Inversion: 4/2 (6/4/2)

As a reminder, we will be using the term *inversion figure* to discuss this shorthand method of identifying inversions. Other systems refer to these same superscript numbers as figured bass, bass position Symbols, or figures, but we need not argue about which name is better. As long as the student understands the difference between *inversion figures*, true *figured bass* (i.e. Baroque system for writing keyboard harmonies), and the shorthand used in *leadsheet notation*, it will make no difference in your effectiveness.

Exercises in strict voice-leading, or species counterpoint, begin with a single, well formed musical line called the *cantus firmus* (fixed voice, or fixed melody; pl. *cantus firmi*). *Cantus firmus* composition gives us the opportunity to examine the following fundamental musical traits:

* smoothness
* independence and integrity of melodic lines
* variety
* motion towards a goal

The “rules” of the style of counterpoint that we will study are compiled from important writings and treatises of the eighteenth century, most notably Johann Joseph Fux, so this style of counterpoint is typically referred to as *eighteenth century counterpoint*. As with all historical studies, especially those that are spread across a continent over decades, there are inconsistencies between systems and styles. We will look at a simplified version of contrapuntal writing to focus our thoughts on melodic interaction, however I urge you to complete a full study of counterpoint at some point in your musical development in order to properly explore this critical facet of music. Our discussion of this topic, however brief, aims to help you absorb the methodology of good counterpoint (voice-leading).

### Terms useful for discussing counterpoint

* Melodic intervals - intervals within a line (horizontal intervals)
* Harmonic intervals - intervals between lines (vertical intervals)

We will consider three types of melodic intervals: - Movement by a 2nd is *stepwise* motion - Movement by 3rd is a *skip* and typically implies a triad. - Any movement of a 4th or larger is called a *leap* and has the most restrictions.

We use the terms *stepwise*, *skip*, and *leap* exclusively to describe melodic intervals, because each of these terms imply forward motion. Do not use these terms to describe harmonic intervals. For harmonic intervals, we use the types of motion (e.g. parallel, similar, etc.) combined with the size of the intervals (e.g. parallel 3rds, etc.)

### 1:1 Counterpoint (first species)

In first species counterpoint, we begin with a *cantus firmus* (new or existing) and compose a single new line–called the *counterpoint*–above or below the cantus firmus. That new line contains one note for every note in the cantus; both the cantus firmus and the counterpoint will consist of only whole notes. Thus, first species is sometimes called one-against-one or 1:1 counterpoint.

## Goals for this topic

Use the following examples of first-species (1:1) counterpoint to develop guidelines for writing in this style. Each of the following examples is in the major mode and has the counterpoint above the cantus firmus, but be aware that not all counterpoint is written this way; it is common to have the cantus firmus above the counterpoint or to compose in the minor mode. We are using a simplified structure as an introduction to the concepts.

**As you develop your rules for first-species counterpoint, look only at the *counterpoint (CP)* line; the *cantus firmus (CF)* was provided, so the counterpoint line was written by following the stylistic rules, not the cantus firmus.**

Generally, your rules should be divided into three categories: - Constructing a *melodic line* and *melodic intervals* - Length - Starting and ending pitches - Approaching the final note - Repeated pitches - Melodic intervals - Leaps - Resolutions following leaps - Range - Climax (position in melody and frequency) - Acceptable *harmonic intervals* - Valid harmonic intervals - Particularly starting and ending intervals - Approaching perfect intervals - Approaching the final pitch - Number of times that an interval size can be used consecutively - Differentiate between perfect and imperfect consonances - Acceptable *motion between lines* - Acceptable types of motion

**Note that these examples are taken from a counterpoint random generator and lack some of the elegance that human-composed counterpoint tends to have.**

{% capture ex1 %}X:1 T:First species (1:1) examples T:Each system is a new example. M:4/4 L:1 K:C V:1 name=CP1 c| B| A| e| d| c| F| G| B| c|] w:P8 M6 M3 M3 m3 P8 m6 m3 M6 P8 c| B| c| F| G| A| f| e| c| B| c|] w:P8 M6 P5 m3 m3 M6 m3 P8 m6 M6 P8 c| d| c| d| A| B| d| f| e| d| c|] w:P8 m3 m6 P8 M3 M3 M6 m3 M3 m3(m10) P8 c| g| f| c| d| a| g| d| e| B| c|] w:P8 m3 m6 m3 P5 M3 M6 m6 M3 M6 P8 V:2 clef=bass name=CF C,| D,| F,| C| B,| C| A,| E| D| C|] C,| D,| F,| D,| E,| C,| D,| E,| E| D| C|] C,| B,,| E,| D,| F,| G,| F,| D,| C,| B,,| C,|] C,| E,| F,| A,| G,| F,| G,| F,| E,| D,| C,|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Conclusions

As you develop your counterpoint rules, your observations will naturally separate into three categories mentioned above: - rules within a single melody (the horizontal aspect of the music) - rules for comparing the intervals between the two melodies (the vertical aspect of the music) - and rules for studying the motion between the line.

To plut this simply, there are rules for melody, harmony, and voice-leading.

### Melodic intervals and structure

These are some general guidelines for each of the *melodic* aspects of 1:1 counterpoint. - First species counterpoint typically has 8 to 14 pitches. - As a general rule, use stepwise motion as much as possible. - Thirds or other leaps can form triads, and this can create a non-functional implied harmony. - The final note should be approached by stepwise contrary motion. - Therefore one voice will have the seventh scale degree (ti) and the other will have the second scale degree (re). - There are generally no repeated pitches - Meaning that static and oblique motion do not occur in first species because they both require at least one voice to repeat pitches - The line should have a clear high (or low) point. - Repeating the highest pitch–or lowest if the contour arcs downward–undermines the climax. A strong melody will have a clear beginning, middle, and end, so having multiple climaxes muddies this journey. - Leaps should be used sparingly, because too many leaps imply certain types of harmony that were not common in this style. - Leaps should always be aproached and left by step, preferably in contrary motion. - You may sometimes leap to or from the climax.

### Harmonic intervals and structure

* 1:1 counterpoint will likely start and end on a perfect octave (or unison) of the tonic pitch, although a perfect fifth can be used to begin the counterpoint if necessary.
* In this style of counterpoint, perfect intervals should only be approached by contrary or oblique motion, although oblique motion is not allowed in first species. (You can use oblique in the later species.)
* You should only use consonant intervals in first species, which you can review from [the previous topic](%7B%7B%20site.baseurl%20%7D%7D%20/05-counterpoint-embell-shapes/a2-introcounterpoint.html).

To be clear, this means that the acceptable consonant intervals in first species are: - **Perfect**: Perfect fifths and octaves - **Imperfect**: Major and minor thirds and sixths

### Motion Between Lines in First Species

Types of motion - contrary - no restrictions - parallel - some restrictions - similar - some restrictions - static - not allowed - oblique - not allowed

In first species, an individual line cannot repeat a pitch, so this eliminates both static and oblique motion entirely. Contrary motion is the easiest motion to use because it has almost no restrictions. Parallel and similar motion are less common but still regularly used; you will need to pay careful attention to avoid creating part writing errors with both of these.

### Errors in motion

* parallel perfect octaves and perfect fifths
  + Parallel perfect octaves and fifths are always unacceptable. Repeating the same pitch in this manner blurs the independence of the lines and becomes too similar to monophony.
* contrary perfect octaves and perfect fifths
  + Unacceptable contrary octaves and fifths occur when two identical perfect intervals occur consecutively in contrary motion. This is a way of trying to hide parallel perfect octaves or fifths by using contrary motion.
* similar/direct/hidden octaves and fifths
  + Unacceptable similar motion occurs when you approach a perfect fifth or octave in similar motion from any interval. Approaching a perfect interval by similar motion makes it more difficult to hear the interval and will make it difficult to continue writing your counterpoint without creating more errors. Similar octaves or fifths are also referred to as direct octaves/fifths or hidden octaves/fifths; I prefer the term “similar octaves/fifths” because it describes the motion accurately.

Today’s topic is the second classification of regular meters: *compound* meters.

We will be using the terminology from the previous topic, so if you are unfamiliar with basic rhythmic terminology, please review Topic 4a first.

And always remember that meter is somewhat subjective and can be greatly altered by many factors, especially tempo. We will discuss this in the next topic, but where one listener might listen to a piece with four quarter-notes per measure and feel that the quarter notes are the beat, another listener may listen to the same piece and hear the beat in a slow two with the half-note as the beat.

## Goals for this topic

Using the following examples, determine: - the defining characteristic of all *compound* meters - what the top and bottom numbers mean in a compound time signature - what *duple*, *triple*, and *quadruple* mean when describing a compound meter - “theoretically ideal” rhythmic notation (e.g. beaming) in compound meters - a list of common meters in *compound duple*, *compound triple*, and *compound quadruple* - the common beat-counting system that we’ll be using in this course (written in the “Compound Quadruple” example) - how to decide whether 3/4 (or 3/8, 3/16, etc.) is a simple or compound meter

{% capture ex1 %}X:1 T:Common examples of compound duple meters with correct beaming T:Meter changes are noted at the end of the previous line M:6/8 L:1/8 K:C G3 GGG | G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2|| [M:6/4][L:1/4] G3 GGG | G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2|| [M:6/16][L:1/16] G3 GGG | G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2|| [M:6/32][L:1/32] G3 GGG | G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2||{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Common examples of compound triple meters with correct beaming T:Meter changes are noted at the end of the previous line M:9/8 L:1/8 K:C G3 GGG G2G| (2GG G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2|| [M:9/4][L:1/4] G3 GGG G2G| (2GG G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2|| [M:9/16][L:1/16] G3 GGG G2G| (2GG G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2|| [M:9/32][L:1/32] G3 GGG G2G| (2GG G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2||{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X:3 T:Common examples of compound quadruple meters with correct beaming T:Meter changes are noted at the end of the previous line M:12/8 L:1/8 K:C G3 GGG G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2 G/2GGG/2 GGG|| w:1 2 la li 3 li 4 & 1 to la ta li ti 2 to la li ti 3 to ta ti 4 la li [M:12/4][L:1/4] G3 GGG G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2 G/2GGG/2 GGG|| [M:12/16][L:1/16] G3 GGG G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2 G/2GGG/2 GGG|| [M:12/32][L:1/32] G3 GGG G2G (2GG|G/2G/2G/2G/2G/2G/2 G/2G/2GG/2G/2 G/2GGG/2 GGG||{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### The problem with 3

Use the MIDI player to listen to the following two examples. Even though they are identical excerpts, one thing has been altered in the second example. What was altered, and does it change your perception of whether the tune is simple or compound? Provide your final classifications for both examples.

{% capture ex4 %}X:4 T:Amelia’s Waltz M:3/4 K:D Q:1/4=100 L:1/8 A,|“D”D3 E D2|“D”D2 F3 E|“Bm”D2 F2 BF|“F#m”A3 F A2|  
“G”B2 G3 B|“D”A2 F3 E|“Bm”D2 B,3 A,|“G”B,4 A,2 | “D”D3 E D2|“D”D2 F3 E|“Bm”D2 F2 BF|“F#m”A3 F A2|  
“G”B3 c d2|“G”d2 e2 f2|“A”e2 B2 c2| “D”d6 ||{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

{% capture ex5 %}X:5 T:Amelia’s Waltz M:3/4 K:D Q:1/4=180 L:1/8 A,|“D”D3 E D2|“D”D2 F3 E|“Bm”D2 F2 BF|“F#m”A3 F A2|  
“G”B2 G3 B|“D”A2 F3 E|“Bm”D2 B,3 A,|“G”B,4 A,2 | “D”D3 E D2|“D”D2 F3 E|“Bm”D2 F2 BF|“F#m”A3 F A2|  
“G”B3 c d2|“G”d2 e2 f2|“A”e2 B2 c2| “D”d6 ||{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

## Conclusions

The common characteristic of compound meters is easy to find after having discussed simple meters.

*Compound meter is a* ***regular*** *meter in which the beat is divided into three equal parts.*

Differentiating regular and irregular meters may be a new concept, but you needn’t worry about this too much right now because we will not be covering irregular meters until later in the course. For now, know that the subjective nature of meters will be discussed in the next topic, 4c - Metric Perception. After that discussion, we will see if this concept makes more sense.

### Describing compound time signatures

For a *compound* time signature: - the top number is how many divisions are in the meter. - the bottom number is the rhythmic value of the division.

These definitions may take quite a few tries for you to reach on your own, because students often focus on making compound time signatures fit the same mold as simple time signatures. It is easy to be careless with your use of the terms *beat, division*, and *subdivision*, but these three terms are the keys to separating compound from simple meters and their time signatures. In a simple meter time signature, the top number represents the number of *beats* in the measure, and the bottom number is the *note value* of the beat. Contrast that with compound meter time signatures. The top and bottom numbers represent entirely different concepts, and for compound meters, this requires a slight bit of math to find the actual number of beats. - To find the number of beats in a compound time signature, divide the top number by 3.

This highlights a fundamental issue in teaching our time signature system. It requires the musician to already understand the system by being able to differentiate between simple and compound meters, because the system is not uniform across all meters. This is why the pedagogical method of grouping meters by *simple* vs *compound* and then attaching a word to denote the number of beats (i.e. single, duple, triple, quadruple, etc.) is useful.

### Duple, Triple, and Quadruple:

The terms duple, triple, and quadruple refer to the number of beats in the measure. In compound time: - duple has 2 strong beats with 3 eighth notes per beat. - ex: 6/8 - triple has 3 strong beats with 3 eighth notes per beat. - ex: 9/8 - quadruple has 4 strong beats with 3 eighth notes per beat. - ex: 12/8

Within a given meter classification, there are many different time signatures. For example, in compound duple, there is 6/8, 6/16, 6/4, and many others.

### Differentiating between compound and simple meters

The simplest and most accurate method for differentiating the various meters is to memorize the standard groupings of all meters. That being said it is fairly easy to remember that if the top number of the time signature is a multiple of three, then that is a compound meter, assuming that the tempo does not become slow or fast enough that that the listener hears a different grouping of the beat.

### “Theoretically ideal” rhythmic notation in compound time

Like simple time, theoretically ideal rhythmic notation in compound time does not obscure beats. Unlike simple time, compound time is written this way in common practice with few exceptions.

The most notable exception, though, occurs regularly enough that we should expect it. Occasionally a compound meter will create hemiola–a feel of two against three–by having three consecutive groups of two divisions over two compound beats. The most common notation of this occurs in 6/8 when three quarter notes are placed in a row. If written using quarter notes rather than tying two eighth notes together, this will obscure the second beat. The tune “America” from *West Side Story* highlights this rhythm as its primary melodic motif.

### Beat counting

As with simple meters, there are various systems for counting beats and their divisions. One of the most common systems condenses the method for counting beats in simple time to 1-&-a. The other most common counting method uses 1-la-li. For this course, we will use the -la-li method to help differentiate the counting from a simple meter.

The problem with both of these systems is that there is not a unique syllable for each subdivsion. Generally speaking, students are asked to insert “ta” between each of the division syllables creating 1-ta-la-ta-li-ta. This is adequate for practice aloud, but it is poor for specificity because there are three ‘ta’ syllables in each beat. For our class, we use: 1-to-la-ta-li-ti

## Meters that have a ‘3’ as the top number of the time signature

After listening the two examples in 3/4, it is easy to identify that the two examples were identical except for the tempo. In the slower example, you will likely hear it in a simple triple meter with the quarter note as the beat. For the faster example, most instead hear this as a fast compound single meter with the dotted half note as the beat. Meters such as 3/8, 3/4, and 3/2 are all dependent on tempo as to whether they are a compound or simple meter. While a good rule of thumb is to consider these meters as simple until you have listened to the piece at tempo, 3/8 meters are commonly fast and conducted in one. Make sure to look at the tempo if determining a meter’s classification when only looking at the score.

If we think back on our progression through the course thus far, we began by studying individual pitches, then combined those pitches into intervals, and then assembled those intervals sequentially and simultaneously to create melodies and chords respectively. Next, we studied a simplified version of counterpoint in order to examine how the combined vertical and horizontal aspects of music interact to create basic tonality. While counterpoint provides a framework for understanding harmony, it is primarily a study of how the horizontal aspect of music, melody, combines and *implies* harmony; it does not establish the vertical aspect of music, harmony, as a standalone concept.

Therefore, we can use a simple counterpoint exercise to begin determining how harmony functions, because harmony is defined by the melodic tendencies of certain pitches within a diatonic scale.

## Implied harmony in two parts

**Each measure of the next example implies the same two harmonies repeatedly–one on the first half note and the second on the second half note.** - Which two harmonies do you think these measures imply? - What are the Roman numerals and inversion figures for each measure? - Is there more than one option for any of the harmonies? - Are all the intervals consonant? - If not, to which chords do the dissonant intervals belong?  
- Do any particular chord members seem more important than the others? - Do any of these measures sound “weaker” than the others?

{% capture ex1 %}X:1 T:Implied harmonies from two voices M:4/4 L:1/2 Q:1/4=80 K:C V:1 Bc|| FE|| de|| Bc|| GE|| GG|] V:2 clef=bass “M3”G,“P8”C,|| “m7”G,“M3”C,|| “P5”G,“M3”C,|| “+4”F,“m6”E,|| “m6”B,,“M3”C,|| “M2”F,“m3”E,|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Conclusion

All of the two-voice progressions in the example imply harmonies of V moving to I in the key of C major, although you could make the argument that some of the implied harmonies are actually viio instead of V7. The bass movement of the first three measures highlights V moving to I, but even once the bass movement changes, you should still hear the same progression of tension and release.

From this, we may conclude that two voices–in this case a soprano line and a bass line–are enough to imply tonality. Furthermore, we can observe that the pitches within a V7 chord pull toward resolving to the pitches of the I chord. One chord is stable and final, while the other wants to resolve to the stable and final chord.

This is *harmonic function*. A chord’s function is a way of describing how it works within the context of tonal music.

## Harmonic functions in diatonic music

In diatonic music, there are three basic categories of harmonic function: *tonic*, *dominant*, and *pre-dominant*. - *Tonic* (**T**) harmonies feel stable and final. - This is primarily the I chord, but in some circumstances, this can include the vi chord. - *Dominant* (**D**) harmonies are strong but unstable. They have a strong tonal gravity pulling toward a *tonic* harmony - This includes the V and viio chords. - *Pre-dominant* (**P**) harmonies are weak and unstable. Their tonal gravity pulls them toward *dominant* harmonies. - This includes the ii and IV chords, but can occasionally include the vi chord. - Note that there is a difference between the words “pre-dominant” and “predominant.”

### Some caveats on making assumptions based on this exercise

You may be tempted to make some definitive conclusions about voice-leading from looking at these examples–such as ti resolving to do, or fa resolving to mi–but be careful not to over-generalize with these ideas. If you make the assumption that ti always resolves to do without considering the context, you will make errors in situations where ti is not part of a dominant function. We will explore the true nature of tendency tones and their resolution in the next unit.

You may also notice that the chordal fifth is the least common chordal member in these examples, and as we will see when we begin voicing four-part harmony, the chordal fifth is indeed expendable. The root and third are best at implying a harmony, and the chordal seventh adds a strong resolution, whereas the fifth only provides a “fullness” to the chord. But not *all* chordal fifths are easily expendable, and sometimes composers will choose to imply/omit a chordal third (or even root!) given a particularly context. We will explore all of these ideas further in our part-writing studies.

## Cadences

Because of the importance of the V-I progression, we will introduce an important term in understanding harmony: the *cadence*. We will explore cadences further in the Unit 8, but for now, you may think of a cadence as a harmonic progression used to conclude a musical phrase. There are many types of cadences, but all of the progressions above are *authentic cadences*–cadences that have a V chord moving to a I chord. Bass movement is a key factor in determining the strength of a cadence. For example, measures 1 and 3 in the examples likely sound stronger to you than the last measure. The last measure not only lacks sol to do in the bass, it also does not have a tonic in the final chord. We will return to this idea when discussing cadences in detail in Unit 8a.

N/A yet

Neapolitan chord and augmented sixth chords act as functional substitutions for pre-dominant chords, although we looked at how they could be used to substitute for dominant chords as well. The chord that you will study below does not fulfill one of the three primary functions; instead, it is used to embellish and elongate a function.

It is possible to think of this chord using tertian harmony, but its voice-leading determines its construction.

Listen to and then analyze the following three progressions. The first is the most straightforward example of this chord, and each example gets progressively more complicated. As always, start your analysis with leadsheet symbols and then provide Roman numerals when possible. In each progression, study the chromatic chord to answer the following questions: - How would you describe its construction? - How does it function? (e.g. tonic, passing, etc.) - Does it have tendency tones, and if so, how do they resolve? - If you were to compare it to a diatonic or chromatic chord that normally fulfills this function, which chord shares the most commonalities with it? - Does this embellishing chord work for all types of chords (i.e. major, minor, etc.)? If not, why?

{% capture ex1 %}X:1 T:Using the common-tone diminished chord M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [BF]| [cE] [GE]| [A^D] [GE]| [BF] [cE]|] [cE] [cE]| [dF] [dF]| [^cE] [dF]| [c2E]|] [cE] [cE]| [dD] [d^E]| [d^F] [d=F]| [c2E]|] V:2 clef=bass [C,G,] [G,,G,]| [G,C,] [G,C,]| [^F,C,] [G,C,]| [D,G,] [G,C,]|] w:C: [C,G,] [A,,A,]| [F,,A,] [G,,B,]| [G,,^A,] [G,,B,]| [G,2C,2]|] w:C: [C,G,] [A,,A,]| [^F,,A,] [^G,,B,]| [A,,C] [B,G,,]| [G,2C,2]|] w:C:{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

Each of these three examples contains one chord which does not function like any chord that we have studied thus far. - The first example is mostly straight-forward; it establishes the key through a I-V-I progression and then begins arpeggiating the I chord. On the downbeat of the the third measure, however, a diminished seventh chord appears that does not function as any diminished seventh chord we have seen. Usually, a diminished seventh chord is a dominant function of the chord that it precedes. In this case, we have D#o7, which, if it were a secondary leading-tone chord, would resolve to a chord with the root of an E–in this key, it would likely be a viio7/iii. Instead, it goes back to the I chord. The notable features of this resolution though, are that three of the pitches resolve smoothly by step-wise motion to the pitches of the I chord while the last pitch is a common-tone between the two chords. You could analyze this as an entire chord that functions as both neighbor tones and a pedal tone, but that does not truly describe its function. So what is this #iio7? - In the second example, we find the same chord on the downbeat of the third measure, but in this example, it is embellishing the V chord instead of the I chord. It shares the same voice-leading principles as the previous example did with the I chord–three neighbor tones and one common tone–as the previous example, but instead of being built as #iio7, it is now a #vio7 that decorates a V chord. - The last example is the most complicated. The progression begins with a I chord moving to a vi chord, but instead of going to a diatonic predominant, it moves to a V6/V. This does not go directly to a V chord, however, and instead passes through a strange diminished seventh chord on the beat 3 of the second measure, an E#o7. While the neighbor tones of the previous example are slightly altered in this case in that they all of our neighbor tones are now passing tones. The chord still has many commonalities to the previous examples, though, in that it is still a diminished seventh chord that is surrounded by the same harmony on both sides and it shares a common-tone with those chords.

## Common-tone diminished chords

Each of the chromatic chords above is an example of *common-tone diminished chord*. You will label these chords as **cto7**.

Common-tone diminished chords: - Are stacks of minor thirds which creates a fully diminished seventh chord. - When you encounter these in an analysis, you will likely assume that it is a secondary leading-tone chord, but you will quickly notice that it does not resolve correctly. - Can be used to embellish *any* major triad or dominant seventh chord. - cto7 most often embellish either I or V (and V7). - These chords do not work well for non-major triads because there will be more than one common tone. For example, a minor triad would have two common tones with its cto7, and this weakens the voice leading. - Share a common tone with the root of the chord to which they resolve. - It is common for the same chord to precede the cto7, but not a requirement. - The three non-common tones will resolve by step to the closest chord tone. - For major triads, this means that the chordal fifth will likely need to be doubled. - For dominant seventh chords, each non-common tone resolves by half-step to the closest chord tone. - Do not have their own primary function (i.e. tonic, dominant, pre-dominant) and instead elongate another chord’s function. - Are always labeled with only o7. - They have no standard inversion, so they do not require an inversion figure. As with all fully diminished seventh chords, they can be enharmonically spelled in four different ways, and the voice leading of the passage will determine how the chord should be spelled. - The two most common cto7 chords are those that embellish the I and V chords. These will most likely be spelled as #iio7 and #vio7 respectively, because these provide the correct voice leading.

As discussed repeatedly in this course, diatonic harmony and its progressions work because of the strength of the voice-leading. To prove this, let’s listen to the following standard progression. As you listen, pay special attention to the voice-leading. Do you consider this progression to have strong voice-leading? If so, what makes it strong? If not, what makes it weak and what could strengthen it?

{% capture ex1 %}X:1 T:Basic diatonic progression M:4/4 L:1 K:C V:1 [EG]| [EA]| [FA]| [BG]| [cG]|] V:2 clef=bass [C,C]| [A,,C]| [D,D]| [G,,D]| [C,E]|] w:C:I vi ii V I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

Most students when presented with these questions determine that the strength of the progression comes from three things: - The overall smoothness of the voice-leading in the upper voices - The “pull” from certain tendency tones toward another - The strong, repetitive pattern of the bass voice

Between any two chords with roots separated by descending P5, there is one common tone and two voices that resolve by step. If we remove the bass voice, we can clearly see (and hear) the smooth voice-leading between these chords while still using complete chords. (The tenor voice has been written in treble clef to make it easier to see the voice-leading. Its octave is not altered.)

{% capture ex2 %}X:2 T:A simplified basic diatonic progression M:4/4 L:1 K:C V:1 [CEG]| [CEA]| [DFA]| [DBG]| [EcG]|] w:C:I vi6 ii V6/4 I6{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

By quantifying this aspect of voice-leading–the “smoothness” between two chords–we can study how this aspect of voice-leading strengthens a progression. In the simplified progression above, count the half-steps necessary to move between each of the two chords. Which chords have the smoothest voice-leading? Which are the most disjunct? Does this line up with what you would have expected?

## Idealized Voice-leading Intervals (IVI)

Counting the half-steps necessary for resolution in idealized voice-leading will be helpful to us as we explore more advanced harmonic concepts, because it gives us a tool to quantify something that is relatively subjective–what makes good voice-leading. We will call this process Idealized Voice-leading Intervals (IVI). You can do this between any two chords by: - Writing both chords next to each other in closed position. - Inverting one of the chords to minimize the distance necessary to resolve the two chords. - Counting the half-steps necessary to resolve the progression.

When counting the half-steps in the the above progression, you hopefully found that the movement from ii to V was the “weakest” voice-leading and required four half-steps to resolve. The next strongest resolutions were vi to ii and V to I. Both of these resolutions require only three half-steps. But in a surprise twist, the winner of the smoothest voice-leading in the above progression, was not a standard function progression at all; it was the I chord moving to the vi chord to start the progression. This happens because it has *two* common tones rather than just the one associated with chords that have roots separated by P5.

## Mediant harmony

Let’s take this one step further. Before reading on, take a moment to find the IVI between a **C major triad** and all triads that are **diatonic to C major or C minor**.\* Rank them in order of smoothest voice-leading to least.

As you can see the smoothest voice-leading possible between a C major triad and a different triad is the one half-step necessary to create E minor, the mediant. In the next closest category (two half-steps), there are three chords: A minor (the submediant), A-flat major (the borrowed submediant), and F minor (the borrowed subdominant). Of the four smoothest chords, three are chords whose roots are separated by a third.

Anytime a progression has two chords whose roots are separated by a M3 or a m3, we call this *mediant harmony*. (Do not confuse this with tertian harmony; tertian harmony is any harmony that uses chords built by stacking thirds. This has nothing to do with the root movement within a progression.) Rather than the structured rules and tendency tones of standard diatonic harmony, mediant harmony relies on the smoothness of voice-leading between two chords to create interesting new colors and progressions within a somewhat tonal framework.

## Finding and labeling mediants

For any major or minor triad, there are eight possible mediant chords: one major and one minor chord for each of the four mediant pitches. For example, the four mediant pitches for C are E (mediant), E-flat (borrowed mediant), A (submediant), and A-flat (borrowed submediant). Each of these four pitches can have either a major or minor chord built off of it for a total of eight possible mediant chords.

Before looking at the completed chart below, find the IVI for each of the eight possible chords. After you group the mediants by IVI, also note how many common tones there are between the C major and each chord.

### Conclusions

All mediant harmonies for a C major triad:

| Diatonic mediants | Chromatic mediant | Doubly chromatic mediants |
| --- | --- | --- |
| E minor | E major | E-flat minor |
| A minor | A major | A-flat minor |
| – | E-flat major | – |
| – | A-flat major | – |

There are three categories of mediants. The following descriptions compare describe the relationship to any major or minor chord:

*Diatonic mediants* (2 possible chords) - Have two common tones - Have the opposite chord quality - Have an IVI of 1 or 2 - Found as the diatonic mediant chord and submediant chord

*Chromatic mediants* (4 possible chords) - Have one common tone - Have the same chord quality - Have an IVI of 2 or 3 - Found as: - EITHER the diatonic mediant chord and submediant chord *from the parallel minor/major mode* (2) - OR the triads built by *changing the chord quality* of the diatonic mediant chord and submediant chord (For C major, E minor become E major and A minor becomes A major)

*Doubly chromatic mediants* (2 possible chords) - Have zero common tones - Have the opposite chord quality - Have an IVI of 3 or 4 - Found by changing the chord quality of the diatonic mediant chord and submediant chord *from the parallel mode*

## Using IVI in Analysis

Listen to the following progression. It will not sound like a standard diatonic progression, but at the same time, it will likely sound like a convincing modulation from a C major chord to a B-flat major chord. You may even hear the last two chords as a cadence. Is it possible for you to analyze this using normal Roman numeral analysis?

{% capture ex3 %}X:3 T:Mediant progression M:4/4 L:1 K:C V:1 [CEG]| [C\_E\_A]| [CF\_A]| [CFA]| [DFA]| [DF\_B]|] w:Cmaj Abmaj Fmin Fmaj Dmin Bbmaj{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

In this progression, Roman numerals cease to have a meaningful role because the chords do not follow standard function. What good is using Roman numerals if a iii chord can function directly before the tonic chord? You *could* label this passage as beginning in C major and moving through I-bVI-iv, and you would then need to pivot on the F major chord to become the V chord in B-flat major. You could even analyze the D minor chord as just the arrival of the B-flat major triad with a retardation on the A.

But none of this truly explains why this works. In passages like these– those that rely more on an interesting pattern of voice-leading rather than standard function–I recommend writing Roman numerals under each chord in order to give an approximation of what key you are hearing, but also putting an IVI number between each pair of chords. I would analyze the above passage as:

| Key | Chord 1 | Chord 2 | Chord 3 | Chord 4 | Chord 5 | Chord 6 |
| --- | --- | --- | --- | --- | --- | --- |
| C: | I [IVI:2] | bVI6 [IVI:2] | iv6/4 [IVI:1] | IV6/4 [IVI:2] | —– | —– |
| Bb: | —– | —– | —– | V6/4 [IVI:2] | iii [IVI:1] | I |

## The limits of IVI

As with all tools, you must be careful with how you use Idealized Voice-leading Intervals and mediant harmony. For example, when looking at diatonic progressions, the order in which the chords appear matters as much as the smoothness of the voice-leading. If you try to resolve V to ii, you have created a regression that will likely sound displeasing to someone familiar with tonal harmony. Also, many would say that adding a seventh to a chord (e.g. V becoming V7) strengthens the progression, because we have added a second tendency tone and therefore more tonal gravity between the two chords. But if you were to only look at IVI, adding the seventh would *weaken* the progression because it adds an extra half-step of resolution. In general, IVI is most useful when looking at non-standard tonal progressions.

Transposition is the most commonly used set manipulation, but there is a second commonly used function that is of equal importance to understanding pc sets.

## Inversion

When first studying tonal harmony, we discussed the scale degree names in pairs: dominant/subdominant, mediant/submediant, subtonic/supertonic. For each of these pairs, there is a duality to their naming in that they share a relationship centered around the tonic pitch. For example, the dominant is a P5 *above* the tonic where the subdominant is a P5 *below* the tonic. They are mirrored around the central pitch, and therefore represent an *inversion* of each other.

In set theory, we can perform this same operation using intervals (i.e. numbers of half-steps). Take a moment to think about how to translate the concept of inversion from traditional intervals (e.g. P5,M3) into pitch-class integers. What kind of results do you expect for integer notation? Remember that to find an inversion of any musical pitch, you need two pieces of information: the starting pitch class and the pitch class *around* which you will invert.

## Visually inverting pitch classes

Depending on the central pitch used to invert, pitch-class integer notation can make inversion relatively easy. It does not require you to understand a specialized pitch and interval system like traditional notation. Instead, it only requires basic mathematical functions.

Before tackling the mathematical approach to inverting pitch-class integers, let’s visually explore inversion using the pitch class continuum below. For simplicity’s sake, let’s start by centering our inversions around C/0. To visually find an inversion, pick a letter/integer on the chart below. Count the number of steps it takes to reach C/0, and then continue past C/0 for the same number of steps. (You can think of it as balancing the scale.) Of course, you will find that each positive integer is paired with its negative integer; 5 becomes -5, 8 becomes -8, etc. If you were to create a chart showing all inversion pairs as letter names, what patterns do you notice about the pairings? For example, how does the 7/-7 pair compare to the 5/-5 pair? Also, what is the inversion for C/0? Why?

| -e | -t | -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | t | e |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C# | D | D# | E | F | F# | G | G# | A | A# | B | C | C# | D | D# | E | F | F# | G | G# | A | A# | B |

Your first chart should have 12 pc sets, although two of them are technically only one pitch name – C/0 and F#/6 end up inverting on top of themselves meaning that they are monads. However, as you look at the pairs, do you see a pattern? How many *unique* pc sets are there if you only look at pitch letter names?

## Applying Mod12

As you hopefully can see, there are only six *unique* inversion pairs once you eliminate duplicates by examining pitch letters. However, when we instead look at the pitch-class integers, you still have 12 unique pc sets because negative numbers differentiate the sets. You have just demonstrated the importance of using Mod12 to simplify all pc sets to only include integers between 0 and 11. (This is also a visual demonstration of how *octave equivalency* works.) If you look at the chart below, you can see what happens when we apply Mod12 to a series of integers; it creates a continuously repeating set of integers between 0 and 11, which means that inversion is as simple as memorizing six pairs…as long as you are using fixed zero/six as your inversion axis. If you decide to invert around a different pitch class, you will end up with six different pairs.

| -e | -t | -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | t | e |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | t | e | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | t | e |

This means that the inversion pairs when inverting around zero (and 6) are:

| Inversion Pair 1 | Inversion Pair 2 |
| --- | --- |
| 0 | 0 |
| 1 | e |
| 2 | t |
| 3 | 9 |
| 4 | 8 |
| 5 | 7 |
| 6 | 6 |

Because mod12 creates a continuously repeating series of 12 integers, you may use the visual aid of a clock to help you find inversions. First, draw a clock (with 0 in the place of 12). Then draw a line between 0 and 6; this line will represents the center around which you will invert your pitches. To find your inversion pairs, connect the integers by a line that is perpendicular to the center line (i.e. integers that are directly across the line), and you will see that you create the same set of inversion pairs above. If you were to move your center line to connect a different set of opposites, say 2 and 8, what would this represent?

## Finding inversions mathematically

As with transposition, we have shorthand to represent inversion. To show the inversions around zero used to create the chart above we would write:

T0I (0,1,2,3,4,5,6) = (0,e,t,9,8,7,6)

As you can see, each pitch class in the result is just the inversion of the corresponding pitch class in the original pc set. If you were to put the result in normal form you would get (6,7,8,9,t,e,0).

What if you wanted to invert *and* transpose a pc set? Try inverting and transposing the following pc set, but do it two different ways to see if you get the same results: - Transpose first, then invert - Invert first, then transpose

T4I(1,5,6)

Did you get the same result either way? If not, why are they different? Which do you think is correct? Why?

## The shortcut

Inverting first will always give you the correct answer, because in that case you are inverting *around zero* and then transposing. If you transpose first, you are actually inverting around a different axis. You can think of this easily using the clock face. If you invert first, you invert around the 0/6 axis and then you transpose the result. If you transpose first, you move the axis of transposition, and then you invert around that.

Luckily there is a mathematical shortcut for inverting around zero and transposing. Look at the following correctly solved examples. Do you see a simple way to find the answers given only the numbers in the formula? It may be helpful to think of the original number series that we used at the top of the page, before we converted it using mod12. To make it easier to find the shortcut, the results have purposely *not* been put into normal form, although you should always do so after inverting.

TtI(2,6,7) = (8,4,3)

T5I(2,6,7) = (3,e,t)

T9I(2,6,7) = (7,3,2)

T0I(2,6,7) = (t,6,5)

### Conclusion

To quickly invert and transpose, just subtract each member of your pitch class from n in the formula T<sub>n</sub>I. So in the first example above, n = t.

TtI(2,6,7) = (8,4,3)

If you subtract each pitch class from the inversion interval, which is t (or 10) in this case, you will get the resulting set.

* 10-2 = 8
* 10-6 = 4
* 10-7 = 3

You should get in the habit of putting these into normal form after inversion. If you transpose a pc set in normal form, it will still be in normal form. If you invert a pc set in normal form, you will have to find normal form again. Usually, the normal form of an inverted set the reverse order, but there are certain situations in which this will not be the case. You should always double-check your normal form to be sure.

Analyze and listen to the following short progressions. There are three progressions in major and then three similar progressions in the parallel minor. Start your analysis with leadsheet symbols and then provide Roman numerals. (You may want to refer back to Unit 17a to review the finer points of using the Roman numeral system.) In each progression below, there is a chromatic chord that will stand out. What is its function in each case? (e.g. tonic, passing, etc.) If you were to compare it to a diatonic or chromatic chord that normally fulfills this function, which chord shares the most commonalities with it? (Hint: Think about the inversion and choice of doubled notes.) Does it seem most “at home” in major or minor?

{% capture ex1 %}X:1 T:Standard progressions in major using the bII M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [cE]| [\_dF] [BF]| [c2E]|] [cE] [cE]| [\_dF] [c/2E][B/2F]| [c2E]|] [cE] [\_dF]| [c\_E] [BD]| [c2E]|] V:2 clef=bass [K:C] [C,G,] [A,,A,]| [F,,\_A,] [G,,G,]| [G,2C,2]|] w:C: [C,G,] [A,,A,]| [F,,\_A,] [G,,/2G,][G,,/2G,]| [G,2C,2]|] w:C: [C,G,] [F,,^G,]| [^F,,A,] [G,,G,]| [G,2C,2]|] w:C:{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Standard progressions in minor using the bII M:4/4 L:1/2 Q:1/4=90 K:Eb V:1 [cE] [cE]| [\_dF] [=BF]| [c2E]|] [cE] [cE]| [\_dF] [c/2E][=B/2F]| [c2E]|] [cE] [\_dF]| [cE] [=BD]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [F,,A,] [G,,G,]| [G,2C,2]|] w:c: [C,G,] [A,,A,]| [F,,A,] [G,,/2G,][G,,/2G,]| [G,2C,2]|] w:c: [C,G,] [F,,^G,]| [^F,,=A,] [G,,G,]| [G,2C,2]|] w:c:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

As you labeled the chords, you probably noticed that you had a chord that could only be explained as the borrowed II chord from the Phrygian mode. In each case, it was acting as a pre-dominant chord and followed the rules of a standard ii chord. This bII chord is used often enough that it earned a special name: the Neapolitan chord. The origin of the chord’s moniker (Neapolitan) is disputed, but recently, one could make a case for calling this the “Batman” chord; it has been featured prominently in almost every modern Batman theme. Composers love to use this chord to add darkness to a progression.

## Neapolitan chords (bII)

You may label the Neapolitan chord using standard Roman numeral notation (bII) as discussed in the mode mixture unit (Unit 17a), but it is also common to substitute an upper-case “N”–short for Neapolitan–in your Roman numerals. For voice-leading purposes, the chord may sometimes have an enharmonically equivalent pitch–such as the G# shown in the third and sixth progressions–but we still always analyze this as a bII chord.

The above examples are three of the most common ways in which you should approach and leave a Neapolitan chord: - Directly to the V chord, most often the V7 - Into a cadential 6/4 progression - Into a viio7/V

As you observed in the example, the bII chord is most commonly used as a pre-dominant function. In this case, you can make the argument that it is most similar to a pre-dominant ii chord, because it has the same scale degrees of ^2, ^4, and ^6, with a lowered ^2 and ^6. While this is true, if you look at the common doubling and inversion of the Neapolitan chord–first inversion with a doubled third–it may be easier for you to consider the Neapolitan as a functional substitution for a borrowed iv chord. This ensures correct doubling and voice-leading tendencies. Look at the chords side-by-side in below, and you will notice there is only a half-step difference between the two chords.

{% capture ex3 %}X:3 T:bII6 and iv M:4/4 L:1/2 Q:1/4=90 K:C V:1 [F\_A\_d] [F\_Ac]|] w:c:bII6 iv{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

Perhaps the most important reason for this doubling is that it solves two major part writing errors that occur for root-position bII chords: 1. *Resolving to V* - The root of the bII chord is a tendency tone and should not be doubled as we do for many chords. The flatted second scale degree pulls strongly downward, and when going directly to a V chord, it will resolve downward by an interval of a diminished 3rd to the third of the V chord. Of course, the chordal third of the V chord is also a tendency tone, so you would create multiple parallel perfect octaves if you were to double the root of the Neapolitan. 2. *Resolving to a cadential 6/4 or a viio7/V* - Not only is the root a tendency tone, the chordal fifth of this chord (^b6) also wants to resolve downward. If the bII chord resolves to either a cadential 6/4 or a viio7/V, the movement between the root and chordal fifth would create parallel perfect fifths. By using a first inversion triad and placing the chordal third in the bass, you are free to move the root above the chordal fifth in your voicing.

You may use a Neapolitan chord as a pre-dominant function in any progression in which you could use a minor iv chord. In minor, there is only one chromatic pitch (^b2), but in major, you will need to lower both ^2 and ^6.

## Neapolitan chords as dominant chords

In the modal interchange video from Unit 17b, you may have noticed that one of the progressions used a bII chord. In the same unit, we then looked at a similar usage of the bII in the excerpt from Mahler Symphony No. 2. Let’s look at this again to refresh the details of your final analysis. How is the Neapolitan chord different from the above examples? What is its function here? If it is not a pre-dominant as above, then what chord from this new function shares the most commonalities with it?

{% capture ex4 %}X:4 T:Mahler Symphony No. 2, Mvt. I T:Simplified reduction M:4/4 L:1/4 Q:1/4=60 K:C V:1 [g3GEC] \_B/2>\_A/2| [g3GEC] \_G/2>F/2| [g3GEC] \_E/2>\_D/2| [g3GEC] \_B,/2>\_A,/2| [G2EC] z2| [G2EC] z2| [Eceg] [\_E3c\_eg]|] V:2 clef=bass (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [B,DF]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [\_A,\_D]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [\_A,F,]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [B,,D,F,]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 [C,2E,G,]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 [C,2E,G,]| [C,,4C,]|]{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

As we discussed in 17b, in this case, the bII is acting as a functional substitution for a dominant function (or possibly a plagal cadential function). It shares many common tones with a viio7 chord, and these tendency tones follow the voice-leading resolutions that you would expect of a viio7. When it is used to resolve to a I chord, the voice-leading issues are difficult to overcome, so you must be thoughtful in your approach and resolution.

Please note: While the Neapolitan is a commonly used chord, it is far more common to use it as a predominant function rather than as a functional substitution for dominant. Remember that if you ignore the standard tonic/dominant relationship too often, the listener will begin to lose the sense of diatonic progression. This can be good or bad depending on your desired outcome.

As always, if you study a chord’s voice-leading, you can use this to deduce its function.

Secondary chords can be extended beyond the dominant function, creating further tonicization of a chosen chord.

## Extending toniczation

For the following chorale, provide leadsheet symbols and a Roman numeral analysis. There are multiple chromatically-altered chords, some of which cannot be explained as secondary dominant or secondary leading-tone chords. And while it might be tempting to label a minor v chord in your analysis, that doesn’t explain what the listener is hearing. Instead focus on looking for “pockets” of tonality, in which you might be able to explain a progression easier through the lens of another key.

As with all analysis, you should never dwell too much on an individual chord in your first attempt. If you get stuck, just move to the next chord. It is helpful to start with leadsheet symbols when working with chromatic harmony, because it allows you to label chords by their construction before worrying about each chord’s function and relationships.

{% capture ex1 %}X:1 T:Other secondary functions M:4/4 L:1/2 K:C Q:1/2=60 V:1 [c/2E][B/2F][cE]| [dG][^cA]| [d2A]| [d2F]| [c2E]|] V:2 clef=bass [C,/2G,][D,/2G,][C,G,]| [G,,\_B,][G,,A,]| [F,,2D]| [G,,2B,]| [C,2G,]|] w:C:{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusion

At first glance (and hearing), the G minor triad seems starkly out of place. We have seen minor v chords in previous examples, but in each case, they followed the defined conventions of one of our alternate functions such as a passing or pedal functions. Here, the minor v chord does not fit any of our known functions, so we need to examine the context of this example.

The chord following the G minor triad is a clear V4/2/ii which then resolves to a ii6 chord. If you look through your leadsheet symbols, you can clearly see a pattern that extends backwards if you continue thinking in the key of ii (D minor). In the key of ii, a G minor chord is a diatonic iv chord, which would make this a iv-V-i progression in that key. Therefore, the correct labeling of this example is iv/ii – V4/2/ii – ii6. Without a stable cadence, we have not changed keys, but this progression clearly emphasizes and extends our pre-dominant harmony.

## Secondary or diatonic?

Because of the nature of diatonic progressions, there is a great deal of crossover between non-dominant secondary functions and the actual diatonic chords of a key. Provide a Roman numeral analysis of the following chorale, paying particular attention to the second chord. Is it diatonic or a secondary function?

{% capture ex2 %}X:2 T:Ambiguous secondary functions M:4/4 L:1 K:C V:1 [cE]| [cE]| [dA]| [dF]| [cE]|] V:2 clef=bass [C,G,]| [A,,A,]| [^F,,C]| [G,,B,]| [C,G,]|] w:C:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusion

The second chord, the A minor triad, is clearly a vi chord in the key of C major. It is worth noting however, that because this chord is followed by a secondary dominant, this chord also functions perfectly in the secondary key as a non-dominant secondary function. The third chord is a V7/V which tonicizes the key of G major. If you extend this key backwards, the A minor chord functions as a ii/V chord.

You do not need to label this as anything other than a vi chord in C major, because it is fulfilling its standard diatonic function in every way. However, this further illustrates how fluid harmony can become when thinking of the relationships between keys and voice-leading.

Look at the following example. In both cases, the starting interval contains enharmonically equivalent pitches of a tri-tone. In the first measure it is notated as an A4, but in the second measure, it is notated as a d5. What harmony do you think is implied in these two measures? How does the choice of using D-flat or C-sharp change the resolution in a tonal context?

{% capture ex1 %}X:1 T:The importance of pitch notation in tonal harmony M:2/2 L:1/2 K:C V:1 Q:1/4=50 ^C D|| z2|| \_D C|] V:2 clef=bass G,^F,|| z2||G, \_A,|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

In a tonal context, there is an important difference between enharmonically equivalent pitches such as D-flat and C-sharp. In the example above, the A4 between G and C-sharp implies the outward resolution of a V4/2 to I6 in the key of D major. In the second progression, changing the C-sharp to a D-flat creates a d5 that implies an inward resolution of a V6/5 to I in the key of A-flat major. Clearly, the pitch notation system we use is designed to show harmonic movement in a tonal setting.

## Leaving tonality

As we move toward music that no longer relies on tonal harmony, the tools with which we notate analysis reflect the lack of a traditional tonal center. If a piece does not rely on the tonic and dominant relationship to provide tension and release, the importance of Roman numerals, scale degrees, and even pitch names becomes less useful. They are derived from a system that prioritizes seven pitches at a given time, so without that requirement, we need a method for demonstrating the relationships between all twelve chromatic pitches.

Look at the following ornamented melody. The numbers below the staff denote the *pitch class* for each pitch. (Note that t = 10, e = 11) Each number is considered a *pitch class* (abbrev.: pc), and the system itself is called *pitch-class (pc) integer notation*. After studying this example, what can you determine about the pitch classes? How do you determine which pitches are in a pitch-class? Is this numbering built around a key center or just a particular pitch? While it should be obvious that this system would not be ideal for analyzing tonic and dominant centers, what kinds of information *does* this system demonstrate?

{% capture ex2 %}X:2 T:Happy Birthday in G major (a la R. Strauss) M:3/4 L:1/4 Q:1/4=75 K:G D/2>^D/2| E/2\_E/2 D G/2^E/2| F2 (3D/2^C/2D/2| E D A/2^F/2| G2 D/2>D/2| w:2 3 4 3 2 7 5 6 2 1 2 4 2 9 6 7 2 2 d/2\_d/4c/4 B/2\_B/4A/4 G| F/2=F/2 HE c/2>c/2| (3B/2^A/2B/2 G/2^G/2 =A/2\_A/2| G2|] w:2 1 0 e t 9 7 6 5 4 0 0 e t e 7 8 9 8 7{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusion

As you can see, pitch-class integer notation assigns a unique integer to all enharmonically equivalent pitches. This particular example is labeled in *fixed zero*, meaning that C=0, and every pitch is counted as half-steps from that point. This system is wonderful for showing intervals quickly, because each number is actually counting the number of half-steps away from zero. For fixed zero, D is two half steps away from zero, A is nine half steps away, and so on. Therefore, when you look at the numbers, you know that if the difference between two numbers is small, it is a small interval. Large distances equate to large intervals.

Look at the following chart for the pitch class of every pitch in fixed-zero pc integer notation. Note that this chart does not include double-sharps or double-flats, but *any pitch* can be included along with its enharmonic equivalents.

| Pitch-class integer | Pitch 1 | Pitch 2 |
| --- | --- | --- |
| 0 | C | B-sharp |
| 1 | C-sharp | D-flat |
| 2 | D | – |
| 3 | D-sharp | E-flat |
| 4 | E | F-flat |
| 5 | F | E-sharp |
| 6 | F-sharp | G-flat |
| 7 | G | – |
| 8 | G-sharp | A-flat |
| 9 | A | – |
| t (10) | A-sharp | B-flat |
| e (11) | B | C-flat |

## Movable-zero pc integer notation

Much like solfege, there is another system for labeling pitches in pc integer notation. Look at the following scales taken from Unit 21. Each scale is labeled using pc integer notation, but C no longer equals 0. First, figure out what scale is represented on each line, and then look at how the numbering system is adjusted. How are the numbers determined? What does having a *movable zero* demonstrate?

{% capture ex3 %}X:3 T:Scales labeled using movable-zero pc integer notation M:4/4 L:1/4 Q:1/4=75 K:C D E ^F G| A B ^c d|] w:0 2 4 5 7 9 e 0 E ^F G A| B ^c d e|] w:0 2 3 5 7 9 t 0 F \_G ^G A| B c d \_e| f|] w:0 1 3 4 6 7 9 t 0{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

You can see that using movable-zero pc integer notation allows you to set 0 to the most important pitch for a given set of pitches, and then base every number around that pitch. In the first example, the D major scale labels D as the central pitch and then counts the half-steps away from that D. The second line assigns E as 0 to show the intervallic structure of the E dorian mode, and the last line assigns F as 0 to show the intervallic structure of an F HW octatonic scale.

This does make it easy to see the intervals within each scale, but to be honest, standard interval labels (e.g. M2 and m3) do a similar job while also implying context. Movable-zero notation is actually best used for looking for patterns within subsets of pitches. Look at the next example which uses the exact same three scales, but instead of having only one zero, it assigns 0 to multiple pitches within the same scale. What patterns do you see emerge? Can you think of other ways to potentially use this?

{% capture ex4 %}X:4 T:Scales labeled using multiple zeros in pc integer notation M:4/4 L:1/4 Q:1/4=75 K:C D E ^F G| A B ^c d|] w:0 2 4 5 0 2 4 5 E ^F G A| B ^c d e|] w:0 2 3 5 0 2 3 5 F \_G ^G A| B c d \_e| f|] w:0 1 3 4 0 1 3 4 0{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

By using movable zero to highlight certain collections of pitch classes, you can show intervallic patterns within these collections. For a major scale, there are two (0245) collections separated by a whole step. For a Dorian mode, there are two (0235) collections separated by a whole step. And for a HW octatonic scale, there are two (0134) collections separated by a whole step. What scale would two (0235) collections separated by a half-step create?

Any time we have a collections of pitch classes, this is called a *pitch-class set* (abbrev: pcs). A pitch-class set can be any number of pitches, and we call the number of pitches within a pcs its *cardinality*. Each cardinality has a special name shown in the chart below.

| Number of pitch classes in the pitch-class set | Name |
| --- | --- |
| 0 | empty set |
| 1 | monad |
| 2 | dyad |
| 3 | triad |
| 4 | tetrachord |
| 5 | pentachord |
| 6 | hexachord |
| 7 | septachord |
| 8 | octachord |
| 9 | nonachord |
| 10 | decachord |
| 11 | undecachord |
| 12 | aggregate |

In the second scale example above, we used pc integer notation to show specific tetrachords within common scales. [0245] is often called the “major” tetrachord, [0235] is often called the “minor” tetrachord, and[0134] is often called the “diminished” or “octatonic” tetrachord. What tetrachord do you think is most associated with the whole-tone scale? What other scales make use of these tetrachords?

## Introduction to set theory

Pitch-class integer notation is really the beginning of *set theory*, a system that was first laid out by Allen Forte in *The Structure of Atonal Music*, and since been refined by many other theorists. Notably, Joseph Straus created a wonderful teaching method for set theory in his *Introduction to Post-Tonal Theory*. Both are amazing references and if you need to explore the topic further, I recommend that you start with these after reading through the set theory overview of Unit 22.

When you perform a harmonic analysis, you are attempting to explain how a listener hears a harmonic progression and why it sounds either functional or non-functional to that person. To do so, we rely on our understanding of diatonic tendencies and voice-leading to explain likely listener interpretations, in the same way that a composer relies on their musical knowledge to elicit a desired reaction from a listener.

Once we go beyond looking at the fundamental aspects of music – rhythm, intervals, chords, keys, etc. – and begin combining these concepts to analyze function, we must begin to organize music into structures that combine rhythm, pitch, and timbre into complete musical ideas.

A *motive* is the smallest identifiable fragment of music. It can be a short melodic fragment, a short harmonic progression, a distinct rhythm, or a combination of these things. A composer can take a motive and build an entire work around it through various transformations, but it will always retain some fundamental relationships of pitch, rhythm, or both.

A *phrase* is the complete musical idea built to support a motive. The most common analogy used to describe a phrase is to compare it to a “musical sentence.” A good written or verbal sentence has a clear beginning, middle, and end. It has a few required structures and often some decorative parts to provide more specific function. This is exactly how a musical phrase works. It has a clear beginning, middle, and end; it has required structures to define its function; and it can be manipulated, decorated, and transformed to relate to the ideas that surround it. Phrases can sometimes be divided into *sub-phrases*, but these sub-phrases do not function independently; instead, sub-phrases are best thought of as motives with their supporting textures.

## Identifying phrases

Now that you have a basic understanding of harmonic progressions, harmonic function, labeling function with Roman numerals, and cadences, you can combine these ideas to explore musical phrases. - After listening to Mozart’s *An Die Freude* multiple times (found below), mark the beginning and ending of each phrase based on your listening. - Remember that each phrase should sound like a complete musical idea with a clear beginning, middle, and end. - Once you have established these, label the last two chords of each phrase using Roman numerals and inversion figures. - Do each of your phrase endings fit one of the cadences discussed in Unit 7c? If so, label the cadence below the Roman numerals. - Identify at least one motive and describe what are defining characteristics of the motive. Rhythm? Specific intervals? Repeated progressions? - Find multiple iterations of your motive. How does Mozart transform it throughout the piece? - Once you have completed each of these steps, discuss what you think defines a phrase. What are the essential components?

Because this piece only has two voices, many chords will have more than one option for a harmony, so you must use the harmonic flowchart from the beginning of this chapter to choose the most likely harmony based on function. For example, if a harmony only has mi and sol, this could be either a I chord or a iii chord. If you put it into context, however, it will become clear what harmony the listener is likely to hear. If the harmony with mi and sol is preceded by fa and sol, it is highly unlikely that this is a iii chord. fa and sol outline a V7 harmony, and a V chord will not resolve to a iii chord. Instead the listener will hear this as a V chord resolving to a I chord – albeit an unstable I chord.

Also note that this piece has multiple modulations that I have marked into the score. We will cover modulations in a later unit, but for now, make sure to analyze each phrase ending in the correct key. If you do not, your cadences will not make sense.

{% capture ex1 %}X:1 T:Mozart - An Die Freude M:2/4 L:1/8 Q:1/4=70 K:F V:1 F2- FG/2A/2| G4| AG/2A/2 BG| EF z2| F2- FA/2c/2| cB- BG/2F/2| E2- EG/2B/2| A2 z2| c2- cA/2F/2| d2 c2| cB BA| AG z2| G2- Gc| A2- Af/2d/2| c2- c=B| c2 z2| c2- ce/2c/2| Af ed| c2 =B2| c2 z2| A2- A\_B/2c/2| cB AG| *e2 dc| B/2A/2G z2| c2- cd/2=e/2| fe dc| BA GF| c2 z2| c2- cd/2B/2| Af (3efd| c2- cd/2B/2| BA z2| c2- cA/2F/2| d2- dc/2B/2| Ac EG| F2 z2| c2- cB/2A/2| d/2f/2e/2g/2 fB| A2 G2| F2 z2|] V:2 clef=bass zA, G,F,| zE, D,C,| F,F, D,B,,| C,D, z2| zA, A,A,| zG, G,G,| w:F: C,C, C,C,| F,F, G,G,| A,A, A,A,| B,B,, A,,A,| G,E, F,=B,,| C,C, D,D,| E,E, E,E,| w:* \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ C: F,F, F,F,| G,G, G,G,| A,A, G,F,| E,E, E,E,| F,F, F,F,| G,G, G,,G,,| C,C/2D/2 C/2B,/2A,/2G,/2| ^F,F, F,F,| G,G, G,G,| ^F,F, F,F,| G,G, =F,F,| E,E, B,B,| A,C B,A,| w:g: \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ \_ F: B,A, G,F,| C,C, C,C,| E,E, E,E,| F,F, F,F,| E,E, E,E,| F,F, F,F,| A,A, A,A| B,B, B,B,| CC C,C,| D,D, D,D,| A,,A,, A,,A,,| B,,B, A,B,| CC C,C,| F,2 z2|]

{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Conclusions

A phrase is a complete musical idea that: - has a clear sense of harmonic progression. - ends with a cadence. - has a melodic structure that creates tension and release. - ends with longer rhythmic values to create a sense of slowing.

### Phrase Key to *An Die Freude*

Phrases 1. m. 1-4 Deceptive cadence (DC) 2. m. 5-8 Imperfect Authentic Cadence (IAC) 3. m. 9-12 Half Cadence (HC) 4. m. 13-16 Deceptive Cadence (DC) 5. m. 17-20 Perfect Authentic Cadence (PAC) 6. m. 21-24 Imperfect Authentic Cadence (IAC) 7. m. 25-28 Half Cadence (HC) 8. m. 29-32 Imperfect Authentic Cadence (IAC) 9. m. 33-36 Deceptive Cadence (DC) 10. m. 37-40 Perfect Authentic Cadence (PAC)

In this piece, each phrase is four measures long, and most musical pieces will establish a “standard” phrase length. This is not a defining feature of phrases, though, because many composers prefer to have varied phrase lengths in their compositions to keep the listener engaged.

## The benefit of using leadsheet symbols in analysis

As we leave strict diatonic function and begin to explore chromatic alterations and modulation, one of the most difficult challenges in analysis is discerning what tonic is implied at any given moment. Roman numeral analysis shows function–tonic, dominant, etc.,–but it shows this through each chord’s relationship to tonic. Simply put, you cannot write a Roman numeral if you do not know your tonic. On the other hand, leadsheet notation is limited in that it does not show how a chord functions, but it *does* provide a way to examine a chord quality independent of key or tonic. An F major chord could be a I chord in F major, a IV chord in C major, a III chord in D-flat major, and many others, but it will always be an F major chord.

Leadsheet notation does not rely on any pre-existing knowledge of the piece, and because of this, it is helpful to use this system as a shorthand when you begin analyzing a piece–particularly those with the potential for modulations. As you start analyzing an unfamiliar section of music it is helpful to write leadsheet symbols above the staff so that you can quickly reference them once you have completed a larger section of the music. This will allow you to look for patterns within chord progressions rather than having to repeatedly re-examine every chord each time that you discover something new.

## Simple modulations and common chords

The simplest modulation is one that uses standard functional progressions and produces modulations through slight changes. Analyze the following excerpt from a Haydn piano sonata using leadsheet symbols. Even though there is only one altered note, it clearly ends in a different key than the key in which it starts. To begin understanding how this modulation works, ask these key questions: 1. Where do you first *hear* something changing? 2. How is the change prepared? 3. What harmonies transition into and out of the modulation?

Once you have answered these, create Roman numerals for *both the beginning key and the ending key*. (This will require secondary function chords.) When looking at the Roman numeral progressions, you can see where the progressions function diatonically and where they emphasize non-tonic chords such as the subdominant.

{% capture ex1 %}X:1 T:Haydn - Piano Sonata in G Major, mvt. 3 M:4/4 L:1/8 K:G Q:1/4=65 V:1 d| d>e/2f/4 gg g2 fe| e/2d/2c/2B/2 d/2c/2B/2A/2 BG zd| d>e/2f/4 gb b2 ag| g/2f/2e/2d/2 e2 d2 z:|] V:2 clef=bass z| zG, B,C DD, DC| B,G, A,D, G,D,/2B,,/2 G,,2| w:G: zG, B,G, zG ^CE| DF, G,A, D,A,, D,,:|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusion

The example begins in the key of G major but ends in the key of D major. The first two bars clearly establish G major and end with an authentic cadence on beats 2, 3, and 4 of the second measure. The third measure also begins in G major, but beats 3 and 4 have a chromatic tone (C-sharp) as part of an A7 chord used to tonicize D major. This tonicization is then solidified through an authentic cadence in D major in measure 4, completing the modulation.

If you attempt to analyze this excerpt in only one of the two keys, you do not create a convincing explanation of what you hear in either key. In G major, the second phrase requires many secondary dominants and results in a *heavily* tonicized V chord at the end. Conversely, if we try to analyze the first phrase in D major, we end up with a progression that looks as if it’s operating entirely in the key of IV.

{% capture ex3 %}X:3 T:Haydn - Piano Sonata in G Major, mvt. 3 M:4/4 L:1/8 K:G Q:1/4=65 V:1 d| d>e/2f/4 gg g2 fe| e/2d/2c/2B/2 d/2c/2B/2A/2 BG zd| d>e/2f/4 gb b2 ag| g/2f/2e/2d/2 e2 d2 z:|] V:2 clef=bass z| zG, B,C DD, DC| B,G, A,D, G,D,/2B,,/2 G,,2| w:G:I \_ \_ (6/4) \_ V7 \_ I \_ V7 \_ I w:D:IV \_ \_ \_ \_ V7/IV \_ IV \_ V7/IV \_ IV zG, B,G, zG ^CE| DF, G,A, D,A,, D,,:|] w:G:I \_ \_ \_ V7/V \_ \_ V \_ V7/V \_ V w:D:IV \_ \_ \_ V7 \_ \_ I \_ V7 \_ I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

When you look at the analyses in both keys on top of each like this however, there is one point at which the progression makes sense in *both* keys. At the beginning of the measure three, the listener will hear the G major triad as a continuation of the I chord from the previous cadence. This chord can also act as the diatonic IV chord in the key of D major. Therefore, this moment is both the conclusion of V-I in G major as well as the beginning of a IV-V-I progression in D major. This is an exemplar of a *pivot chord*.

A pivot chord is a chord that allows the composer to smoothly modulate between two keys. Any chord can be used to pivot between two keys, but this chord must be part of a **functional progression** in *both* keys to be considered a pivot chord. If a chord does not have an obvious function on both sides of the pivot, it is not a pivot modulation. We will discuss the other modulatory techniques in the next topic.

## Common chords between keys

The smoothest pivot chords will be diatonic to both keys, although we will study some common non-diatonic chords in Unit 16c. In the example above, if you pivot anywhere other than the G major chord that bridges the first and second phrases, you must use a secondary dominant. By having a chord that is diatonic to both keys, the transition between the two keys is as smooth as possible. The less strong the pivot chord’s function in both keys, the more jarring the modulation will be.

When a modulation centers around a common chord between two keys, we call this a *common chord pivot modulation*. To better understand why closely-related keys create smoother modulations, it is helpful to look at the number of common chords between the two keys. In the following chart, I have listed each chord from C major and G major, but I have aligned them by root rather than by scale degree.

| C major | Chord | Chord | G major |
| --- | --- | --- | --- |
| I | **C maj** | **C maj** | IV |
| ii | D min | D maj | V |
| iii | **E min** | **E min** | vi |
| IV | F maj | F#o | viio |
| V | **G maj** | **G maj** | I |
| vi | **A min** | **A min** | ii |
| viio | Bo | B min | iii |

You can see that the two keys share four common chords (highlighted in bold), so writing a smooth progression in both keys is fairly easy because it can rely on multiple common chords. Try creating a table like this for distantly-related keys such as C major and E major. What about G major and F minor? You will find that closely related keys share many more common chords than distantly related keys.

## Pivot chords and modulation points

As described above, the *pivot chord* of a pivot chord modulation is more than just a chord that is common to both keys. A pivot chord smoothly transitions from one key to another because it is part of a functional progression in *both* the old and the new keys. The simpler the pivot’s progression, the less-jarring the modulation.

In the previous topic, we listened to an excerpt from the third movement of the second movement of Tchaikovsky’s Symphony No. 5. Analyze this piece beginning with leadsheet symbols, then add Roman numerals from the beginning until you get to the *modulation point* – the place where you first hear the modulation.

**Common chord pivots occur *right before you hear* the modulation point.**

To show a modulation: - Draw a bracket that provides an area on top and bottom. Your bracket needs to have more than one line, otherwise it resemble a slash and therefore a secondary function. - On the top part of the bracket, show the Roman numeral for the pivot chord in the original key. - On the bottom part of the bracket, name the new key (using an upper/lower case letter followed by a colon) as well as the Roman numeral for the pivot chord in this new key.

{% capture ex2 %}X:2 T:Tchaikovsky - Symphony No. 5, Mvt. II T:reduction M:12/8 L:1/8 K:D Q:1/8=90 V:1 z6 z3 DCB,| D3 C6 A,B,C| E3 D6 DEF| G3 G2G G3-G2G|G3 F3 z3 DCB,| D3 C6 A,B,C| E3 D6 DEF| ^G3 G2 G G3-G2 G| ^GBA A6 z3|] V:2 clef=bass [A,6E,A,,C,,] [A,6F,A,,D,,]| [A,6G,A,,E,,] [A,6E,A,,G,,]| [A,6A,,F,,] [A,6DF,A,,D,,]| [G,6DE,B,,E,,B,,,] [A,3DA,,,A,,E,,][A,3CA,,,A,,E,,]| [A,6DD,A,,E,,] [F,,6]| w:D: [A,6G,A,,E,,] [A,6E,A,,G,,]| [A,6A,,F,,] [A,6DF,A,,D,,]| [F,6FB,D,B,,B,,,] [F,3FB,D,D,,][^G,3^ECC,C,,]| [F,9FCC,F,,] z3|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

What makes this modulation work so well? More specifically, how strong is the progression before and after the pivot chord?

## Secondary leading-tone chords

Just as we can tonicize non-tonic chords by borrowing their dominant chords, we can also tonicize non-tonic chords by borrowing the leading-tone chord (viio) from that same key. A secondary leading-tone chord follows all of the same voice-leading rules as if it were written in the borrowed key.

There are two different ways to explore secondary leading-tone chords(viio/x)–through functional substitution as a dominant chord or through functional substitution as a pre-dominant chord.

## Secondary leading-tone chords through functional substitution

In Unit 11b, we introduced the idea of functional substitution as a way to explore how chords with similar functions are related. To better understand the voice-leading of viio chords, I asked you to think of them as V7 chords without the root. This explains why viio breaks many of standard part-writing doubling conventions. - You *should not* double the root, because it’s a tendency tone…like the third of the V7 chord. - You *should* double the chordal third, because it is not a tendency tone…like the fifth of the V7 chord.

First, harmonize the following example as written, and then turn the ii7 chord into a V7/V by adding the appropriate accidental.

{% capture ex1 %}X:1 T:Creating a V7/V M:4/4 L:1/2 K:C V:1 [cE] [c]| [c] [B]| [c2]|] V:2 clef=bass [C,G,] [A,,]| [D,] [G,,]| [C,2]|] w:C:I vi V7/V V I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

In doing this, you have created a well-voiced secondary dominant seventh chord, V7/V that should look something like this:

{% capture ex3 %}X:3 T:Completed secondary dominant chord progression M:4/4 L:1/2 K:C V:1 [cE] [cE]| [c^F] [BG]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [D,A,] [G,,G,]| [C,2G,]|] w:C:I vi V7/V V I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

To turn this into a secondary *leading-tone* chord, you need to replace the root–in this case, the pitch D–with a note from viio/V. While this is a simple statement, I hope that you remember our discussions of the difficulties in voicing a viio triad. You do not want to double the tendency tones, because one of them will need to resolve incorrectly to avoid objectionable parallels with each other. And because there are so many tendency tones–the root, fifth, and seventh of any viio7 are all tendency tones–you need to be careful of where each voice is placed to avoid parallelisms, poor resolutions, and spacing errors.

As you work on revoicing your V7/V, take note of which pitch you choose to double. What other changes are necessary to avoid poor resolutions? You may choose to use any inversion for your viio/V chord, so try re-voicing using the following voicing:

{% capture ex4 %}X:4 M:4/4 L:1/2 K:C V:1 [cE] [cE]| x [BG]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [^F,,] [G,,G,]| [C,2G,]|] w:C:I vi viio/V V I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

If you tried to create your viio/V based on the V7/V voicing from above, it is likely that you immediately ran into issues in trying to eliminate the D from the bass chord. Substituting an A in the same octave creates parallel octaves against the tenor. Substituting an F-sharp in the same octave creates parallel octaves against the alto. You could frustrate the leading tone in the alto as a workaround, but the fact remains: viio *triads* are difficult to use as a dominant function with good voice-leading, and there is no straightforward answer to the above exercise that does not result in some compromise.

## Adding a seventh

It is much easier to use a viio as a seventh chord. In the following example, try to using a viio7/V using the provided bass line. You may use either a fully diminished or half-diminished seventh chord in this example.

{% capture ex5 %}X:5 T:Using a secondary leading-tone seventh chord M:4/4 L:1/2 K:C V:1 [cE] [cE]| [EA] [DG]| [E2G]|] V:2 clef=bass [C,G,] [A,,A,]| [^F,,C] [G,,B,]| [C,2C]|] w:C:I vi vii%7/V V I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Conclusion

As you can see, the part-writing mostly takes care of itself in voicing this chord as long as you resolve the tendency tones correctly. The most obvious solution is listed below. Notice that the resolutions are smooth and allow every tendency tone to resolve correctly without creating objectionable parallels.

{% capture ex6 %}X:6 T:A completed secondary leading-tone seventh chord M:4/4 L:1/2 K:C V:1 [cE] [cE]| [c\_E] [DB]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [^F,,A,] [G,,G,]| [C,2G,]|] w:C:I vi viio7/V V I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

Because this is a functional substitution for a V/V chord, the root and fifth of the viio7/V are acting as if they were the third and seventh of the V6/5/V chord. You can see this when you voice the two chords side-by-side.

{% capture ex7 %}X:7 T:Comparing a viio7/V to a V7/V M:4/4 L:1/2 Q:1/4=60 K:C V:1 [cD] [DB]| [c\_E] [DB]|] V:2 clef=bass [^F,,A,] [G,,G,]| [^F,,A,] [G,,G,]|] w:C:V6/5ofV V viio7/V V I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

## Secondary leading-tone chords through similar chords

It is also helpful to approach secondary leading-tone chords by exploring the dual nature of their function. To this point, we have focused on their role as dominant function chords in a second key. For example, we have shown repeatedly that a V7/V functions as the V chord *in the key of* V. This explains their voice-leading, but it does not address their *actual* function within the progression as a whole in the home key–the key of I. In the home key, the V7/V takes the place of a *pre-dominant* chord, most often replacing a ii chord.

This can be applied to viio7/x as well. Notice that the roots of both dominant function chords–V and viio–and the roots of pre-dominant chords–ii and IV–are separated by the interval of a third. If we add this observation to the idea that a V/V chord is a functional substitution for a ii chord, it reasons that a viio chord is therefore a functional substitution for a IV chord. They share a function and have a root that is a third higher than their more commonly used counterpart.

You can demonstrate this by harmonizing the following diatonic progression. Once you have a harmonization with good voice-leading, alter the IV6 chord to become the viio7 chord from the key of the chord you will be tonicizing–in this case, the viio7 from G major. What note(s) do you have to alter to achieve this? How do these notes relate to a V7/V? Did you have to re-voice this to accommodate the alterations?

{% capture ex2 %}X:2 T:viio7/V as it relates to IV M:4/4 L:1/2 K:C V:1 [cE] [c]| [c] [B]| [c2]|] V:2 clef=bass [C,G,] [A,,]| [A,,] [G,,]| [C,2]|] w:C:I vi IV6 V7 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

After having done this, do you feel that viio is more closely related to ii7 or IV? Why?

Now that we understand how circle-of-fifths progressions within a key create a basic harmonic “outline,” we can use that pattern to begin analyzing harmony. The framework of these progressions can be used to organize any piece of music in this tradition and allows us to ask the two fundamental questions of all harmonic analysis: - How are expectations created in the music? - Which pitches are functional in creating these expectations?

Regardless of the complexity or era of a composition, if a theorist can answer these questions about a piece, they can analyze the qualities that define that style of composition.

## A first attempt at harmonic analysis

As we progress through the examples below, we will develop a process for analyzing a piece of tonal music. Students often think that “analyzing” a piece of music simply involves identifying and labeling a bunch of chords, but as you move through this, be aware that *the goal of harmonic analysis is to explain how the listener hears the music*. While the first step is identifying harmonies, it is far more involved than that, so as you move past the first step of identifying chords, I encourage you to make a list of all the questions and decisions that you encounter as you work.

**Study the following chorale, and provide a Roman numeral and inversion figure below every new harmony. As you go through this process, keep track of the questions that you solve as well as what makes this difficult. Start by looking at the big picture, and do not get bogged down in trying to figure out every pitch and chord at first glance. If you get stuck, keep moving and return to the difficult sections after you have a feel for the piece as a whole. You should also consider starting with leadsheet notation until you are confident of the key of the piece; you can then return to add Roman numerals once you have more context.**

{% capture ex1 %}X:1 T:Old hundredth psalm M:4/4 L:1/4 Q:1/4=80 K:G V:1 [GD]| [GD] [FD] [EB,] [DD]| [GB,] [AD] H[BD] [BD]| [BD] [BG] [AF] [GG]| [cG] [BG] H[AF] [GG]| [AF] [GB] [AF] [DG]| [EE] [FC] H[GB,] [dD]| [BD] [GG] [AF] [cA]| [GB] [AF] H[GG]|| [G4C4]| [G4B,4]|] V:2 clef=bass [G,B,]| [G,B,] [A,D,] [E,G,] [B,,G,]| [E,G,] [D,F,] H[G,G,,] [G,G,]| [G,G,] [G,D] [DD,] [E,B,]| [C,E] [G,,D] H[DD,] [E,B,]| [D,D] [G,D] [D,D] [B,,G]| [C,G,] [D,A,] H[G,E,] [G,B,]| [G,G,] [E,B,] [D,D] [A,,E]| [D/2B,,/2]-[D/2C,/2] [D/2D,/2]-[C/2D,/2] H[G,,B,]|| [C,4E,4]| [G,,4D,4]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

To do this, there are three primary questions that must be answered in a harmonic analysis: - What is the harmonic rhythm? (i.e. How often does the harmony change?) - Which pitches are chord tones and non-chord tones? - Which pitches, if any, are omitted but implied by the context?

#### Harmonic rhythm

We will tackle the second and third questions in the example below, but before you can begin to analyze the chords within a piece, you need to figure out how often the chords change. This concept is called *harmonic rhythm*. It is different for every piece; sometimes it will be every beat as in the chorale above, but other pieces will have irregular patterns and/or many measures before new harmonies.

Determining harmonic rhythm is intuitively obvious to most musicians while listening, but can be difficult to illustrate when looking only at the music. This is often a chicken-or-the-egg question: you need to know how often the chord changes to determine which pitches to include in the chord, but you also need to look at which pitches create chords to figure out how often the chord changes. Chorales are an easy place to start, because most often, they change chords in a consistent rhythm–in this case, every beat–and this creates an easy-to-see visual cue as each chord is stacked vertically and mostly homorhythmic. For more complicated textures, studying melodic patterns and bass-lines is often enough to provide enough context for an educated guess. Bass-lines in particular will often sustain pitches and/or outline chords until the harmony changes, and this gives a clear indicator of probable harmonic rhythm. This becomes much easier as the student gains experience.

#### Omitted/implied chord tones

The Old Hundreth Psalm has a number of incomplete chords, and this may not be obvious at first glance. To fill in the missing pieces, music theorists use a number of tools, most of which are designed to look at contextual clues and draw conclusions based on their general knowledge. We created one of these tools in Unit 7a with the diatonic harmony flowchart.

| (*unnamed*) | (*unnamed*) | pre-dominant | dominant | tonic |
| --- | --- | --- | --- | --- |
| iii | vi | ii | V | I |
|  |  | IV | viio |  |

By employing the progressions from this flowchart, a theorist can look at a given harmony and decide which pitches support a harmonic progression that is *likely* to be heard by a listener, even if those tones are not present.

## Embellishments

One of the most difficult issues to tackle in harmonic analysis is determining *which pitches are functional*. - Which pitches define how the listener “hears” the music? - Which pitches could be removed without changing the basic effect? - Which pitches are added solely to provide variety?

**Analyze the following embellished first phrase of the Old Hundredth Psalm. Which notes are not necessary for the harmonic function? How would you describe their motion? If you are struggling to determine whether it belongs or not, try referring to your the harmonic outline that you built in the previous topic** [**Unit 7a**](07-harmonic-functions/a1-diaprogcirclefifths.html)**. Does the voice-leading–i.e. how each chordal member resolves–work with the rules that you established in Unit 7a if you do not have a non-chord tone?**

{% capture ex2 %}X:2 T:Embellished first phrase of Old Hundredth Psalm M:4/4 L:1/4 Q:1/4=50 K:G V:1 [GD]| [G/2D][G/2E] [F/2D][F/2C] [E/2B,][E/2C] [D/2D][D/2C]| [GB,] [AD] H[BD]|] V:2 clef=bass [G,/2B,][F,/2B,]| [G,B,] [A,D,] [E,G,] [B,,G,]| [E,G,] [E,/2F,][D,/2F,] H[G,G,,]|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusion

The essential pitches of any harmony are those that if removed, would noticeably alter the way the listener hears the harmony. As you attempted to analyze this decorated melody, were you able to see and hear the basic framework from the first phrase of the Old Hundredth? If so, it should have allowed you to figure out both the harmonic rhythm as well as which pitches were decorative.

The harmonic rhythm stayed the same; one chord per quarter note, even though the voices were often filled double the amount of notes.

From there, you must consider a number of factors to determine which notes are embellishments. - Which pitches are on the strong beats? - Are any pitches repeated? - Is one pitch more dissonant against the other chord tones? Differentiating between chord tones and non-chord tones is the key to deciding a chord’s function.

## Before moving forward…

As you answered each of these questions, you began understanding how harmony *functions*. Even without much guidance, you can use your knowledge of musical fundamentals–intervals, chords, melodic lines, Roman numeral labeling, etc.–to create a sketch of the harmonic underpinnings of this chorale.

We use chorales to begin studying analysis because of the vertical nature of the writing. Every chord in this composition is aligned to where it can be easily parsed by sight, and almost every tone is functional. As you look at other musical styles, try to reduce the music down to a simpler texture–one that resembles a chorale voicing–if you cannot answer the basic questions of finding harmonic rhythm and chord tones.

## Pitch systems and an introduction to solfege

There are many methods for labeling pitches, and these vary based on language of origin, style of music, pedagogy, and analytical purposes. In this textbook, we will primarily reference the widely-used English-language notation system that employs seven letter names and accidentals. This system is discussed below and is sufficient for differentiating between pitches in a diatonic tonality system. (If the terms *diatonic* and *tonality* don’t mean anything to you yet, don’t worry; we’ll cover those terms in later units.)

There are times, however, in which we want to discuss the *concept* of a tonal structure without tying ourselves to a particular tonal center, and we often see this concept in our every day lives. Take, for example, the common occurrence of a group of people spontaneously bursting into song–e.g. everyone singing *Happy Birthday* at a niece’s birthday party. These people do not likely have formal musical training and no one chooses a particular key, but the song is still completely recognizable. (Usually.)Instead, they start singing and their voice finds a comfortable key based on their vocal range. They do this by intuiting *the relative distance between pitches* rather than using a predetermined set of pitches. So to discuss how the distance between pitches implies tonal centers, we need a system that demonstrates *relative* distance without having to refer to the letter system.

There are multiple pre-existing systems that define music in relative terms, but for this textbook, we will use *moveable-“do” solfege*, a system that evolved from some of the earliest methods of notation. In this system, we assign the most privileged note of a scale to do, and then we assign each note above that pitch a similar Latin name based on its distance from do. For those of you familiar with the classic musical *The Sound of Music*, you probably already know the basic seven solfege. “Do, a deer, a female deer…and so on.

We will discuss this system in detail in the unit on scales, but until then, it will be helpful for you to refer to the following chart when necessary.

| Scale degree | Solfege syllable | Raised | Lowered |
| --- | --- | --- | --- |
| ^1 | do | di | N/A |
| ^2 | re | ri | ra |
| ^3 | mi | N/A | me |
| ^4 | fa | fi | N/A |
| ^5 | sol | si | se |
| ^6 | la | li | le |
| ^7 | ti | N/A | te |

### Accidentals

This course assumes that you have a basic knowledge of how to raise and lower pitches in standard music notation. If you need to review proper usage of accidentals, please refer to the *Further Reading* section under [Discussion 1b](01-pitches-clefs//b2-labelingpitches.html).

## Enharmonic Equivalence and Pitch Classes

When studying tonal harmony, C-sharp and D-flat have unique functions and are *not* interchangeable, however, when considering their physical properties, there is no difference between these two pitches meaning that we consider these two pitches to be *enharmonically equivalent*. At its core, enharmonic equivalence is an easy concept: When two pitches sound the same–meaning that they share identical [frequencies](https://amazing-space.stsci.edu/resources/explorations/groundup/lesson/glossary/term-full.php?t=wavelength_and_frequency)–but have different note names (i.e. letters), we consider them to be enharmonically equivalent.

If you were to group all pitches that are enharmonic equivalents, you create a *pitch class*; such as C-sharp, D-flat, and B-double-sharp. There are twelve pitch classes in traditional Western tonality. Every pitch has multiple enharmonic equivalents, but some are used less frequently due to the necessity for uncommon accidentals such as double-sharps and double-flats. Note that all but one pitch class has at least three enharmonic equivalents when using the five most common accidentals: *naturals, flats, sharps, double-flats, and double-sharps*. (The remaining pitch class only has two possible enharmonic equivalents without creating accidentals that exist only in theory such as triple-sharps or triple-flats.)

### Goals for this topic

In the example below, each measure contains two notes that are enharmonically equivalent. Using this example, determine: - up to three *enharmonic equivalents* for every *pitch class* using flats, sharps, double sharps, and double flats. - Which one of the *pitch classes* only has two enharmonic equivalents when using the five most common accidentals?

### Accidentals and Enharmonic Equivalence

{% capture ex1 %}X:1 T:Enharmonic Equivalence M:2/4 L:1/4 K:C V:1 name=“Treble Clef” \_B ^A |f ^e |^^E ^F |] V:2 name=“Alto Clef” clef=“alto” ^G \_A |B, \_C |^^G, A,|] V:3 name=“Tenor Clef” clef=“tenor” ^F, \_G, |F, ^E, |D, ^^C,|] V:4 name=“Bass Clef” clef=“bass” \_D, ^C, |^B,, C, |D, \_\_E,|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusion

Using the example above, you can extrapolate which pitch classes have three enharmonic equivalents and which have two.

Two examples of complete enharmonic equivalent groups would be: - A, B-double-flat, G-double-sharp - B, C-flat, A-double-sharp

Each pitch in these groups belong to the same pitch class, because they share an identical frequency. Yet they function differently within the context of music, so we have multiple ways of labeling the same frequency.

This shows that the *letter* system employed in staff notation is the limiting factor in creating enharmonic equivalents within a pitch class. The pitch class that includes A-flat is isolated from its neighbors in such a way that there is no pitch that uses the letter *F* or *B* to create a third enharmonic equivalent when using only the five common accidentals. The interaction between the 7 letter names and 12 pitch classes is the basis for our musical notation system and will be critical in how we label intervals, chords, and scales.

{% capture ex2 %}X:2 T:Enharmonic Equivalence T:Each measure contains all notes within a pitch class that are enharmonically T:equivalent using only the five most-common accidentals. M:3/4 L:1/4 K:C ^B, C \_\_D| ^^B, ^C \_D| ^^C D \_\_E| ^D \_E \_\_F| ^^D E \_F| ^E F \_\_G| ^^E ^F \_G| ^^F G \_\_A| ^G \_A z| ^^G A \_\_B| ^A \_B \_\_C| ^^A B \_C|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

## **Labeling Octaves and Clef Relationships**

### ISO

When labeling pitches, we also need a way to refer to specific octaves or registers. We will be using the system used by the International Standard Organization (ISO). In this system, each pitch is given an Arabic numeral that designates its octave. For example, middle C is labeled as C4.

### Goals for this topic

Using the example below, determine: - where C4 lies in each clef - what the numeral refers to in the ISO system for labeling octaves - how to describe the usage of this system to a non-musician

{% capture ex3 %}X:3 T:Pitches and Clefs M:C L:1/4 K:C V:1 name=“Treble Clef” e a f b g ^c B|] w: E5 A5 F5 B5 G5 C#5 B4 V:2 name=“Alto Clef” clef=alto E A F B G ^C B,|] w: E4 A4 F4 B4 G4 C#4 B3 V:3 name=“Tenor Clef” clef=tenor E, A, F, B, G, ^C, B,,|] w: E3 A3 F3 B3 G3 C#3 B2 V:4 name=“Bass Clef” clef=bass E, A, F, B, G, ^C, B,,|] w: E3 A3 F3 B3 G3 C#3 B2{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

There are a few simple rules to label octaves using the ISO system. - Notes are labeled using a pitch name and a number. - The numbers represent an octave range and higher numbers equate to higher octaves. - Each numbered octave starts on C, not A. - Each number ends on B. - Even if two notes are enharmonically equivalent, they can have different octave designations. For example, C-flat4 and B3 are enharmonically equivalent, but because they straddle the octave break between C and B, they are labeled as belonging to different octaves.

You were told that C4 is *middle C*, and from this, you should be able to determine where *middle C* appears on each clef

{% capture ex4 %}X:4 T:Middle C in each clef M:C L:1 K:C C| [K:clef=alto]C| [K:clef=tenor]C| [K:clef=bass]C|]{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

From this, it is easy to see the necessity of clefs. Ledger lines are an important notation tool, but too many ledger lines becomes difficult to read quickly. Therefore, each clef highlights a specific range that can be written without employing ledger lines. Alto clef is typically thought of as a lower extension for treble clef; it adds the visual space of seven steps from treble clef. Tenor clef is a higher extension for bass clef and adds the visual space of five steps from bass clef. Of course, alto and tenor clef have similar ranges and one of the other could likely be eliminated with little issue – alto clef is visually seven steps from either treble or bass clef – but because both of these clefs have been widely used for more than a century, it is necessary for all musicians to be familiar with reading them.

### Why is the ISO system based on C instead of A?

This is almost entirely related to the evolution of the musical notation system and how the non-accidental pitches (i.e. “white keys” of the keyboard) form a major scale. While this is a fascinating topic, it is somewhat beyond the purview of this chapter, but I hope you will explore this further on your own.

### Goals for this topic:

As you listen through all of the examples below, you should: - figure out why *natural, melodic,* and *harmonic* minors are named as they are - be able to describe how *modes* relate to the major and minor scales (or vice versa) - describe which modes seem “light” and “dark” and what seems to create this phenomenon - discuss how major and minor *pentatonic* scales relate to the major and minor scales - memorize the names for each scale degree (i.e. tonic) as well as the corresponding numeral notation - how the names for each scale degree are derived (e.g. How are dominant and subdominant scale degrees related?) - incorporate the Latin spelling for every solfege

## Modes

The next eight scales are all modal scales, and the first six of these modes actually pre-date the major and minor scales. Even though you are likely more familiar with major and minor scales to this point in your musical education, modes are commonly used in all types of Western music, including classical, jazz, pop, movie soundtracks, and folk music. As you listen to Happy Birthday played in each mode, take note of the basic structure of each mode by comparing how they are related to the major and minor scales. Is there an easy way to remember these?

Each mode can be “ranked” on a scale from the darkest to lightest sound, so on your first listen, take note of which sound dark and light to you. (Remember that describing a scale as light or dark is a somewhat subjective concept, so take your ranking with a grain of salt.) Once you have them grouped dark and light modes, see if you can figure out what each group has in common. Does there seem to be a pattern of notes that pushes a mode toward the extremes of your rankings?

Because we have yet to discuss tonality as a concept, you do not need to worry too much about the difference between modal and diatonic (i.e. major and minor) music yet. So as you listen to the modes below, simply compare the intervallic patterns and solfege to that of the major and minor scales above. We will discuss their usage more as we begin to explore musical function and harmony in later chapters.

{% capture ex19 %}X: 19 T:Happy Birthday in G Ionian M:3/4 L:1/4 Q:1/4=90 K:G D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“19” abc=ex19 %}

{% capture ex11 %}X: 11 T:Happy Birthday in G Dorian M:3/4 L:1/4 Q:1/4=90 K:F D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“11” abc=ex11 %}

{% capture ex12 %}X: 12 T:Happy Birthday in G Phrygian M:3/4 L:1/4 Q:1/4=90 K:Eb D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“12” abc=ex12 %}

{% capture ex13 %}X: 13 T:Happy Birthday in G Lydian M:3/4 L:1/4 Q:1/4=90 K:D D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“13” abc=ex13 %}

{% capture ex15 %}X: 15 T:Happy Birthday in G Mixolydian M:3/4 L:1/4 Q:1/4=90 K:C D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“15” abc=ex15 %}

{% capture ex16 %}X: 16 T:Happy Birthday in G Aeolian M:3/4 L:1/4 Q:1/4=90 K:Bb D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“16” abc=ex16 %}

{% capture ex17 %}X: 17 T:Happy Birthday in G Locrian M:3/4 L:1/4 Q:1/4=90 K:Ab D/2>D/2| E D G| F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“17” abc=ex17 %}

The next “mode” is not a strict mode in the traditional sense but is used often enough in jazz and commercial music that you should at least be familiar with its construction.

{% capture ex18 %}X: 18 T:Happy Birthday in G Lydian Dominant M:3/4 L:1/4 Q:1/4=90 K:D D/2>D/2| E D G| =F2 D/2>D/2| E D A| G2 D/2>D/2| d B G| =F E c/2>c/2| B G A| G2|]{% endcapture %} {% include abc-example.html number=“18” abc=ex18 %}

### Conclusion

When first studying the modes, most students consider modes a simple extension of their major scale–i.e. “Phrygian mode is a major scale starting on the third scale degree”–even though the primary six modes (Ionian through Aeolian) predate the major scale. Relating the modes to the major scale is a good way to memorize their construction, because many major scales are widely taught as the foundation of Western music. Eventually, you should strive to be able to recall each mode as its own entity, so that you can begin hearing the intracacies of how the mode functions musically, rather than hearing it as an derivative of the major scale.

| Modes from C Ionian | ^1 | ^2 | ^3 | ^4 | ^5 | ^6 | ^7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ionian | C | D | E | F | G | A | B |
| Dorian | D | E | F | G | A | B | C |
| Phyrgian | E | F | G | A | B | C | D |
| Lydian | F | G | A | B | C | D | E |
| Mixolydian | G | A | B | C | D | E | F |
| Aeolian | A | B | C | D | E | F | G |
| Locrian | B | C | D | E | F | G | A |
| Lydian Dominant | F | G | A | B | C | D | Eb |

Of course, there are other ways to memorize these. The most obvious is to memorize the intervallic pattern from the tonic note. The table below shows the intervals necessary to reach the next scale degree of each mode.

| Intervallic patterns of modes | ^1 | ^2 | ^3 | ^4 | ^5 | ^6 | ^7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ionian | W | W | H | W | W | W | H |
| Dorian | W | H | W | W | W | H | W |
| Phyrgian | H | W | W | W | H | W | W |
| Lydian | W | W | W | H | W | W | H |
| Mixolydian | W | W | H | W | W | H | W |
| Aeolian | W | H | W | W | H | W | W |
| Locrian | H | W | W | H | W | W | W |
| Lydian Dominant | W | W | W | H | W | H | W |

You may prefer to remember the relationship of *scale degrees* to the Ionian mode–much as you derive the minor scale through raising and lowering pitches–rather than relating the entirety of the scale to its Ionian mode.

| Modes as related to Ionian (major) scale degrees | ^1 | ^2 | ^3 | ^4 | ^5 | ^6 | ^7 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Ionian | ^1 | ^2 | ^3 | ^4 | ^5 | ^6 | ^7 |
| Dorian | ^1 | ^2 | ^b3 | ^4 | ^5 | ^6 | ^b7 |
| Phyrgian | ^1 | ^b2 | ^b3 | ^4 | ^5 | ^b6 | ^b7 |
| Lydian | ^1 | ^2 | ^3 | ^#4 | ^5 | ^6 | ^7 |
| Mixolydian | ^1 | ^2 | ^3 | ^4 | ^5 | ^6 | ^b7 |
| Aeolian | ^1 | ^2 | ^b3 | ^4 | ^5 | ^b6 | ^b7 |
| Locrian | ^1 | ^b2 | ^b3 | ^4 | ^b5 | ^b6 | ^b7 |
| Lydian Dominant | ^1 | ^2 | ^3 | ^#4 | ^5 | ^6 | ^b7 |

Yet understanding construction does nothing to further your understanding of their function. We often associate modes with early music, but as mentioned above, modal music is still common in many types of modern music. Using modes allows composers to create a range of colors, through a variety of techniques. For example, one popular theory ranks the modes from “light” to “dark” based on the number of raised or lowered pitches in the mode. If you apply this logic to the previous table, you can see that Lydian and Ionian would be the “brightest” modes because they have the most raised pitches, whereas Phrygian and Locrian would be the darkest modes because they have the most lowered pitches respectively.

Our “non-mode”–the Lydian Dominant scale–shares the altered pitches from both the Lydian and Mixolydian modes, so it cannot be derived in the same manner as the other modes. It is, however, useful in improvising over dominant seventh chords and has the unusual characteristic of acting as a hybrid of the whole tone and octatonic scales, two non-diatonic scales that we will discuss in Unit 22. After you read more about those two scales at a later date, return to the Lydian Dominant scale to see if you can determine *why* we consider it a hybrid of a whole tone and octatonic collections.

You should spend time exploring each of these modes to learn why one pitch can sound “tonicized” without a traditional dominant to tonic relationship. With very few exceptions, every piece of music contains a harmonic method for creating tension and release, and music written in these modes is no different. When listening to all of the versions of *Happy Birthday* above, you probably disliked the first time a mode landed on te, but after listening to multiple examples using te, it becomes normalized and can be heard as a weaker–but still functional–counterpart to do. Discovering how each mode creates tension and release is paramount to understanding modal usage, and will help you create a framework for any scale–including those below.

## Basic pentatonic scales

We will discuss the pentatonic scales here because of their importance and prevalence in a variety of music, but these are not a complete modal shift from major and minor scales in the way that the modes are. Instead, certain the penatonic scales exclude certain pitches when compared to the parallel major or minor scale, which makes them easily related but functionally different. You will see this in the examples below, because it required some “artistic license” to translate a tune based in the major scale into a pentatonic collection.

### Major pentatonic

{% capture ex5 %}X:5 %%staffsep 75% T:Happy Birthday in G major pentatonic M:3/4 L:1/4 Q:1/4=90 K:G D/2>D/2| E D G| D2 D/2>D/2| E D A| G2 D/2>D/2| w:^5 ^5 ^6 ^5 ^1 ^5 ^5 ^5 ^6 ^5 ^2 ^1 ^5 ^5 w:sol sol la sol do sol sol sol la sol re do sol sol d B G| D E d/2>d/2| B G A| G2|] w:^5 ^3 ^1 ^5 ^6 ^5 ^5 ^3 ^1 ^2 ^1 w:sol mi do sol la sol sol mi do re do{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Minor pentatonic

We must also apply the same restrictions to the minor pentatonic scale. These scales do not correlate directly to their seven-note counterparts, so this is more of a re-imagining of Happy Birthday.

{% capture ex6 %}X:6 %%staffsep 75% T:Happy Birthday in G minor pentatonic M:3/4 L:1/4 Q:1/4=75 K:Bb D/2>D/2| F D G| D2 D/2>D/2| F D B| G2 D/2>D/2| w:^5 ^5 ^7 ^5 ^1 ^5 ^5 ^5 ^7 ^5 ^3 ^1 ^5 ^5 w:sol sol te sol do sol sol sol te sol me do sol sol d c B| G HF c/2>c/2| B G F| G2|] w:^5 ^4 ^3 ^1 ^7 ^4 ^4 ^3 ^1 ^7 ^1 w:sol fa me do te fa fa me do te do{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

### Conclusions

The pentatonic scale is a nearly universal sonority as demonstrated by Bobby McFerrin in the following clip.

Neither the major or minor form of the pentatonic scale relates strongly to the harmonic functions that we will study in this course, but their prominence in world and folk musics makes them an important part of our musical heritage. This alone justifies familarity with these colors.

Major and minor pentatonic scales have a simple relationship to their major and minor counterparts. The major pentatonic scale uses the first, second, third, fifth, and sixth scale degrees of the major scale. The minor pentatonic scale uses the first, third, fourth, fifth, and seventh scale degrees of the minor scale.

Even though they do not function diatonically, there are two general concepts of harmony in pentatonic scales. 1. The tonic and dominant scale degrees still function as the primary harmonic “poles” in a pentatonic scale. 2. The lack of a leading tone in both forms is the primary reason that these do not function similarly to diatonic harmony. That being said, la in major pentatonic scales and te in minor pentatonic scales can take on a similar function by pulling toward the tonic in a melody.

## Chromatic scale

This final example is a heavily ornamented version of *Happy Birthday* that demonstrates every possible solfege as well as the correct resolution for all chromatic tones. This arrangement is still technically in G major, because strictly speaking, the chromatic scale is a collection of pitches and does not necessarily center around one tone. (Note that because ABC notation has no way to represent scale degrees, I was forced to omit the ^ that would normally appear above each scale degree and to use a b to represent a flat and a # to represent a sharp. Please forgive the misuses.)

{% capture ex7 %}X:7 %%staffsep 75% T:Happy Birthday in G major (a la R. Strauss) T:decorated to demonstrate all possible scale degrees and solfege M:3/4 L:1/4 Q:1/4=75 K:G “5”D/2>“#5”^D/2| “6”E/2”b6”\_E/2 “5”D “1”G/2”#6”^E/2| “7”F2 (3”5”D/2”#4”^C/2”5”D/2| “6”E “5”=D “2”A/2”7”^F/2| “1”G2 “5”D/2>“5”D/2| w:sol si la le sol do li ti sol fi sol la sol re ti do sol sol “5”d/2”b5”\_d/4”4”c/4 “3”B/2”b3”\_B/4”2”A/4 “1”G| “7”F/2”b6”=F/2 “6”HE “4”c/2>“4”c/2| (3”3”B/2”#2”^A/2”3”B/2 “1”G/2”#1”^G/2 “2”=A/2”b2”\_A/2| “1”G2|] w:sol se fa me me re do ti te la fa fa mi ri mi do di re ra do{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

### Conclusions

The chromatic scale is not a tonality, because it has no tonic. It is however, the aggregate pitch collection and functions as a useful way to familiarize a musician with all twelve pitch-classes.

The final “Happy Birthday” version above uses every possible scale degree in order to demonstrate resolution in a diatonic key, but it is not a “chromatic” tonality. That example is still in G major, but it is heavily embellished using chromatic tones.

Of particular note, the example demonstrates the importance of considering resolution when choosing which chromatic pitch to use. Generally, if a pitch is raised, it should resolve upward; if a pitch is lowered, it should resolve downward. For example, li and te are enharmonically equivalent, but they function differently because their accidentals imply specific resolutions. Li should resolve to ti, but te should resolve to la. This is not only important in simplifying notation for harmonic analysis, but it also makes it easier for performers when reading heavily chromatic music.

*NOTE: The full descriptions below of each type of non-chord tone are from the online textbook,* [*Open Music Theory*](http://www.openmusictheory.com)*, although each has been edited to suit this textbook’s terminology and purpose. If you have not had a chance to check out Open Music Theory in the Further Reading sections from the previous units, please take the time to do so. It is an excellent resource!*

## Non-chord tone recap

Understanding non-chord tones is critical for increasing the accuracy and speed of your tonal analysis. When looking at pieces of music, specifically those that have complicated textures, you will often face difficult decisions about which tones are functional to the harmonic progression and which tones are embellishing those functional tones. If you know the shapes that chord tones and their embellishments form, you can separate chord tones from embellishments by simply looking for common patterns.

**We will use the same simple progression that we used in the previous topic as a template for demonstrating non-chord tones. If you do not still have this analyzed, you may wish to do so again before proceeding.**

{% capture ex1 %}X:1 T:A simple phrase M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] [EB]| [FA] [FD]| [DD] [CE]| H[C2F2]|] V:2 clef=bass [F,C]| [B,,D] [CC,]| [CF,] [D,B,]| [B,,G,] [G,C,]| H[A,2F,,2]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## More non-chord tones

Compare the examples below to the original progression to determine what has changed knowing that any added pitches will be the NCTs of that type. As you do this, use the the three characteristics discussed in the previous topic–preparation, NCT, and resolution–to create a definition for each NCT. Once you have a working definition, see if the other other descriptors (e.g. upper/lower, ascending/descending, chromatic/diatonic, on-chord/off-chord, or accented/non-accented) can be applied to each NCT.

### Neighbor Groups (NG) - also called “double neighbor tones”

**How does the neighbor group relate to a neighbor tone?**

{% capture ex4 %}X:4 T:With added neighbor groups M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] [EB]| [FA] [FD]| [DD] [CE]| [C/2F/2]“ng”[C/4G2/4][C/4E/4]H[CF](cantusFirmus.html)|] V:2 clef=bass [F,C]| [B,,D] “ng”[C/4C,/4][D/4C,/4][C/4C,/4][B,/4C,/4]| [CF,] [D,B,]| [B,,/2G,/2]“ng”[B,,/4F,/4][B,,/4A,/4] [G,C,]| H[A,2F,,2]|] w:F:I ii6 V7 \_ \_ \_ I IV6 ii6 \_ \_ V I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

#### Conclusions

Like neighbor tones, a *neighbor group*, also known as a double neighbor figure, begins and ends on the *same* stable tone. Between those two instances of the stable tone are two embellishing tones — one a step above and the other a step below the stable tone being embellished. Though individually we may consider each of the two embellishing tones to be incomplete neighbor tones, working together in the double-neighbor figure, they balance each other and create a contiguous whole, with the overall stability of a complete neighbor. A double neighbor figure is typically unaccented and off-chord, although it could be both accented and on-chord.

### Appoggiaturas (APP)

**In the same way that suspensions and retardations are often grouped together, appoggiaturas and escape tones are as well. The following two examples include NCT appoggiaturas and escape tones as well as appoggiaturas *figures* and escape tone *figures*. Use the example below to answer the following:** - What is the definition for both of these non-chord tones? - What do they have in common and why are they grouped together? - What major difference does the term “figure” imply when used in referencing non-chord tones? Do you think that “figure” could be applied to any of the previous NCTs that we have studied?

{% capture ex5 %}X:5 T:With added appoggiaturas M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [D/2G/2]“app”[D/2c/2] [EB]| [FA] [FD]| [DD] [CE]| H[C2F2]|] V:2 clef=bass [CF,]| [B,,D] [C/2C,/2]“app fig”[C/2G,/2]| [CF,] “app”[D,/2A,/2][D,/2B,/2]| [B,,G,/2][G,C,]| H[A,2F,,2]|] w:F:I \_ ii6 V7 \_ I IV6 \_ ii6 V I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Escape tones (ET)

{% capture ex6 %}X:6 T:With added escape tones M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] [E/2B/2]“et fig”[E/2c/2]| [F/2A/2]“et”[F/2B/2] [FD]| [DD] [CE]| H[C2F2]|] V:2 clef=bass [F,C]| [B,,D] [CC,]| [CF,] [D,/2B,/2]“et”[D,/2C/2]| [B,,G,] [G,C,]| H[A,2F,,2]|] w:F:I ii6 V7 I IV6 \_ ii6 V I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

#### Conclusions

An appoggiatura is a kind of incomplete neighbor tone that is *approached by leap, and followed by step in the opposite direction*.

An escape tone, or *echappée*, is *approached by stepwise motion and left by leap in the opposite direction*.

The term “figure” can be used when discussing non-chord tones to imply that the melody follows the *shape* of a particular non-chord tone, but all pitches are actually chord tones. This is very useful in describing melodic shapes. (e.g. A melody can be described as having a passing tone figure if the melody has a stepwise movement continuously in one direction, even if every note belongs to a chord.)

### Anticipations (ANT)

{% capture ex7 %}X:7 T:With added anticipations M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] [E/2B/2]“ant”[E/2A/2]| [FA] [FD]| [DD] [C/2E/2]“ant”[C/2F/2]| H[C2F2]|] V:2 clef=bass [F,C]| [B,,D] [CC,]| [CF,] [D,/2B,/2]“ant”[D,/2G,/2]| [B,,G,] [G,C,]| H[A,2F,,2]|] w:F:I ii6 V7 I IV6 \_ ii6 V I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

#### Conclusions

An anticipation is essentially an otherwise stable tone that comes too early. An anticipation is a non-chord tone that will occur immediately before a change of harmony, and it will be followed on that change of harmony by the same note, now a chord tone of the new harmony. Therefore, it is approached by stepwise motion and left by static motion. The static motion between the NCT and its resolution means that you may consider this related to both suspensions and retardations, although unlike suspensions and retardations, this is an unaccented, off-chord NCT with static motion occurring *after* the NCT rather than before. It is typically found at the ends of phrases and larger formal units.

#### Syncopation versus anticipations

Some theorists classify syncopated rhythmic figures as separate from anticipations, but this is more a discussion of re-articulation. For those that classify these differently, [syncopation](http://openmusictheory.com/syncopation.html) occurs when a rhythmic pattern that typically occurs on strong beats or strong parts of the beat occurs instead on weak beats or weak parts of the beat. Like the anticipation, the syncopated note is an early arrival — it tends to belong to the chord on the following beat. Unlike the anticipation, the syncopation is tied into a note in that chord and is not rearticulated. Rather than anticipating a note in the chord that follows, a syncopation is simply a disjointed and repeated arrival of the chord itself. Of course, you should consider context when making this decision as this difference is subtle, but if there is a pattern of syncopated rhythms in a passage, you could be more likely to label syncopation for the passage as a whole, rather than many anticpations.

### Pedals (PED)

**Pedals, often referred to as pedal points, most often occur in the bass voice but can occur in any voice. They can be difficult to spot if the texture is broken into arpeggiated chords, so it may be necessary to reduce a complicated texture down to block chords to more easily find the pedals.**

{% capture ex8 %}X:8 T:With an added pedal point M:4/4 L:1/2 Q:1/4=100 K:F V:1 [FA]| [DG] [EB]| [FA] [FD]| [DD] [CE]| [CF][DF]| H[C2F2]|] V:2 clef=bass [F,C]| [F,B,] “ped”[F,C]| [CF,] [D,B,]| [B,,G,] [G,C,]| [A,F,,] “ped fig”[B,F,,]| H[A,2F,,2]|] w:F:I ii6 V7 I IV6 ii6 V I IV6/4 I{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

#### Conclusions

Pedals are *approached by static motion and left by static motion*; essentially, this is just a pitch that refuses to leave regardless of whether it belongs to the chord. Pedals are one of the most interesting non-chord tones because they have a dual nature–they create some of the strongest dissonances in tonal harmony, but their repetitive nature provides a sort of strange stability. As a pedal continues, it will often alternate between acting as a chord tone and non-chord tone, so it can be helpful to label the chord tones as “pedal figures” to show the continuation of the pedal.

## A less common non-chord tone

### Incomplete Neighbor Tone (INT)

It is uncommon, but you will occasionally encounter an unaccented non-chord tone that is approached by leap and left in the *same* direction; resembling an appoggiatura but not resolving in the opposite direction. For this course, we will label these as *incomplete neighbor tones*, although some theorists use this term to refer to appoggiaturas and escape tones as well. Broadly speaking, you should not resort to an incomplete neighbor tone NCT unless you have exhausted all other options, because it is far more likely for this shape is part of a chordal skip rather than an NCT.

## Part-writing

The term *part-writing* can imply many things depending on its context, but for our purposes, this will be our first attempt to combine the fundamentals of melody (counterpoint) and harmony (voice-leading from circle-of-fifths progressions) into functional music using diatonic tonality.

By applying the various rules and techniques that we have studied thus far, we will be able to: - Harmonize a melody - Compose a melody given a harmony - Fully voice four-part harmonies - Create independent melodic lines that function harmonically together

Units 10 and 11 will help you solidify this process. First, we will establish a reference model by looking at the rules–and resulting errors from breaking those rules–that occur when writing in a four-part chorale style. We will then apply these guidelines to our own attempts to compose basic four-part chorales in order to better understand the voice-leading principles of diatonic music.

We will be referring to this handout, [Part-Writing Error Checklist and Guide](https://docs.google.com/document/d/1s9Xd3LPqoaEevshTopxHzLX9jCzxVCZocOBLD_dceMU/edit?usp=sharing), for the next two units, so you may want to print this out or open it in a separate window.

## Why part-writing?

Before we begin, I would like to address a question that I have received many times from students. Why do we study part-writing rather than just analysis, particularly in a strict style that is not performed regularly by modern musicians?

There are many answers for this, but there is one in particular that I think justifies the study of this in this course. Part-writing is the simplest way to study *how* voice-leading creates harmony. Even though most of its rules are archaic, and a modern student’s ear is not nearly as offended by certain style characteristics (e.g. parallel perfect fifths), this is the most direct way to study every aspect of how music functions: voice-leading, chord progressions, voicing chords, chordal structure, tendency tones, melodic construction, and so on.

We could attempt to focus on only one style of modern music–whether pop, jazz, classical, or otherwise–but because each is a fully developed, complex language, you would still need to learn basic harmonic movement before beginning to write in that style. And because each of these musics has its roots in diatonic harmony, an understanding of basic chorale style part-writing will allow you to study and develop a process to analyze *all* of these styles, rather than focusing your studies into only one area and being ignorant of the others.

In short, focus on the *process* of the part-writing rather than trying to memorize every rule as if it is unbreakable. Even within a style, rules are guidelines, so an inflexible mindset will lead to nothing but frustration. Once you have grasped the basics of part-writing, you will have advanced another step toward the goal of improving your musicianship.

## Traditional errors

In the last [topic](10-intro-harmonic/a1-voiceleadingerrors.html), we first looked at some basic rules for voicing a chord in a four-part chorale style. These rules included: - Voice-crossing - In this style, voices generally should not cross - Exception: alto and tenor may cross briefly if musically necessary - Spacing - In this style, the top three voices–soprano, alto, and tenor–should always be within an octave of the adjacent voices. To be more specific, there can never be more than an octave between *soprano* and *alto*, and there can never be more than an octave bteween *alto* and *tenor*. - There **can** be more than an octave between *bass* and *tenor*. - There **can** be more than an octave between *soprano* and *tenor*, and this creates two different types of voicings. - A *closed voicing* has **less** than an octave between *soprano* and *tenor*. - An *open voicing* has **more** than an octave between *soprano* and *tenor*. - Range - Each part must stay within the typical range for that voice/instrument? - Doubling - You can double the root of a chord when possible. - For triads, you may double the fifth instead of the root if necessary. - This is actually more preferable if the triad is in second inversion. - **Do not** double the third because it is a tendency tone. If this is doubled, it will force you to choose between the incorrect resolution of a tendency tone or unacceptable parallel octaves. Also, the third should also be least present chord tone in the balance for the chord to sound best. - **Do not** double the seventh because it is a tendency tone. If this is doubled, it will force you to choose between the incorrect resolution of a tendency tone or unacceptable parallel octaves. - **Do not** double the fifth of a seventh chord. This would require omitting the root, third, or seventh, and none of these are expendable.

## Part-writing errors

In addition to the voicing rules, there are a number of standard part-writing errors that should be avoided as well: 1. Parallel perfect octaves or perfect fifths 2. Similar octaves or fifths (sometimes referred to as “direct,” “hidden,” or “exposed”) 3. Unacceptable unequal fifths 4. Contrary perfect octaves or perfect fifths

Please note that these errors *must be within the same two voices* across both chords. Due to the effects of consistently doubling roots, there will almost always be consecutive perfect octaves and perfect fifths between two triads, but this is not *parallel*. For example, a root position C major triad moving to a root position G triad likely will have two voices on C in the first chord and two voices on G in the second chord, if standard doubling practices are observed. This is fine as long as its not in the *same* two voices in both chords (e.g. soprano and bass both have C and then both have a G).

Each of the four primary categories of part-writing errors are *symptoms* of voice-leading issues. If you understand the underlying voice-leading issues of each of these errors, you can find them more easily and avoid them in your own part-writing.

**Once you are comfortable with the descriptions of each of the errors below, try to fix each of the errors using the interface. What do you have to change? Do you have to alter the harmony? Voice-leading? Voicing? In trying to fix it, do you just create further errors?**

## Parallel perfect fifths and perfect octaves (PP5, PP8)

Part-writing errors result from poor voice-leading. For example, look at the progression below and try to find our first major error: *parallel perfect octaves* (PP8). Once you have found it, look to see if a voicing rule (e.g. spacing, doubling, etc.) has been broken. If the voicing error is not fixed, is there any way to avoid the parallel octaves without incorrectly resolving a tendency tone?

{% capture ex1 %}X:1 T:Parallel perfect octaves (PP8) M:4/4 Q:1/4=80 L:1/2 K:C V:1 [cE] [AD]| [BF] [cE]|] V:2 clef=bass [C,G,] [F,A,] | [B,G,] [C,C]|] w:C:I ii6 V7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

Listen to the following example, and try to locate the parallel perfect fifths aurally before you look through the parts. Once you have identified the voices that contain the PP5, try singing the upper of the two voices, and then listen to the example again. Do you have a difficult time differentiating the upper voice from the lower of these two voices?

{% capture ex2 %}X:2 T:Parallel perfect fifths (PP5) M:4/4 L:1/2 Q:1/4=80 K:C V:1 [cE] [AF]| [BF] [cE]|] V:2 clef=bass [C,G,] [D,A,] | [DG,] [C,C]|] w:C:I ii V7 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

PP8 and PP5 undermine the independence of lines, so you should always avoid them in this style. Unacceptable parallel fifths and octaves occur when two voices have consecutive perfect fifths/octaves and move in parallel motion. It is not parallel perfect fifths/octaves if the intervals change voices. (e.g. The first P8/P5 is between the soprano and tenor, but the second P8/P5 is between the soprano and alto.)

In the first example, there are two examples of parallel perfect octaves: - between the soprano and tenor moving from ii6 to V7 - between the soprano and tenor moving from V7 to I

There is a larger underlying issue, however, because a doubling rule was broken on the V7. Because the third was doubled, you are forced to choose between incorrectly resolving one of the leading tones or undermining the independence of the two voices by locking them into consecutive perfect octaves.

{% capture ex7 %}X:7 T:Parallel perfect octaves (PP8) M:4/4 L:1/2 K:C V:1 [cE] [AD]| [BF] [cE]|] V:2 clef=bass [C,G,] [F,A,] | [B,G,] [C,C]|] w:C:I ii6 V7 I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

In the second example, there are two examples of parallel perfect fifths: - between the bass and tenor from I to ii - between the bass and tenor moving from ii to V7

{% capture ex8 %}X:8 T:Parallel perfect fifths (PP5) M:4/4 L:1/2 K:C V:1 [cE] [AF]| [BF] [cE]|] V:2 clef=bass [C,G,] [D,A,] | [DG,] [C,C]|] w:C:I ii V7 I{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

Parallel perfect fifths and octaves undermine the independence of the individual voices. If you repeatedly listen to the the PP5 example repeatedly, you will find it difficult to distinguish the tenor voice from the bass voice. This effect would be even more pronounced if the chords were tuned using just intonation, because the upper note will blend into the overtone series of the lower note.

In summary, you may never have parallel perfect octaves or parallel perfect fifths in this style of music. Please note that for an interval to be considered *parallel*, the interval must occur consecutively in the *same* two voices. For example, if your first P8 is between the bass and alto, the second P8 must also be in the bass and alto. If you find a P8 between the bass and tenor on the second chord, this is acceptable because it does not undermine the independence of the voices.

## Contrary perfect fifths and octaves (CP5, CP8)

Our next part-writing error, *contrary perfect fifths* and *contrary perfect octaves* (CP5 or CP8) are simply an attempt to cover up parallel perfect fifths and parallel perfect octaves by displacing one voice by an octave. The next two examples attempt to fix the errors from the first two examples on this page by displacing one voice of the parallel perfect intervals. Identify these by comparing them to the previous example (i.e. P) Notice that it creates multiple voicing and spacing errors as well as nearly unsingable parts!

{% capture ex3 %}X:3 T:Contrary perfect octaves (CP8) M:4/4 L:1/2 K:C V:1 [cE] [AD]| [BF] [cE]|] V:2 clef=bass [C,G,] [F,A,] | [B,G,] [C,C,]|] w:C:I ii6 V7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

{% capture ex4 %}X:4 T:Contrary perfect fifths (CP5) M:4/4 L:1/2 K:C V:1 [cE] [AF]| [BF] [cE]|] V:2 clef=bass [C,G,] [D,,A,] | [D,G,,] [C,C]|] w:C:I ii V7 I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

In the first example, there are two examples of parallel perfect octaves: - between the soprano and tenor moving from ii6 to V7 - between the soprano and tenor moving from V7 to I

In the second example above, the CP5s occur between bass and tenor voices between: - the I chord and ii chord - the ii chord and the V7 chord

Contrary perfect 5ths/8ves occur when two voices have consecutive perfect fifths/octaves and move in contrary motion. Contrary fifths and octaves occur when trying to mask parallel perfect fifths and octaves, so they will exhibit most of the traits of PP5/PP8 including the fact that the intervals must occur between the same two voices If the interval changes voices, it does not undermine the independence of the voices.

## Unacceptable unequal fifths (UU5)

The last two common part-writing errors have specific clauses tied to them that specify which voices are acceptable and unacceptable. The first, *unacceptable unequal fifths* (UU5), must occur between the bass voice and one of the upper voices. In the following example, find the *unacceptable unequal fifths* where a d5 moves to a P5. What is wrong with the voice-leading here?

{% capture ex5 %}X:5 T:Unacceptable unequal fifths (UU5) M:4/4 L:1/2 K:C V:1 [cE] [Fd]| [dF] [cG]|] V:2 clef=bass [C,C] [D,A,] | [B,,G,] [E,C,]|] w:C:I ii V6/5 I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Conclusions

Unacceptable unequal fifths are one of the easier part-writing errors to understand, because we are actually focusing on only one voice-leading issue. And because it is limited to certain voices, it is relatively easy to find compared to parallel and contrary fifths/octaves which are not acceptable between any voices.

For this course, we will consider a d5 moving to a P5 *unacceptable* unequal fifths, but we will consider a P5 moving to a d5 as *acceptable*–a P5 to a d5 does not require poor resolutions of tendency tones. Remember that these errors are best thought of as symptoms of the actual problem. In this case, the real issue is that the only two notes in a diatonic key that can form a d5 are ti and fa, and as discussed many times in this course, these two notes imply a dominant harmony that wants to resolve inward with ti moving to do and fa moving to mi. For a d5 to be followed by a P5, it would mean that fa must resolve to sol–or less commonly, ti resolving to la as part of a deceptive progression–which is poor voice-leading and therefore the error we are trying to avoid. There are some stricter versions of chorale part-writing that do not allow any form of unequal fifths.

## Unacceptable similar fifths or octaves (US5, US8)

The final common part-writing has many names, but we will use the term *unacceptable similar fifths or octaves*. The term *similar* can also be replaced with “direct,” “hidden,” or “exposed.” I prefer the term *similar* because it describes the motion like the other categories, but I also think that *exposed* does a fine job describing the effect. (I dislike the term *hidden* because students often confuse this with contrary fifths (or octaves), because the goal of contrary fifths is to “hide” parallel fifths.) *Unacceptable similar fifths or octaves* have the most restrictions. The conditions are: - They can only occur between the soprano and the bass voices. - They require a skip of a third or more in the soprano voice. - The two voices must move in similar (not parallel) motion. - The second interval must be a P5 or P8.

If any one of these conditions are *not* met, then this error does not exist in that case. Look at the following example to find an example of *similar octaves*. Once you have found it, look at the voice-leading around it. What does it do to spacing? Does it create more errors? Unacceptable similar octaves and fifths also often create melodies that imply different harmonies. To demonstrate, sing the melody alone. Do you hear it as C major or a different key?

{% capture ex6 %}X:6 T:Similar octaves (S8) M:4/4 L:1/2 K:C V:1 [Ge] [AA]| [FA] [FB]| [c2E2]|] V:2 clef=bass [C,C] [CA,,]| [F,,C] [DG,,]| [C2C,2]|] w:C:I vi IV V7 I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

### Conclusions

Similar fifths/octaves occur when 1) the soprano and bass voices 2) move in similar motion to a 3) perfect fifth/octave, and 4) the soprano voice has a skip of a third or larger. You can see an example of this between the first two chords in this example.

{% capture ex11 %}X:11 T:Similar octaves (S8) M:4/4 L:1/2 K:C V:1 [Ge] [AA]| [FA] [FB]| [c2E2]|] V:2 clef=bass [C,C] [CA,,]| [F,,C] [DG,,]| [C2C,2]|] w:C:I vi IV V7 I{% endcapture %} {% include abc-example.html number=“11” abc=ex11 %}

Similar fifths/octaves are sometimes called “exposed” fifths/octaves, and both of these terms demonstrate a key feature about the part-writing error. Obviously, they must move in similar motion, but the term “exposed” highlights the fact that these must occur between the outer voices. By having similar motion to a perfect interval in the outer voices, it creates the impression of a parallel perfect interval. Most importantly, the leap in the soprano typically creates a poor soprano line in which the melody outlines/implies an unintentional harmony. In the example above, if you sing the melody line without the harmony it outlines A minor instead of C major.

When one begins reading transposed scores, it can be daunting to try to process the information, however, the best score readers are able to mentally “condense” the information into a score that contains all of the important parts to make sense of the most important information. To practice this, we will continue using simple four-part chorales. While a complete score in most styles will be considerably more complex, a chorale will allow you to practice the transpositions and then use your analysis skills to make sure that your transpositions worked correctly.

# Examples

Practice your transposition on the following two examples by condensing the top four voices into an SATB score on the grand staff at the bottom two staves. Each upper voice is written in the standard transposition for the listed instrument, so you will need to transpose each of these parts to concert pitch before placing it on the grand staff. You may want to open Unit 12a in a separate window/tab in order to refer to the transposition guidelines.

{% capture ex1 %}X:1 T:Bach - Chorale no. 269 (“Jesu, der du meine Seele”) T:Note: Playback does not work on this example because of the transpositions M:4/4 L:1/4 Q:1/4=60 K:Gm V:1 name=“Alto Saxophone” [K:Em] b b f g| a g/2f/2 f2| He4|] V:2 name=“English Horn” [K:Dm] d/2^c/2 d c d| d/2^c/2 d d c| HA4|] V:3 name=“Tenor Saxophone” [K:Am] c/2d/2 e e e| d e f e/2d/2| Hc4|] V:4 name=“Double Bass” clef=bass [K:Gm] G,/2A,/2 B,/2C/2 D C/2B,/2| A, G, C D| HG,4|] V:5 name=“soprano and alto voices” x4| x4| x4|] V:6 clef=bass name=“tenor and bass voices” x4| x4| x4|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X:2 T:Bach - Chorale no. 60 (“Ich freue mich in dir”) T:Note: Playback does not work on this example because of the transpositions M:4/4 L:1/4 Q:1/4=60 K:D V:1 name=“Clarinet in B-flat” [K:E] G/2A/2| B c B A/2G/2| HG3|] V:2 name=Viola clef=alto [K:C] D/2C/2| D D D/2C/4B,/4 C| HD3|] V:3 name=“Horn in F” [K:A] E| E D E E| HE3|] V:4 name=“Baritone Saxophone” [K:B] B/2c/2| d e d/2c/2 F| HB3|] V:5 name=“soprano and alto voices” [K:C] x| x4| x3|] V:6 clef=bass name=“tenor and bass voices” x| x4| x3|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

# Class discussion

# Further reading

## From Open Music Theory

### Sentences

The prototypical sentence is eight measures long and contains two four-measure phrases. The first of these is called the *presentation phrase* and the second is the *continuation phrase*.

#### Presentation phrase (mm. 1–4)

The presentation phrase begins the sentence and has two primary components, one melodic and the other harmonic. Melodically, it contains two repeated *basic ideas* (BI). Harmonically, it prolongs the tonic, by means of either a [subsidiary harmonic progression](harmonicSyntax2.html#subsidiary-harmonic-progressions%22) or [contrapuntal chords](harmonicSyntax2.html#contrapuntal-prolongation--passing-chord).

Presentation: Mozart, K. 283, i., mm. 1–4

Here, the basic idea begins with the pickup to m. 1 and ends with the F-sharp on the downbeat of m. 2. It’s then repeated. Though a basic idea is often exactly repeated, this example shows that it need not be. Rather, a basic idea is defined more abstractly by its rhythm and melodic contour, and thus, varied repetitions like this are possible.

Harmonically, these four measures prolong tonic. Measures two and three are contrapuntal chords that are surrounded by the tonic:

**I V4/3 V6/5 I**  
or  
**T(1 D(2 7)n 1)**

Altogether, the two expressions of the basic idea and the tonic prolongation in this phrase exhibit [*presentation function*](themeFunctions.html#presentation). Hence, the name “presentation phrase.”

#### Continuation phrase (mm. 5–10)

Continuation phrases acquire momentum and lead to the cadence that ends the sentence. Three types of cadence typically end a sentence: PAC, IAC, or HC.

Continuation phrases begin with [*continuation function*](themeFunctions.html#continuation-function), which has one or more (but not necessarily all) of the following five characteristics.

* Fragmentation: a breakdown in the size of melodic units
* Liquidation: removal of “characteristic” melodic figures
* Sequential repetition
* Accelerated surface rhythm
* Accelerated harmonic rhythm

Presentation + Continuation: Mozart, K. 283, I, mm. 1–10

This example exhibits all five characteristics. The basic idea creates a normative unit that is two measures in length. Beginning with the pickup to m. 5, that normative size is *fragmented* into one-measure units whose second half is *sequenced* one step lower. At m. 7 *increased surface rhythm* is matched with an *acceleration of harmonic rhythm* as the pianist’s sixteenth notes occur above a hemiola in the pianist’s left hand.

Sentences always end with cadential progressions that support [*cadential function*](themeFunctions.html#cadential-function). In this passage, while mm. 5–8 prolonged tonic by means of contrapuntal chords, mm. 8–10 employ a typical cadential progression:

**I IV6 Cad.6/4 V7 I**  
or  
**T1 S6 D5 — T1**

And while mm. 5–8 employed fragments of the basic idea (the “characteristic” elements of the melody), mm. 8–10 *liquidates* those into elements unrelated to the basic idea (the “conventional” elements—scales and arpeggios, ending with a descending contour).

#### Phrase length

Note the length of the phrases in this example: a four-bar presentation phrase is followed by a *six-bar* continuation phrase. The prototypical phrase is four measures, but this is commonly [expanded](internalExpansions.html) or even compressed by composers. In the sentence, continuation phrases are more likely to undergo expansions or contractions than are presentation phrases.

We can view the voicing rules (i.e. spacing, range, doubling, and voice-crossing) as our guidelines for creating the vertical aspect of this style of music, and our voice-leading rules (i.e. tendency tones, conjunct lines, and avoiding part-writing errors) as guidelines for creating the horizontal aspect of this style of music. By combining these ideas with a general knowledge of diatonic chord progressions, we can begin composing our first attempts at chorale-style music.

Before beginning, please remember that when composing in this style, you occasionally will need to bend, or even break, these rules to accommodate other musical goals. There is not a “right” or “wrong” hierarchy for the conventional rules of part-writing. For example, you might choose to accept parallel perfect 5ths if you are trying to create a particular melodic line that emphasizes stepwise motion. Or, you might decide to use voice-crossing of the inner voices to change the timbre and texture of a passage. So even the cleverest of composers may choose to eschew convention if it does not align with their musical goals, but for our beginning attempts, you should do your best to observe every rule in order to understand their importance and implementation.

## Reviewing our part-writing process

In [Unit 11a](11-further-part-writing/a1-funds-of-part-writing.html), we outlined a method for harmonizing a melody: 1. Identify the key 2. Determine your phrase 3. Choose a cadence to complete your phrase. 4. Create the rest of the diatonic progression beginning on tonic and ending with your cadence. 5. Compose a bass line based on your harmonization. 6. Fill in the alto and tenor voices.

And we employed the stylistic guidelines that we studied in Unit 10 to act as the framework for our part-writeing. - follow the standard harmonic progressions outlined by circle-of-fifths progressions - correctly use cadences - use functions such as tonic, dominant, and pre-dominant as general guides - employ the smoothest possible voice-leading for each line - The bass can be slightly more disjunct than the upper parts, particularly when using root-position chords. - do not cross voices - avoid spacing or range errors - avoid incorrect doubling - resolve tendency tones correctly - avoid unacceptable part-writing such as parallel perfect 5ths/8ves, contrary perfect 5ths/8ves, similar 5ths/8ves, and unequal 5ths

Remember that circle-of-fifths progressions work because the voice-leading taps into the primary functions of diatonic harmony. If you review [Unit 7a](07-harmonic-functions/a1-diaprogcirclefifths.html), you will remember that we created the harmonic flow chart by simply following good voice-leading between chords that have roots separated by a descending P5/ascending P4. Admittedly, long strings of root-position chords create unmelodic bass lines, but they still represent the strongest voicing for many sonorities.

## Getting started

To give you a chance to create all four voices, we will now compose a four-part chorale using a circle-of-fifths progression. Because you now have harmonies and a bass line composed for you, you can use the same process as above but replace steps 3 and 4 (and 5 if given a pre-determined bass line from the harmony): - **Write a simple melody (soprano line)** - Use mostly stepwise motion. - A good phrase will have an overall arc (upward or downward) with only one climax. - Leaps of a fourth or more should resolve by stepwise motion in the opposite direction.

Try to create a clean and simple texture. Write the soprano line from the given first pitch, and then fill in the inner voices following the guidelines above.

{% capture ex1 %}X:1 T:Circle-of-fifths triadic progression M:4/4 L:1 K:C V:1 c| x| x| x| x|] V:2 clef=bass [C,]| [A,,]|[D,]| [G,,]| [C,]|] w:C:I vi ii V I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

After you have completed your harmonization, make sure to double-check it for part-writing errors. If you feel good about your attempt, try changing your melody and trying again.

### Conclusion

After attempting this for the first time, most students are surprised at how relatively simple this process is once you get started. Your first harmonization from above was probably similar to this:

{% capture ex8 %}X:8 T:Circle-of-fifths triadic progression M:4/4 L:1 K:C V:1 [cE]| [cE]| [dF]| [dG]| [cE]|] V:2 clef=bass [C,G,]| [A,,A,]|[D,A,]| [G,,B,]| [C,C]|] w:C:I vi ii V I{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

Because the chord progression provides a vertical framework and the focus on smooth voice-leading provides a horizontal framework, most of the process is simply following a pattern. This example is admittedly straightforward, because it relies entirely on root-position triads in a circle-of-fifths progression.

## Adding the seventh

In studying music theory, we will often spend more time discussing the exceptions to rules than the actual rule itself. And even though the general rule for resolving chordal sevenths–*Chordal sevenths resolve down by step*–is fairly consistent, there are common situtations in which you will be forced to break this rule (e.g. pre-determined melodies, sequences, etc.) Make downward stepwise resolution your default until you are forced to choose otherwise.

Try adding the following two seventh chords to our circle-of-fifths progression, making sure to pay attention to how your chordal thirds and sevenths are resolving. The first chord is fully voiced to force you into certain decisions, so you will need to start from the beginning rather than working your way backward.

{% capture ex2 %}X:2 T:Root-position part-writing with T:seventh chords and root movement by P4/P5 M:4/4 L:1 K:C V:1 [cE]| x| x| x| x|] V:2 clef=bass [C,G,]| [A,,]|[D,]| [G,,]| [C,]|] w:C:I vi7 ii V7 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusion

The addition of seventh chords create problems to solve as you now must contend with additional tendency tones. The first arises between the second and third chords. If you simply choose the smoothest voice-leading possible for each voice going into the second chord, vi7, you will place the chordal seventh in the tenor voice. This locks the voice-leading of the tenor voice into resolving downward by step to the third of the following ii chord, and in turn, that chordal third has its own tendencies and should resolve upward by step to the the root of the next chord. This means that the initial placement on the vi7 effectively locks the entire tenor voice into place. From there, our alto voice is predetermined, because we do not want to double the third of the ii chord, leaving us with only the closest D or A. If we were to move to the A, that would create parallel perfect 5ths with the bass voice, so we can only choose the D for the alto voice. To move to the next chord, if we do not alter our soprano voice, we are then forced to place a B in the tenor voice which creates a less melodic tenor line.

{% capture ex10 %}X:10 T:Root-position part-writing with T:seventh chords and root movement by P4/P5 M:4/4 L:1 K:C V:1 [cE]| [cE]| [dD]| [dF]| [cE]|] V:2 clef=bass [C,G,]| [A,,G,]|[D,F,]| [G,,B,]| [C,C]|] w:C:I vi7 ii V7 I{% endcapture %} {% include abc-example.html number=“10” abc=ex10 %}

While this works, it leaves many strange voicings, such as the tripled roots of the ii and I chords as well as the unmelodic tenor line. There is a simpler option. It is easier to have the alto voice jump slightly to the the chordal seventh on the vi7 which leads to the following progression.

{% capture ex9 %}X:9 T:Root-position part-writing with T:seventh chords and root movement by P4/P5 M:4/4 L:1 K:C V:1 [cE]| [cG]| [dF]| [dF]| [cE]|] V:2 clef=bass [C,G,]| [A,,A,]|[D,A,]| [G,,B,]| [C,C]|] w:C:I vi7 ii V7 I{% endcapture %} {% include abc-example.html number=“9” abc=ex9 %}

Notice that the chordal third in the alto voice of the ii chord defies its tendency to resolve upwards to the root, and instead, uses static motion to become the chordal seventh of the V7. This is our first example of having to make a choice between two guidelines; is it better to prioritize smooth part writing or tendency tone resolution. In this case, the smooth voice-leading creates a stronger overall texture, so I prefer that option. You could, however, prefer the other sound and prioritize your tendency tones.

## Exploring options

Of course, there are multiple chords in our circle-of-fifths progressions that have root movement by intervals other than 4ths and 5ths. Try harmonizing the following short chord progressions while observing our guidelines. Keep track of what types of root movement create the most issues while developing at least two possibilities for each of the progressions.

{% capture ex3 %}X:3 T:Short chord progressions T:Treat each measure as a separate progression M:4/4 L:1/4 K:C V:1 cxxx|| cxxx|| cxxx|| cxxx|] V:2 clef=bass [C,] [F,,] [G,,] [C,]|| [C,] [F,,] [G,,] [A,,]|| [C,] [D,] [F,] [G,]|| [C,] [D,] [G,,] [C,]|] w:C:I IV V7 I I IV V vi I ii IV V I ii7 V7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

When you were harmonizing these short progressions, which chord progression presented the most issues? For most, it will likely be when the progressions that have root-movement by 2nd, particularly a progression like IV-V-vi. Let’s examine this by isolating a common example of this movement, V moving to vi. In this progression, the V is acting according to its standard dominant function, but the vi chord has replaced the I chord in the position where a tonic chord usually appears. This progression represents a *functional substitution* in which vi is now acting as the tonic function. (This concept has application within the dominant and pre-dominant functions as well, but we need to explore first-inversion chords in the next topic, 11b, before we are ready for that discussion)

### Function over Form (Part 1)

A *functional substitution* can, and often should, inform your voice-leading. When a root-position V chord precedes a root-position vi chord, we must choose to prioritize either our *doubling* conventions or our *part-writing* conventions. More specifically, do we want to double the third or do we want to end up with parallel perfect 8ves/5ths? We can demonstrate this by looking at two nearly identical progressions. Harmonize the following two progressions; first with the standard tonic function (i.e. V to I) and then with the functional substitution (i.e. V to vi.) Even though the I chord and vi chord have two common tones–the first and third scale degrees–you will have to make very different choices to avoid voice leading errors.

{% capture ex4 %}X:4 T:Using a functional substitution for a deceptive cadence M:3/4 L:1/4 Q:1/4=60 K:C V:1 [cE][B][c]| ] [cE][B][c]|] V:2 clef=bass [C,G,] [G,,] [C,]| [C,G,] [G,,] [A,,]|] w:C:I V I I V vi{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

When attempting this deceptive cadence, you hopefully realized that you cannot allow the tenor voice to remain on G and then resolve to A because it creates parallel octaves with the bass voice. Because the vi chord acts as a replacement for a I chord when it is part of a deceptive cadence, we double the scale degree that works best for a I chord, do, rather than the standard doubling of the root, la or fifth, mi. In this progression, it is correct to break standard convention for doubling and double the chordal third of the vi chord. This doubling should now be your permanent convention for deceptive cadences. - When V goes to vi, the vi chord is replacing the tonic function and therefore functions as a Isub6

So for the above example, a better approach would be to alter the melody to allow for a doubling of the chordal third of the vi chord.

{% capture ex11 %}X:11 T:Using a functional substitution for a deceptive cadence M:3/4 L:1/4 Q:1/4=60 K:C V:1 [cE][dG][cE]|] V:2 clef=bass [C,G,] [G,,B,] [A,,C]|] w:C:I V vi{% endcapture %} {% include abc-example.html number=“11” abc=ex11 %}

### Root movement by 2nd

The other difficult resolution in the previous example was when the root position IV chord moved to the V chord. We do not have a *functional substitution* to provide a doubling exception here, so instead you must be careful about how you resolve the voices. Harmonize the following progression without altering the given pitches, and pay particular attention to the direction that the upper voices resolve as you avoid part-writing errors.

{% capture ex5 %}X:5 T:Root movement by 2nd M:4/4 L:1/4 Q:1/4=60 K:C V:1 [cE] [c] xx|] V:2 clef=bass [C,G,] [F,,] [G,,] [C,]|] w:C:I IV V I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

#### Conclusion

Now that we are dealing with root movement of an interval other than a perfect fourth, you cannot solely rely on simple voice leading guidelines such as “chordal third moves upward by step to the root of the following chord.” While this will still hold true when moving from V to I in this example, the the IV and V chords are separated by a 2nd. So if you solely rely on smooth, stepwise voice-leading, you will likely create objectionable parallel movement between the two chords. For example, when composing he soprano line as you move from the IV to the V chord, you cannot choose re, because this creates parallel perfect 5ths against the bass. So you must choose to move to the leading tone instead which locks your soprano line into C - C - B - C. From there, you will have to use some small skips in your other voices to resolve every voice in the smoothest possible way. There are a few different options for this progression, but you likely ended up with something like this.

{% capture ex12 %}X:12 T:Completed root movement by 2nd M:4/4 L:1/4 Q:1/4=60 K:C V:1 [cE] [cF](cantusFirmus.html) [BD] [cE]|] V:2 clef=bass [C,G,] [F,,A,] [G,,G,] [C,G,]|] w:C:I IV V I{% endcapture %} {% include abc-example.html number=“12” abc=ex12 %}

## Common exceptions

There are some commonly used exceptions to our general part-writing conventions. For example, when a chord progression has a root that moves down by P5, we expect the chordal third to resolve up by step to the root of the following chord. However, if you need to change the texture of your part-writing to be more or less compact, you may choose to have the chordal third leap to the following chordal third which changes the entire voicing possibilities of the two chords. (Note that you can only use this on the leading tone if it is in an inner voice.) Use this method to fill in the inner voices in the following example to change the voicing of the final chord.

{% capture ex6 %}X:6 T:Chordal third to chordal third M:4/4 L:1/4 Q:1/4=60 K:C V:1 [eG] [d] [c2]|] V:2 clef=bass [C,C] [G,,] [C,2]|] w:C:I V I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

Another common exception is called the *frustrated leading tone*. While not considered ideal, you can choose to have the leading tone resolve by skipping downward to the root of the tonic chord, *if the leading-tone is in an inner voice*. This can solve doubling issues if you are trying to fix an incomplete triad by adding the chordal fifth. Try it in the tenor voice on the following two progressions. Notice that this allows you to create a deceptive cadence without having to double the chordal third of the vi chord.

{% capture ex7 %}X:7 T:Frustrated leading tone M:3/4 L:1/4 Q:1/4=60 K:C V:1 [eG] [d] [c]|| [eG] [d] [c]|] V:2 clef=bass [C,C] [G,,] [C,]|| [C,C] [G,,] [A,,]|] w:C:I V7 I I V7 vi{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

## Overall conclusions for root-position part-writing

When first asked to compose a simple chorale, it is easy to feel paralyzed as you consider all of the rules and guidelines that you have learned. Luckily, if you develop an order to process the guidelines, they greatly simplify the part-writing process. It is much simpler to write a melody when you only have one or two options for the next pitch!

As stated above, you should use smooth voice-leading when possible, making it a high priority in your decision-making process. But what constitutes “smooth” voice-leading? The simple answer is that stepwise, or sometimes static, motion is preferred, although this is only one decision point to consider. When you are creating a line, you will need to balance stepwise motion against avoiding errors. For our simple chorale-style, we are not using non-chord tones yet, so your next pitch must be a chord-tone. This means that you must also consider the notes that are already present such as the bass line or melody in order to ensure that you form a complete harmony and avoid errors. When you add in doubling and range limitations, you can usually narrow your options to one pitch.

You should also understand that while there are some general guidelines for resolving tendency tones, there are no simple rules that are unbreakable. At its most basic, ti resolves up by step, and fa resolves down by step. When part-writing, however, this is too simplistic a view. For example, fa often moves upward by step to sol, either as part of an ascending scalar melodic line or in the bass line when a pre-dominant chord (i.e. IV or ii6 moves to a root-position V chord. A more advanced part-writer may think that ti and fa are tendency tones when they are part of a V7 chord, so therefore, the rule for tendency tones should be that *chordal thirds* resolve up by step and *chordal sevenths* resolve down by step. This is a better rule, but it also falls apart when we leave circle-of-fifths progressions (chords with roots separated by a descending P5). When a IV chord moves to a V chord, it is impossible for the third to move *up by step* to the root of the V chord. For now, the easiest rule for tendency tones is: - *Chordal thirds* resolve up by step and *chordal sevenths* resolve down by step *when part of a circle-of-fifths progression*.

### Our part-writing process

As a review, here are our finalized methods for part-writing in a four-part chorale style:

### If given a melody:

* **Identify the key**
  + Look for melodic patterns, starting pitches, and ending pitches for clues as to an implied key.
* **Determine your phrase**
  + In a short excerpt such as many of your assignments, you will have little room for decision making, but for a larger melody, try singing the phrase repeatedly and listen to your natural inclination for breaths or pauses.
  + It can also be helpful to look for spots in which the rhythm slows naturally.
* **Choose a cadence** to complete your phrase.
  + Refer to [Unit 7c](07-harmonic-functions/c1-cadences.html) to review the types of cadences.
* **Create the rest of the diatonic progression** beginning on tonic and ending with your cadence. (If not already provided.)
  + This will establish your key center. Refer to [Unit 6b](06-intro-harmonic/b1-diafuncvoicelead.html) for a review of the three primary harmonic functions: tonic, dominant, and pre-dominant.
  + Refer to [Unit 7a](07-harmonic-functions/a1-diaprogcirclefifths.html) to determine a functional harmonic progression.
* **Compose a bass line** based on your harmonization.
  + This will resemble 1:1 counterpoint, so refer to [Unit 5b](05-counterpoint-embell-shapes/b1-cantfirmand1st.html).
  + It is okay for the bass line to be more disjunct than the other voices, so feel free to leave your chords in root position to make doubling simpler.
  + Contrary motion against the soprano line is preferred.
* **Fill in the alto and tenor voices.**
  + Refer to the rules for voicing, range, and doubling in [Unit 6c](06-intro-harmonic/c1-voiceleadingerrors.html).
* When writing your parts, always **strive to have voice-leading that is as smooth as possible** by emphasizing stepwise motion.
  + As mentioned above, bass lines are the exception and will often have more leaps, especially when using root-position chords.

### If given a harmonic progression (and likely a bass line):

* **Remember to check your key**
  + Even though you have been given the key in this case, make sure to follow the guidelines for this mode (i.e. major or minor).
* **Determine your phrases via cadences**
  + In longer examples, you will need to identify your cadences before moving to the next step. You can look for spots in which the harmonic rhythm slows naturally.
  + Refer to [Unit 7c](07-harmonic-functions/c1-cadences.html) to review the types of cadences.
* **Write a simple melody (soprano line)**
  + Use mostly stepwise motion.
  + A good phrase will have an overall arc (upward or downward) with only one climax.
  + Leaps of a fourth or more should resolve by stepwise motion in the opposite direction.
* **If the harmony does not give you a predetermined bass line, compose a bass line.**
  + This will resemble 1:1 counterpoint, so refer to [Unit 5b](05-counterpoint-embell-shapes/b1-cantfirmand1st.html).
  + It is okay for the bass line to be more disjunct than the other voices, so feel free to leave your chords in root position to make doubling simpler.
  + Contrary motion against the soprano line is preferred.
* **Fill in the alto and tenor voices.**
  + Refer to the rules for voicing, range, and doubling in [Unit 6c](06-intro-harmonic/c1-voiceleadingerrors.html).
* When writing your parts, always **strive to have voice-leading that is as smooth as possible** by emphasizing stepwise motion.
  + As mentioned above, bass lines are the exception and will often have more leaps, especially when using root-position chords.

I next asked them to add two seventh chords along with the rule that the *chordal seventh should resolve down by step*.

## Class discussion

**Pentatonic Scales Tricks**

-Take out the tri-tone notes (Degree 4 and 7) from the major scale for major pentatonic.

-Minor pentatonic can be remembered as taking out scale degree 2 and 6.

-Major and Minor are the same pitches, but just organized in a different order (different starting point). They are modes of each other.

**Bobby McFerrin Video**

He could demonstrate that the pentatonic scale can be used independently and easily taught.

Even though it is missing the two notes that we considered important scale degrees, if can still be expressive and interesting (and it is in our bones).

# Further Reading

## From *Open Music Theory*

### The Chromatic Scale

The chromatic scale consists entirely of half steps, and uses every pitch on the keyboard within a single octave. Here is the chromatic scale that spans the pitches C4 through C5.

The chromatic scale

The chromatic scale

# Class discussion

**Standard progressions using the bII** - You can spell this chord enharmonically! We see this in the third mini-example within this example. The Ab in the tenor is changed to a G# in order to make the voice leading make more sense–we go to an A next, so seeing a G# is easier to read. - A doubled third on a vii dim chord is common because the root and fifth are tendency tones. - bII6 is going to be the most common version of this chord you see. You can also write it as N6, but we suggest bII6 because that actually informs its function (predominant, just like a regular ii!). - A root position bII has…problems. - We’ve introduced *rah*, which wants to resolve down because it’s a flattened *re*. So, when it’s followed by a V(7), we either have to have parallel octaves or have a tendency tone resolve in the wrong direction (rah skipping down to ti or going up to re because there’s no doh in V. gross). - bII6 - iv sounds super cool! - There’s only a half-step difference which makes voice leading a dream (le down to sol). - bII6 in the 20th century starts to get weird, functionally. Mahler used it just as a color. - bII6 is mode mixture: it’s borrowed from Phrygian mode.

## Class Discussion

Lowest pitch=bass. Root is the chord that be build the thirds around.

**How do we determine seventh chord quality?**

The first letter gives the quality of the triad, while the second letter gives the quality of the seventh. For example, Mm7 = a major triad + a minor seventh.

Looking at both the triads in the seventh chord and be aware of the different qualities they have.

Dominant and Dimished relationship: They both have diminished 5ths. Dominant is between 3rd and 7th, while diminished is 1st and 5th (all chordal pitches).

**How do we determine and label seventh chord inversions?**

Seventh chords add third inversion because they have an additional note compared to triads. Their inversion figures are as such: - Root position: 7 - First inversion: 6/5 - Second inversion: 4/3 - Third inversion: 4/2

Remember to not add the slash when handwriting. Stacked things are just impossible to notate online.

The inversions figures do not tell you the exact intervals and their qualities above the bass. These are made to work with roman numberals.

# Further Reading

## From *Open Music Theory*

### Seventh chords

A four-note chord whose pitch classes can be arranged as thirds is called a *seventh chord*.

Like with a triad, the pitch classes belonging to a seventh chord occupy adjacent positions (a four-pitch-class clump) on the circle of thirds. The four members of a seventh chord are the *root*, *third*, *fifth*, and *seventh*.

A seventh chord (A, C, E, G) on the diatonic circle of thirds.

A seventh chord (A, C, E, G) on the diatonic circle of thirds.

There are five qualities of seventh chords that appear in diatonic music: major seventh, dominant seventh, minor seventh, diminished seventh (also called fully-diminished), and half-diminished seventh. They are comprised of the following intervals above their roots:

* major seventh: M3, P5, and M7 above the root (or major triad with a major seventh)
* dominant seventh: M3, P5, and m7 above the root (or major triad with a minor seventh)
* minor seventh: m3, P5, and m7 above the root (or minor triad with a minor seventh)
* diminished seventh: m3, d5, and d7 above the root (or diminished triad with a diminished seventh)
* half-diminished seventh: m3, d5, and m7 above the root (or diminished triad with a minor seventh)

Following are the lead-sheet abbreviations for seventh-chord qualities:

* major seventh: maj7 or △7 (Gmaj7 or G△7)
* dominant seventh: 7 (B7)
* minor seventh: m7 (F♯m7)
* diminished seventh: dim7 or °7 (Ddim7 or D°7)
* half-diminished seventh: ⦰7 (A⦰7)

## Class discussion

Constructing a *melodic line* and *melodic intervals* - Length: 10-12 bars is average for 1:1 counterpoint, but the full range is 8-14 - Starting and ending pitches: the tonic of whatever key we’re in - Approaching the final note: contrary stepwise motion. Ex: re in one voice and ti in another, both will move to do - Repeated pitches, yay or nay? : NAY. You cannot repeat pitches in your line - Melodic intervals: stepwise, skips, and leaps are all ok! - How to approach and resolve leaps?: Approached and followed by stepwise motion in the opposite direction of the leap. Ex: step up, leap down, step up. Think of a sine wave! - Range: about an octave *or less*. It should be easily singable - Climax: happens on the highest (or lowest) note, depending on how your counterpoint curves. There should only be one highest/lowest note

Accpetable *harmonic intervals* - Starting and ending harmonic intervals?: P8 - Approaching perfect intervals: contrary motion - Number of times an interval size can be used consecutively?: never more than 3 times in a row. No consecutive perfect intervals

Accpetable *motion between lines* - Acceptable types of motion: parallel, similar, and contrary

Will there ever be oblique motion resulting from a cantus firmus with static motion? - Not in what we’ll be looking at in class, though some exception probably exists somewhere

# Further reading

## From *Open Music Theory*

### Cantus firmi

A number of others are provided [here][CFs]. Performing these is a helpful practice to develop an internal sense of the sound and feel of a well formed *cantus*, and many of the characteristics of well formed *cantus firmi* carry over into other musical styles. (These model *cantus firmi* can also be used as the starting points for our two-voice exercises.)

From these *cantus*, notice how the general musical characteristics of smoothness, melodic integrity, variety, and motion towards a goal are worked out in specific characteristics. The following characteristics are typical of all well formed *cantus firmi*:

* length of about 8–16 notes
* arhythmic (all whole notes; no long or short notes)
* begin and end on *do*
* approach final tonic by step (usually *re*–*do*, sometimes *ti*–*do*)
* all note-to-note progressions are [melodic consonances](intervals.html)
* range (interval between lowest and highest notes) of no more than a tenth, usually less than an octave
* a single climax (high point) that appears only once in the melody
* clear logical connection and smooth shape from beginning to climax to ending
* mostly stepwise motion, but with some leaps (mostly small leaps)
* no repetition of “motives” or “licks”
* any large leaps (fourth or larger) are followed by step in opposite direction
* no more than two leaps in a row; no consecutive leaps in the same direction (Fux’s F-major *cantus* is an exception, where the back-to-back descending leaps outline a consonant triad.)
* the leading tone progresses to the tonic
* in minor, the leading tone only appears in the penultimate bar; the raised submediant is only used when progressing to that leading tone

#### Melodic tendencies

The characteristics listed above are fairly detailed, and some of them are specific to strict species counterpoint. However, taken together, they express in detail some general tendencies of melodies in a variety of styles.

[David Huron](https://openlibrary.org/works/OL5851060W/Sweet_Anticipation) identifies five general properties of melodies in Western music that connect to the basic principles of perception and cognition listed above, but play out in slightly different specific ways in musical styles. They are:

* **pitch proximity** – the tendency for melodies to progress by steps more than leaps and by small leaps more than large leaps. An expression of smoothness and melodic integrity.
* **step declination** – the tendency for melodies to move by *descending* step more than ascending. Possibly an expression of goal-oriented motion, as we tend to perceive a move down as a decrease in energy (movement towards a state of rest).
* **step inertia** – the tendency for melodies to change direction less frequently than they continue in the same direction. (I.e., the majority of melodic progressions are in the same direction as the previous one.) An expression of smoothness and, at times, goal-oriented motion.
* **melodic regression** – the tendency for melodic notes in extreme registers to progress back towards the middle. An expression of motion towards a position of rest (with non-extreme notes representing “rest”). Also an expression simply of the statistical distribution of notes in a melody: the higher a note is, the more notes there are below it for a composer to choose from, and the less notes there are above it.
* **melodic arch** – the tendency for melodies to ascend in the first half of a phrase, reach a climax, and descend in the second half. An expression of goal-orientation and the rest–motion–rest pattern. Also, a combination of the above rules in the context of a musical phrase.

### First species counterpoint

Counterpoint is the mediation of two or more musical *lines* into a meaningful and pleasing *whole*. In first-species counterpoint, we not only write a smooth melody that has its own integrity of shape, variety, and goal-directed motion, but we also write a second melody that contains these traits. Further, and most importantly, we combine these melodies to create a whole texture that is smooth, exhibits variety and goal-oriented motion, and in which these melodies both maintain their independence and fuse together into consonant *simultaneities* (the general term for two or more notes sounding at the same time).

#### The counterpoint line

In general, the counterpoint should follow the principles of [writing a good cantus firmus](cantusFirmus.html). There are some minor differences, to be discussed below, but generally a first-species counterpoint should consist of two cantus-firmus-quality lines.

#### Beginning a first-species counterpoint

To exemplify goal-oriented motion, the first-species exercise should begin and end with the most stable of sonorities: perfect consonances. Thus, when writing a counterpoint *above* a cantus firmus, the first note of the counterpoint should be *do* or *sol* (a P1, P5, or P8 above the cantus).

When writing a counterpoint *below* a cantus firmus, the first note of the counterpoint must always be *do* (P1 or P8 below the cantus). (Beginning on *sol* would create a dissonant fourth; beginning on *fa* would create a P5 but confuse listeners about the tonal context, since *fa–do* at the beginning of a piece is easily misheard as *do–sol*.)

#### Ending a first-species counterpoint

The final note of the counterpoint must always be *do* (P1 or P8 above/below the cantus).

To approach this ending smoothly, with variety, and with strong goal orientation, always approach the final interval by contrary stepwise motion. If the cantus ends *re*–*do*, the counterpoint’s final two pitches should be *ti*–*do*. If the cantus ends *ti*–*do*, the counterpoint’s final two pitches should be *re*–*do*. Thus the penultimate bar will either be a minor third or a major sixth between the two lines. This is the case for both major and minor keys.

#### Independence of the lines

Like the cantus firmus, the counterpoint should have a single climax. To maintain the independence of the lines and the smoothness of the entire passage (so no one moment is hyper-emphasized by a double climax), these climaxes should not coincide.

A single repeat/tie in the counterpoint is allowed, but try to avoid repeating at all. This promotes variety in the exercise, since there are so few notes to begin with.

Avoid *voice crossing*, where the upper voice is temporarily lower than the lower voice, and *vice versa*. Voice crossings diminish the independence of the lines and make them more difficult to distinguish by ear.

Avoid *voice overlap*, where one voice leaps past the previous note of the other voice. For example, if the upper part sings an E4, the lower part cannot sing an F4 in the following bar. This also helps maintain the independence of the lines.

#### Intervals and motion

The interval between the cantus and counterpoint at any moment should not exceed a perfect twelfth (octave plus fifth). In general, try to keep the two lines within an octave where possible, and only exceed a tenth in “emergencies,” and only briefly (one or two notes). When the voices are too far apart, tonal fusion is diminished. Further, it can diminish *performability*, which though not an essential principle of human cognition is an important consideration for composers, and it has a direct effect on the smoothness, melodic integrity, and tonal fusion of what listeners hear during a performance.

In general, all harmonic *consonances* are allowed. However, unisons should only be used for first and last intervals. Unisons are very stable, and serve best as goals rather than mid points. They also diminish the independence of the lines.

*Imperfect consonances* are preferable to *perfect consonances* for all intervals other than the first and last dyads, in order to heighten the sense of arrival at the end, and to promote a sense of motion towards that arrival. In all cases, aim for a variety of harmonic intervals over the course of the exercise.

*Never, ever, ever* use two perfect consonances of the same size in a row: **P5–P5** or **P8–P8**. This includes both simple and compound intervals. For example, **P5–P12** is considered the same as **P5–P5**. (Two different perfect consonances in a row, such as **P8–P5**, is allowed, however, but try to follow every perfect consonance with an imperfect consonance if possible.) These “parallel fifths and octaves” significantly promote tonal fusion over melodic independence at the same time that the consecutive stable sonorities arrest both the variety and the motion of the exercise. Thus, they are far from ideal, and to be avoided in species counterpoint.

Vary the types of motion between successive intervals (parallel, similar, contrary, oblique). Try to use all types of motion (except, perhaps, oblique motion), but prefer contrary motion where possible. It is best for preserving the independence of the lines, in addition to variety.

Because similar and parallel motion diminish variety and melodic independence, their use should be mediated by other factors:

* Do not use more than three of the same imperfect consonance type in a row (e.g., three thirds in a row).
* *Never* move into a perfect consonance by similar motion (this is called *direct* or *hidden octaves*). This draws too much attention to an interval which already stands out of the texture.
* Avoid combining similar motion with leaps, especially large ones.

### Demonstration

In the following video, I illustrate the process of composing a first-species counterpoint. This video provides new information about the compositional process, as well as concrete examples of the above rules and principles.

## Class discussion

**What is a compound meter?** - Any regular meter where beats are divisible by 3.

**Duple triple, and quadruple all mean the same thing they do in simple meters. As for examples:** - Duple: 6/8, 6/4, 6/2 -Triple: 9/8, 9/16 -Quadruple: 12/8, 12/4

**What do the top and bottom numbers of compound time signatures mean?** - Top = if you divide by 3, that’s how many beats there are? (Yes, but this doesn’t tell us what the numbers mean) - *Top = how many of the note in the bottom there are, bottom = the note value of the division*

# Further reading

## From *Open Music Theory*

### Compound meters

Meters that divide the beat into three equal parts are *compound meters*.

When combined with simple meters, there are six types of standard meter in Western music:

* simple duple (beats group into two, divide into two)
* simple triple (beats group into three, divide into two)
* simple quadruple (beats group into four, divide into two)
* compound duple (beats group into two, divide into three)
* compound triple (beats group into three, divide into three)
* compound quadruple (beats group into four, divide into three)

In a time signature, the *top number* (and the top number only!) describes the type of meter. Following are the top numbers that always correspond to each type of meter:

* simple duple: 2
* simple triple: 3
* simple quadruple: 4
* compound duple: 6
* compound triple: 9
* compound quadruple: 12

### Notating meter

In *compound meters*, the bottom number of the time signature corresponds to the type of note corresponding to *a single division of the beat*. If a compound meter is notated such that each dotted-quarter note corresponds to a beat, the eighth note is the division of the beat, and thus the bottom number of the time signature is 8. If a compound meter is notated such that each dotted-half note corresponds to a beat, the quarter note is the division of the beat, and thus the bottom number of the time signature is 4. Note that because the beat is divided into three in a compound meter, the beat is always three times as long as the division note, and *the beat is always dotted*.

### Compound duple meter

“Shiver,” Radiohead

Strong Quartet No. 17 in B-flat Major, K. 458, “The Hunt,” Movement I., Wolfgang A. Mozart

### Compound triple meter

“The Tourist,” Radiohead

Sonata No. 42 in G Major, Hob. XVI:27, Movement II., Joseph Haydn

### Compound quadruple meter

“Exogenesis: Symphony Part 3,” Muse

Sonata No. 14 in C-sharp Minor, Op. 27, No. 2, “Moonlight,” Movement I., Ludwig van Beethoven

St. Matthew Passion, No. 1, Chorus, “Kommt, ihr Töchter, helft mir klagen,” J.S. Bach

## Class discussion

**Implied Harmony in Two Parts** - You hear a V7 chord but only have the root. Why? - We are conditioned to hear that V chord (and you just listened to a ton of them before this).

* Dissonance wants to resolve to consonance.
* Why is the first measure “stronger” than the second?
  + The two do’s in bass and soprano voices.
* Factors that affect how “strong” something is
  + People are generally better at hearing higher voices
  + Inverted chords
  + Intervals between voices

**Harmonic functions in diatonic music** - The vi chord can be considered tonic because of shared tones with the I chord, but it has to be set up with that intention. In this class, it will not function in that way.

**Cadence** - “The end of our musical sentence when it feels like a musical ending; the harmonic progression at the end of the phrase.”

# Further reading

## From *Open Music Theory*

### Chord voicing

In strict keyboard-style writing, there are four voices: the bass line (which is usually a given in *basso continuo* style), and three *upper voices*: the *melody* or *soprano*, the *alto*, and the *tenor* (from highest to lowest). Since all three upper voices must be played by a single hand, they should never span more than an octave.

The melody always has an upward-pointing stem. Alto and tenor share a downward-pointing stem. If the alto and tenor share a note, that note receives a single downward-pointing stem. (See m. 1 of the example below.) If melody and alto share a note, that notehead is double-stemmed. (See m. 4 of the example below.)

When choosing the notes to place in the upper voices above a figured bass, use the bass and figures to determine the pitch classes present in the chord. (When realizing an *unfigured bass*, you must determine appropriate figures before realizing.) If the chord is a four-note chord, use each chord member once, including the bass (exceptions will be noted later). If a chord has three pitch-classes (a triad, for instance), use each pitch-class once, and “double” one of them according to the following principles:

* If the figure is 6/4, 5/3, or other chord of the fifth, double the bass pitch class.
* If the figure is 6/3 and the bass is a *fixed scale degree* (*do*, *re*, *fa*, or *sol*), double the bass pitch class.
* If the figure is 6/3 and the bass is a *variable scale degree* (*mi*/*me*, *la*/*le*, or *ti*/*te*) or a chromatically altered pitch, double one of the upper voices at the octave or unison.
* Generally, do not double a variable scale degree or a chromatically altered pitch.

### Tendency tones

A *tendency tone* is a pitch (class)—usually represented as a scale degree—that tends to progress to some pitch classes more than others. Sometimes this tendency is absolute within a style, but more often it is context-dependent.

The most prominent tendency tones in Western tonal styles are *ti* (not *te*) and *le* (not *la*).

Generally speaking, when *ti* appears it tends to be followed by *do* in the same voice. In a harmonic context, this tendency is strongest when *ti* occurs in a dominant-functioning chord, and the “resolution” of that tendency comes upon change of function (to tonic or predominant).

Likewise, when *le* appears, it tends to be followed by *sol* in the same voice. This tendency is less dependent on function.

Exceptions to these tendencies include:

* When *ti* is in the middle of a stepwise descent (*re*–*do*–*ti*–*la*–*sol*, for example), it can progress down by step. (Note that *step inertia* here diminishes the effect of an “unresolved” tendency tone. Because there are two conflicting tendencies in play, in this case, either can be “resolved” unproblematically.)
* When *ti* is in an inner voice, it can progress down to *sol* if necessary to accomplish good voice-leading in the other voices and ensure complete chords. This is called a *frustrated leading-tone*.
* When *ti* is a functional dissonance of a tonic-functioning chord (see below) it should progress down by step.

### Functional dissonances

Some tendencies, such as the tendency for *le* to progress down, are relatively context-independent. Others are heavily contextualized. The primary contextual tendency for how melodic notes progress is the concept of *functional dissonance*.

Keep in mind from the [Harmonic functions resource](harmonicFunctions.html) that chords tend to cluster in one of three functional groups (**T**, **P**, or **D**) When pitches fuse into a chord expressing one of these three functions, the pitches that comprise that have certain tendencies of progression that they may or may not have in other contexts.

Following are the scale degrees which act as dissonances for their respective functions:

| function | dissonances |
| --- | --- |
| T or Tx | 7, 5 when 6 is also present |
| P | 3, 1 when 2 is also present |
| D | 4, 6 |

In purely diatonic music (triads and seventh chords, no chromatics), these will include *the seventh of every seventh chord*, *the fifth of viiº or VII* (*fa*), and *the fifth of III or iii* (*ti/te*).

Keep in mind that only sometimes do these functional dissonances express themselves in chords or intervals that are acoustically dissonant. However, they do introduce a degree of tension that, like an acoustically dissonant interval in species counterpoint, requires a smooth introduction and a specific resolution.

When one of these scale degrees is present in a chord with the corresponding function, the dissonant scale degree has a strong tendency to *resolve down by step over the next change in function*. In strict composition, we will *always* follow these tendencies.

In strict keyboard style, these functional dissonances should be “prepared” (approached) by common tone or by step. Thus, though they are proper members of the chord, melodically they will look like one of the three dissonance types of species counterpoint: a *passing tone* or *neighbor tone* dissonance that is approached by step, or a *suspension* dissonance that is approached by a common tone. The suspension type is preferred.

Once a functional dissonance is introduced, it must be resolved down by step in the same voice when the function changes. The dissonance can also be *transferred* to another voice before resolution—for instance, if there are multiple chords in a row exhibiting the same function, a dissonance that appears in the alto can be transferred to the tenor in the following chord, and then resolve in the tenor when the function changes. (It is more typical, and smoother sounding, to transfer dissonances between inner voices or from an inner voice to an outer voice than from an outer voice to an inner voice. Once a dissonance appears in the melody or bass, where it is more noticeable, it tends to resolve in that voice.)

Functional dissonance resolutions often cause conflicts with other principles of voice leading. Except in special cases such as *schemata* (standard patterns that are common enough to sound appropriate, even if they follow different rules), the functional dissonance resolution takes precedence over other principles such as the *law of the shortest way*, contrary motion with the bass, and preferring common tones and steps to melodic leaps. A dissonance resolution is never an excuse for illegal parallels, and only rarely will lead to non-standard doublings.

# Class Discussion

Process of harmonic analysis - What you should try and do as early as possible is determine the *harmonic rhythm*, or how often the chord changes. This can happen every beat, every measure, or many other ways. The chorale we looked at in class is an example where the harmonic rhythm is every beat. - Key: try not to rely as much on the key signature to figure out what key you’re in. Think of it as just one of many tools. There are other indicators of key–what chord does the section start on? What accidentals are repeatedly occurring in the section? Do these fit in with a major key or a minor one? - Leadsheet: doing this first will save time in writing out your Roman numerals, especially if you are still unsure of what key you’re in. - *You do not need to repeat the Roman numerals for multiples of the same chord in a row.*

# Further Reading

## The three common-practice harmonic functions

In common-practice music, harmonies tend to cluster around three high-level categories of harmonic function. These categories are traditionally called *tonic* (**T**), *pre-dominant* (**P** — sometimes referred to as *subdominant*, **S**), and *dominant* (**D**). Each of these functions has their own characteristic scale degrees, with their own characteristic tendencies. And each of these functions tend to participate in certain kinds of chord progressions more than others.

If you are already comfortable with Roman numerals, you can generally think of **I**, **III**, and **VI** as *tonic*, **II** and **IV** as *pre-dominant*, and **V** and **VII** as *dominant*. (Though, as you will see below, there is more to it than that.)

To visualize these functional categories, think of the usual triads in C major arranged on a circle of thirds. Note that each chord sits between the two triads that share the most tones in common — C major (C, E, G) sits between E minor (E, G, B) and A minor (A, C, E), both of which share two tones in common with C.

Convert these chords to Roman numerals (in C major), and we can see the functions. Since the function is determined by the tendencies of the tones that they share, and since on this graph chords are grouped together by notes they have in common, they are also grouped together by function.

*Triads arranged on the circle of thirds, labeled by harmonic functions.*

Interestingly, in common-practice music, a chord’s function can be determined solely by its internal characteristics (the notes that make up the chord). This is not true of all styles. For example, in pop/rock music a **IV** chord can exhibit very different functional tendencies depending on its context. But in classical music, simply knowing the notes in a chord is enough to determine its general harmonic function and the general tendencies of that chord and its individual notes.

The syntactic properties of these functions will be covered elsewhere. What follows simply explains how to determine the function of a chord in common-practice music with greater specificity.

## Finding the function of a chord

Each of the three harmonic functions — *tonic* (T), *pre-dominant* (P), and *dominant* (D) — have characteristic scale degrees. Tonic’s characteristic scale degrees are 1, 3, 5, 6, and 7. Pre-dominant’s characteristic scale degrees are 1, 2, 3, 4, and 6. Dominant’s characteristic scale degrees are 2, 4, 5, 6, and 7.

Ian Quinn (a music theorist at Yale University) further distinguishes these scale degrees, using the categories of functional *triggers*, functional *associates*, and functional *dissonances*. These categories help us understand the functional properties of chords whose scale degrees belong to more than one function, as well as how certain notes behave within a chord. They also help us understand which scale degrees are more or less characteristic of a function ― something that will help determine function when a complete chord is not present.

| function | triggers | associates | dissonances |
| --- | --- | --- | --- |
| **T** | 1 and 3 | 5 and 6 | 5 (if 6 is also present) and 7 |
| **P** | 4 and 6 | 1 and 2 | 1 (if 2 is also present) and 3 |
| **D** | 5 and 7 | 2 | 4 and 6 |

In terms of moveable-*do* solfège:

| function | triggers | associates | dissonances |
| --- | --- | --- | --- |
| **T** | *do* and *mi*/*me* | *sol* and *la*/*le* | *sol* (if *la*/*le* is also present) and *ti*/*te* |
| **P** | *fa* and *la*/*le* | *do* and *re* | *do* (if *re* is also present) and *mi*/*me* |
| **D** | *sol* and *ti*/*te* | *re* | *fa* and *la*/*le* |

To determine the function of a chord, find the function that includes all the scale degrees of a chord (regardless of chromatic alterations ― that is, treat ♯4 the same as regular scale-degree 4). If more than one function contains all the scale degrees, take the function with the most triggers in the chord.

There is one exception to this (for now): a chord with scale degrees 6, 1, and 3 is a special kind of tonic chord, called a *destabilized tonic*. Quinn uses the special functional label is **Tx**, rather than simply **T**, for this chord.

Also note that because the III7 chord’s scale-degrees do not wholly belong to any of the three functions, it can behave similar to **T** and **D** chords, depending on context. It is a rare chord in its diatonic form.

[This handout](/images/Handouts/HarmoniesByBassScaleDegree.pdf) will help you determine the function of a chord from the bass scale degree and/or the Roman numeral.

## Class Discussion

TBD

## Further Reading

### From *Open Music Theory*

### The Keyboard

The keyboard is great for helping you develop a visual, aural, and tactile understanding of music theory. On the illustration below, the *pitch-class* letter names are written on the keyboard.

### Enharmonic equivalence

Notice that some of the keys have two names. When two pitch classes share a key on the keyboard, they are said to have *enharmonic equivalence*. Theoretically, each key could have several names (the note C could also be considered D♭♭, for instance), but it’s usually not necessary to know more than two enharmonic spellings.

### Octave Designation

When specifying a particular pitch precisely, we also need to know the *register*. In fact, if all you have is C-sharp or B-flat, you do not have a *pitch*, you have a *pitch-class*. A pitch-class plus a register together designate a specific pitch.

We will follow the International Standards Organization (ISO) system for register designations. In that system, middle C (the first ledger line above the bass staff or the first ledger line below the treble staff) is C4. An octave higher than middle C is C5, and an octave lower than middle C is C3.

Here is the pitch C4 placed on the treble, bass, alto, and tenor clefs.

The tricky bit about this system is that the octave starts on C and ends on B. So an ascending scale from middle C contains the following pitch designations:

And a descending scale from middle C contains the following pitch designations:

Pitches on the alto staff are as follows:

Pitches on the tenor staff are as follows:

Any accidentals follow the octave designation of the natural pitch with the same generic name. Thus a half step below C4 is C-flat4 (even though it sounds the same as B3), and a half step above C4 is C-sharp4.

Note that a complete designation contains both the pitch-class name (a letter name plus an optional sharp or flat) and the register (the ISO number indicating the octave in which the pitch is found). Unless both are present, you do not have the full designation of a specific pitch.

# Class discussion

**Double Neighbor Tones** Decorates a single pitch, has to come back to the original pitch. - Enclosure! It doesnt matter if you to up or down first, but there is a stepwise note above and below. - Two neighbor tones stapled together.

**Appoggiatura (APP)** Approached by leap and left by step in the opposite direction.

**Escape Tone (ET)** Approached by step and left by leap in the opposite direction.

*appoggiaturas and escape tones are the most common NCT’s*

**Anticipations (ANT)** A reverse suspension, although not upsidedown like retardations. Putting your car in reverse doesn’t put it on its roof. - A chord tone that shows up too early. - Its going to be a chord tone soon, but not yet because the chord hasn’t changed yet. - Static motion!

**Pedals (PED)** Any non chord tone approached by static motion and left by static motion across at least three chords. When labeling with a pedal, use the next voice up to determine inversion.

**“Figure”** It has the right shape, but aren’t non-chord tones. This concept can apply to any NCT. Check if they’re chord tones! \*ex: There’s an appoggiatura figure in [insert random piece], measure 21.

# Class discussion

See 10a for the rules.

See 10b for part writing error checklist/document.

**Primary Errors**

* Parallel perfect octaves or perfect fifths. PP8 or PP5
* Similar octaves or fifths (“direct” “hidden” or “exposed”). This has to do with similar motion.
* Unacceptable unequal fifths. UU5
* Contrary perfect octaves or perfect fifths. CP8 or CP5 a subset of PP8

These errors must be within the same two voices across both chords.

# Class discussion

TBD

N/A yet

# Class Discussion

**Common tone diminished chords** - These are similar to +6 chords in that they don’t quite work right. These also exist just as decoration/voice leading into the next chord. It’s made up entirely of tendency tones to make the resolution really strong - Confusing to ID because they look like another chord - Whether a chord is a ct07 depends on what comes *after* it. If we’re in C and we have a D#07/C, it can be either a ct07 or a vii07/iii. If the next chord is iii, it’s the latter. If it’s I, the chord is a ct07. - The other common Roman numeral that comes after a ct07 is V - Do not label inversions of ct07s. Like +6 chords their function doesn’t work with our system of inversion labeling

**Constructing a ct07** - A ct07 going to I will look like a #ii07, while a ct07 going to V will look like a #vi07. These two points of reference are helpful for knowing what notes you need, but be aware that writing these in “root position” will be incorrect - Again: these chords exist for cool voice leading! If you just write it in root position, all of that cool voice leading goes away. One way to ensure the voice leading is correct is to write the following chord next to it in root position, then construct your ct07 from there by determining what all the notes should resolve to

These are also used in enharmonic modulations and you just label them as ct07 like usual

# Class discussion

## Mediant Harmony and Idealized Voice Leading Intervals

How do we judge good voice leading?

* Stepwise and static motion
* The chordal thirds resolve how you expect

If you put chords in closed position voicing without the bass line there’s not much movement.

If you count the half steps it takes to move between two chords and take the total you have IVI, or Idealized Voice-Leading Intervals.

Which chords have the lowest IVI?

The ones that share two common tones.

Anytime we have harmonies whose roots relate by a 3rd those chords have smooth voice leading because they share two tones.

Mediant Harmony allows composers to have smooth voice leading while using interesting harmony.

Ex: G7 - D

* GBDF to DF#A
* G moves to F#, B moves to A, D stays the same, F moves to F#.
* IVI:5

Voice-leading for IVI is not the same as writing for a chorale.

Bass lines don’t follow the rules of IVI for smooth voice-leading.

Ex: Bbm - Co7

* BbDbF to CEbGbBbb
* Bb moves to Bbb, Db moves to Eb and C, F moves to Gb.
* IVI:5

Ex: G - Fmaj7

* GBD to FACE
* G moves to F and A, B moves to C, D moves to E.
* IVI:7

### IVI In C Major and Parallel Minor

1. C to Dm - IVI:5
2. C to Do - IVI:4
3. C to Eb - IVI:3
4. C to Em - IVI:1
5. C to Fm - IVI:2
6. C to F - IVI:3
7. C to Gm - IVI:4
8. C to G - IVI:3
9. C to Ab - IVI:2
10. C to Am - IVI:2
11. C to Bb - IVI:5
12. C to Bo - IVI:4

Which chords have the smallest IVI?

## Mediant Harmony

The mediant harmony: or any harmony whose root starts a 3rd away.

These chords are the mediant and borrowed mediant, and the submediant and borrowed submediant.

We are left with (in C) Eb, Em, Ab, Am.

We have 4 more mediant harmony chords, and they come from changing the quality of the previous chords.

* Ebm, E, Abm, A.

In total we have 4 chromatic mediant chords (Ebm, Eb, Em, E) and 4 chromatic submediant chords (Abm, Ab, Am, A).

Diatonic mediants: the two mediants that are in the key.

* In C major, Em and Am.
* your diatonic mediants always have 2 common tones and opposite chord qualities.

Chromatic mediants: the 4 mediants that are borrowed from the parallel minor and the opposite chord quality of the diatonic mediants.

* In C major, Eb, Ab, E, and A.
* Eb and Ab are from the parallel minor while the E and A are opposite chord qualities of diatonic mediants.

Doubly chromatic mediants: the 2 mediants that are not in the key, but are the opposite chord qualities of the parallel minor mediants.

* In C major, Ebm and Abm.

You find the first 4 mediants by using the diatonic and chromatic mediants (the 2 from major and 2 from the parallel minor).

# Class discussion

## PC Set Inversion

How do you find the inversion of the number? - you take the number and go that many around the given pitch. - if we are inverting over 0, the inversion of 3 is -3. - -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

What if we apply Mod 12 to this idea? - 1 2 3 4 5 6 7 8 9 t e 0 1 2 3 4 5 6 7 t e - we get the same idea by mirroring numbers over the clock, putting the mirror down the line between 0 and 6. - the inversions of each number are: - 1 e, 2 t, 3 9, 4 8, 5 7, 6 6. - if you’re using the clock for inversion, you can move the mirror axis to any number and treat it the same.

#### Ex: C major triad

What is the pitch class set for a C major triad? (0,4,7). What is the inversion? (0,8,5). - the normal form of the inversion is [5,8,0].

The chord made is a F minor triad, because we directly flipped the intervals around C. ### Transposition and Inversion When you have to transpose and invert a PC set, the formula is TnI(). #### Which is correct? 1. Transpose - ex: T4I(1,5,6) - (5,9,t) 2. Invert - (7,3,2) 3. Find normal form - [2,3,7]

**OR** 1. Invert - ex: T4I(1,5,6) - (e,7,6) 2. Find normal form - [6,7,e] 3. Transpose - next we transpose by adding n (4) to each interger. - [t,e,3]

The SECOND OPTION is correct. By transposing first, it changes the axis you invert over. You have to invert first, THEN transpose. You have to wait to find normal form until AFTER you invert the PC set.

Shortcut: - subtract n by each interger, then set it in normal form. - ex: T9I(4,3,1) - 9-4=5 - 9-3=6 - 9-1=8 - so our PC set is (5,6,8), and normal form is [5,6,8]

### Set Class Think of pitch class, it is a combination of pitches, thus a PC set. So set class, is a collection of pitch class sets.

Heirarchy: - pitch class (1) - pitch class set (1,4,7) - set class (1,4,7);(2,5,8);(3,6,9);(4,7,t);(5,8,e);(6,9,0); etc…

A set class for (0,4,7), a major triad, all of its transpositions and inversions create 24 PC sets, making one large set class. This includes all major and minor triads in interger notation. - a way to decrease a set class is using a symmetrical chord

# Further reading

## From *Open Music Theory*

### Inversion

Inversion, like transposition, is often associated with motion that connects similar objects. You need to be able to (1) invert a collection of pitches and (2) determine the inversional relationship between two collections of pitches.

This passage above from Debussy’s “Sunken Cathedral” is an example. Just as was the case in the [transpositionally-related passages](#transposition-1), these two gestures have the same intervallic content—and so, our ears recognize them as very similar. (Debussy underscores that similarity by giving both of the gestures the same rhythmic setting.) Unlike transposition, however, the interval content of these two gestures is not *arranged* in the same way.

Both have the same intervals, but the {A,D,E} collection has the +5 on the bottom instead of on the top.

Inverting something is a two-step process, performed *in this order*: (1) Reflect the pitch classes in an object around the 0-6 axis of symmetry, and then (2) transpose it. I’ll illustrate first on a clock, and then show you an easier way:

Fortunately, there is a much quicker way to invert a pitch or collection of pitches! Given any collection of pitch classes and a *TnI*, simply subtract the the pitch classes from *n:*

Conversely, to determine the *TnI* that relates two collections of pitch classes, find a common value to which they all sum. That is the *n* in *TnI:*

# Class discussion

## Non-dominant Function Secondary Chords

**Other secondary functions** - What is up with this weird mystery chord??? (Gmin in C major) - Is it a iv/ii? It’s followed by a V/ii, so is it just an extended progression?: Yep! It looks kind of weird, but that’s exactly what it is. - *Contextual analysis tips:* always be thinking about what you’re analyzing actually *sounds.* All Roman numerals do is label function. They’re like a legend indicating what we hear - Think of chords in a secondary progression as being tied together by a string. In our progression iv/ii - V42/ii - ii6 - V7 - I, the first three chords are basically a bundle setting up our V7.

**Ambiguous secondary functions** - You can also label the Am chord as ii/V. You shouldn’t do that, because it’s overthinking, but you could. Remember: *always be thinking about what you’re analyzing actually sounds like.* How does the Am chord function? Label it properly in order to reflect what you hear.

# Class discussion

Welcome to post-tonal analysis!

**The importance of pitch notation in tonal harmony** - In this example, we talked about determining implied key and progression just from looking at the accidentals, harmonic intervals, and resolution. - Both measure contain a a tritone, and they each resolve in a different way: one outward, one inward. This results in resolutions to different keys from enharmonically equivalent chords.

**Happy Birthday in G Major (a la R. Strauss)** - Welcome to pitch class integer notation!! - Remember we only use 0-e in this form of notation. 0 is also 12 (and 1 is also 13, 2 is also 14, etc…) - In this system, there is no difference between C# and Db. Both are written as 1. While it’s important to distinguish these notes in tonality, we’re post-tonal! The notes don’t matter. - All enharmonic equivalents are called a pitch class. This also includes double sharps and double flats. For example, C#, Db#, and Bx are all in the same pitch, class, represented as 1. - What reasons are there to use this system? - Quickly identifying pitches (or pitch classes) - Identifying non-diatonic scales? - Is C always 0? - In fixed zero notation, yes! There is also movable zero notation. Much like fixed and movable do, both of these notations have their uses.

**Scales labeled using multiple zeros in pc integer notation** - Notice each scale is made up of a repeating 4-number pattern. In this example we can see a major scale is based around 0245, Dorian mode is based around 0235, and HW octatonic is based around 0134. - Movable zero is helpful for this kind of thing because we can quickly identify patterns in smaller things, like the scales here. It identifies the specific intervallic framework of a section, based around one note.

A *pitch-class set* (pcs) is a collection of pitch classes. *Cardinality* is the number of pitch classes within a pcs. 0245 is a pcs, and since it has 4 pitch classes in it we call it a tetrachord. We run into problems with some of these cardinality terms because some of the words are the same as ones we associate with tonality.

**What is the application of an empty set?** - We need it for when we start inverting things later. An empty set is the inverse of an aggregate, containing all twelve pitch classes.

Our “normal” scales and modes would be called septachords, because they contain seven pitch classes.

**Can you apply this system of notation to tonal music?** - You *can*! The example Dr. Butterfield pulled up in class was Hindemith’s Trumpet Sonata, which he called “a mess to play” but went through using pc integer notation to look at the piece intervallically and not have to transpose as much

# Further Reading

## From *Open Music Theory*

Tonality is highly charged system where *scale degrees* are endowed with a magnetic or gravitational pull towards other tones. Within the key of C major, B-natural is attracted to the tonic C, other members of the dominant triad are attracted to the tonic triad, and other scale degrees have functions as well. *Spelling* is extremely important within common-practice tonality. A-flat — as lowered scale degree 6 — leads to G, but G-sharp — as raised scale degree 5 — leads to A. Underlying “scale degree” and “spelling” are two important concepts that will influence our study of post-tonal music.

### Octave Equivalence

”Scale degree” implies an *equivalence* between [pitches](pitches.html) that are spelled the same but any number of octaves apart. C4 is the same as C3 is the same as C9, and so on. The concept of scale degree, then, has the idea of *octave equivalence* embedded within it.

### Enharmonic Equivalence

Though *octave equivalence* is central to our understanding of tonal music, enharmonic equivalence often is not. In the key of C major, A-flat and G-sharp are *not* equivalent, though in isolation they sound the same. Spelling often indicates tendency: A-flat *falls* to G and G-sharp *rises* to A.

In post-tonal music, enharmonic equivalence is often assumed — with exceptions of course. Because many composers no longer felt constrained by a tonal center, the same gravitational relationships amongst tones that we find in tonal music aren’t important. A-flat and G-sharp, therefore, can be treated as representations of the same thing.

### Pitch

*Pitches* are discrete tones with individual frequencies. The concept of pitch, then, does not imply octave equivalence. C4 is a pitch, and it is not the same pitch as C3.

### Pitch class

Pitch classes are *pitches* under octave equivalence that are also spelled the same. A4, A3, A2, etc. are all members of the pitch class A.

**Pitch Space**

### Integer notation

When analyzing post-tonal music where assuming octave equivalence and enharmonic equivalence is appropriate, we can use integers to represent pitch class. All C’s and any notes that are enharmonically-equivalent to C (B-sharp, for example) are pitch class 0. All C-sharps’s and any notes that are enharmonically-equivalent to C-sharp (D-flat, for example) are pitch class 1. And so on: C = 0, C-sharp = 1, D = 2, D-sharp = 3, E = 4, F = 5, F-sharp = 6, G = 7, G-sharp = 8, A = 9, B-flat = 10 (T), and B = 1 1 (E).

This type of pitch-class, which assumes octave and enharmonic equivalence is easily visualized on a clock-face diagram, like the one below.

**Pitch-Class Space**

### Disclaimer!

Post-tonal music is extremely various. Composers have individual compositional styles, aesthetic goals, and unique conceptions of pitch. All this is to say that you must approach a composition with flexibility. For example: because it is quasi-tonal, Debussy’s music often benefits from a view that does *not* assume enharmonic equivalence. But sometimes it does. You must rely on your musical intuitions when analyzing this music, and you should also be willing to approach pitch in these compositions from multiple perspectives until you find one that seems most appropriate.

## Atonal glossary

*this glossary is far from complete, in the very early stages of being built*

**collection** – The general term for treating multiple pitch classes as a single entity. Sets, set classes, scales, simultaneities, chords, and intervals are all specific kinds of collections.

**interval class** – The number of semitones between two *pitch classes*, counted as the shortest distance between them on a clock face. For instance, C and E make an interval class of 4. This is always the case, no matter which *pitch* is higher or lower, because interval class is concerned only with *pitch classes*. Interval classes are labeled **ic1**, **ic2**, . . . **ic6**. (There are none smaller than **ic1** or larger than **ic6**.)

**interval vector** – The interval vector of a set class describes all of the interval classes present in a set class. There are six interval classes (1–6). The interval vector gives the number of each of those intervals in order from 1 to 6, within angle brackets. An interval vector of **<101102>** means that the set has one ic1 (semitone/major seventh), no ic2s, one ic3 (minor third/major sixth), one ic4 (major third/minor sixth), no ic5s (perfect fourths), and two ic6s (tritones).

**ordered pitch interval** – The number of semitones from one pitch (not pitch class) to the next. Ascending intervals are denoted by positive numbers, descending intervals by negative numbers. Examples: B4–G5 would have an ordered pitch interval of 8 (eight ascending semitones). B3–G5 would be 20. B4–G4 would be –4.

**ordered pitch-class interval** – The number of *ascending* semitones from one pitch-class to another. G–B is four semitones, for an ordered PC interval of **4**. B–G is eight ascending semitones, for an ordered PC interval of **8**.

The ordered pitch-class interval is also the modulo12 version of the ordered pitch interval. For example, B4–G4 is –4 semitones (4 semitones down). mod12(–4) = 8. C3–D4 is 14 semitones. mod12(14) = 2.

**pitch** – A pitch class in a specific register, such as C4 (middle C).

**pitch class** – One of the twelve steps on the chromatic scale, summarized by a note name (C, D-sharp, B-flat, etc.) or a number 0–11 (C = 0, C-sharp = 1, . . . B = 11). In atonal music, spelling rarely matters except to make performance easier, so enharmonically equivalent pitch classes are considered identical (C = B-sharp = D-double-flat = 0).

**pitch-class set** – An *unordered* collection of pitch classes, usually grouped into curly brackets: {C, E, G}, {D, E-flat, G}, or {4, 5, 9}.

**pitch-class set class** or simply **set class** – A category of pitch-class sets that are all related by transposition or inversion. For example, the 12 major triads are all related by transposition. While each major triad is a different pitch-class set, they all belong to the same set class (the same category of sets). Note that minor triads are upside-down major triads (minor third–major third, instead of major third–minor third). Thus since major and minor triads can be related by inversion, they belong to the same set class. Set classes are typically named according to their *prime form* (see *prime form* in this glossary).

**prime form** – Since set classes come in as many as 24 different forms (12 transpositions times 2 inversions), one of those forms is chosen as its name or referential form, for ease of categorization. That form is the prime form. The prime form is, in a nutshell, the inversion and rotation of the set class that keeps the pitch classes most tightly packed on and above C (0).

For help finding the prime form of a set, Jay Tomlin’s [set theory calculator](http://www.jaytomlin.com/music/settheory/) can be helpful. The following video demonstrates how to use it.

SetTheoryCalculator from Kris Shaffer on Vimeo.

**simultaneity** – Any collection of more than one pitch (class) that sound at the same time. This includes dyads/intervals, chords, clusters, and “salami slices” of contrapuntal textures.

**unordered pitch-class interval** – A regular *simple* chromatic interval: the number of half steps between two pitches. Compound intervals (larger than an octave) are typically reduced to their corresponding simple interval. They are labeled with a lower-case **i**: **i4** is a major third, for example.

# Class Discussion

## Identifying Phrases

* Look for rests
* Listen for a clear beginning, middle, and end.
* Look for cadential chords; I, V, and vi. A cadence is like the period at the end of a sentence.
* Look for structure. Sometimes, phrases stay the same length, and this can make it a lot easier to separate the different phrases.

# Class discussion

LEAD SHEET >>>>>>>> EVERYTHING

We *highly* recommend that if you weren’t doing lead sheet notation first in your analyses, you start now. It’s especially important to do it this way now because we’re getting into modulation, and lead sheet will keep you from having to go back and re-do a bunch of work, which might happen if you try and do Roman numerals first. Remember: Roman numerals label function, whereas lead sheet just labels chords. To figure out what the music is doing, first we have to know what we have.

**Pivot modulations (Common chord pivot modulations)** - Three important questions: - Where do you first hear something changing? - How is the change prepared? - What harmonies transition in and out of modulation? - With pivot modulations, you always modulate before you actually hear it. There’s always an overlap with the previous key where the pivot modulation happens–there has to be a functional progression on both sides of the pivot chord - Ideally, your pivot chord is the chord *right* before you hear the modulation.

* In the Haydn example, we don’t hear the modulation until the C# in the bass in the second system. So, the chord in the first half of the same measure (I in G, IV in D) is where we would actually put the pivot chord bracket.
* Another ex: in the Tchaikovsky example, we hear the modulation in the second to last measure. The chord in the second half of the measure right before it is D major, which is I in the original key and Vi in the new key–a perfect pivot chord! It fits right into a standard circle-of-fifths progression.
* If you have a lot of V/V - V - V/V - etc. in a row, chances are you have modulated and are now in a new key. This is the case for any new key, not just V.
* How to label: use a pivot chord bracket!
* Where will you (usually) find these?: in the middle of a phrase!

Make a chart of the chord functions, between two keys you are looking at, to find the pivot chords easily.

# Class discussion

**What do you think is a secondary leading tone of V?** - It’s a vii0/V! Stretched out, we would say it is vii0 in the key of V. (Remember slashes with Roman numerals = “of.”)

**Creating a V7/V** - Once we figured out our voicing, we changed the V7/V to a vii0/V. This is possible because vii0 is just V7 without the root. - We had a lot of problems trying to figure out which tone to double in vii0/V. There’s two tendency tones, and with the voicing we wrote out doubling the third results in parallel octaves. Bad all around, just don’t use these…use seventh chords instead

**Using a secondary leading-tone seventh chord** - You can use vii07 to tonicize major or minor chords, but vii%7 works *only* with major chords. If you try and tonicize a minor chord with vii%7, things will get really screwed up because of where all the voices want to resolve - When trying to correctly resolve a vii07/V, it might be easier to think of the regular vii07 solfege: ti re fa le. This will help you resolve the tendency tones correctly into the next chord. Remember: all you’re doing is thinking of vii07 in the key of V.

# Class discussion

**Circle-of-fifths triadic progression: I - vi - ii - V - I** - Static movement in the melody is very good. It’s exactly what we want because it can make everything else a whole lot easier. Priotize static or stepwise movement in the melody whenever you can - Build from the back. Since we’re dealing with a circle-of-fifths progression, we know exactly how tendency tones are going to resolve and we can reverse-engineer the inner voices after we’ve written our melody

**Adding the seventh: I - vi7 - ii - V7 - I** - Used the same boring melody as before (C C D D C) because we have to K.I.S.S. - Really the best way to do these is to write your melody from the front and fill in the inner voices from the back - *Frustrated leading tone*: can ONLY be used in the inner voices. This happens when the leading tone resolves down by third to the fifth of the next chord instead of going upward to the root. Ex: in C, in our V the B in the tenor can go down to G on the next chord (I) if we really, really want to have a fifth in there

**Short chord progressions, #2: I - IV - V - vi** - Soprano line: C C B C. There were a bunch of other options proposed that were at the same level of simplicity (focus on smooth voice leading), but they all caused errors - DOUBLE! THAT! THIRD! for a deceptive cadence. vi is a functional substitute for I because of its position in a deceptive cadence. In this instance it functions as the tonic instead of its usual “pre-predominant.” We double the third because it’s do/the tonic - Any time you use smooth contrary motion you’ll avoid the majority of movement errors

* “Circle of fifths progression” = literal circle of fifths bass movement. This is our vi - ii - V - I. When we move I - IV - V - (etc…) this is stepwise progression, so we can bend our tendency tone rules a little. Otherwise, our normal rules will create more problems.
  + Think about functional substitutes, too! IV is just a ii7 without the root. vii0 is just a V7 without a root. vi stands in for I in deceptive cadences. In the progression we did in class, temporarily changing IV to ii7 helped make clear why the A in our IV did not have to resolve how thirds usually do, since A is the fifth in ii7 and should follow the same voice leading rules
* vi6 is a NO. The do in the bass makes it sounds like this chord was supposed to be I instead, which is the opposite of what you want to do with a deceptive cadence

**Overall conclusions** - Frustrated leading tone is a get out of jail free card in the inner voices ONLY - You can double the third for the vi in a deceptive cadence

**Additional tips** - Check the outer voices for errors before filling in the inner voices. If you catch errors early, you save yourself time

# Further reading

## From *Open Music Theory*

### Harmonic syntax

*Harmonic syntax* concerns the norms or principles according to which harmonies (chords) are placed into meaningful successions. These norms include progressions that are more or less common than others. Those norms generate expectations for listeners familiar with the style: if **IV–V** is more common than **IV–VI**, the appearance of a **IV** chord generates an expectation that the next chord is more likely to be **V** than it is to be **VI**.

In Western classical music, harmonies generally group into three *harmonic functions* — tonic (T), pre-dominant (P), and dominant (D) — and these functions group together chords that progress to and from other chords in similar ways. For example, since **II** and **IV** are both pre-dominant chords, they will participate in many of the same kinds of chord progressions, and at times can be substituted for each other with only a minimal change to the musical effect.

On a local level (chord-to-chord progressions), we can summarize the tendencies of these functions with the cycle **T–P–D–T**. That is, harmonies tend to progress through a cyclical progression of those three functions:

**T → P → D → T →** and so on . . .

That does not rule out T progressing to D, D progressing to P, etc. But it does mean that those progressions tend to be less common, at least in classical music.

Higher-level musical structures also impact the norms according to which these harmonic functions progress. For now, we will consider one higher-level structure that influences chord-progression tendencies — the phrase — and we will limit our study to isolated, complete, self-sufficient phrases. This is an idealized, oversimplified setting — like strict voice-leading — that is useful for learning the basics. Some such phrases even exist in real music! But most of the time there are a number of competing factors that influence the chord-progression strategies employed by a composer at any given moment. However, the idealized phrase is a helpful starting point. Future study will explore how classical composers employ harmonic progressions in larger musical works that combine multiple phrases (which are not self-sufficient) into larger themes and movements.

### The idealized phrase

The *idealized phrase* (also called the *phrase model*) is a single musical phrase that progresses through an entire cycle of harmonic functions, beginning and ending on tonic. (Strict voice-leading exercises are such phrases.) These phrases begin with a point of stability (tonic), move away from that stable point, and then eventually lead to a point of high tension and resolution (an *authentic cadence*). This pattern of stability–instability–stability, or rest–motion–rest, with a single goal at the end, should be familiar both from species counterpoint and from strict keyboard-style voice-leading. (This pattern also governs large-scale formal structures in classical music.)

The simplest phrase that exhibits this complete harmonic cycle is a tonic-dominant-tonic progression: **I–V–I.** This phrase begins and ends with the most stable harmony (**I**), and includes an *authentic cadence* (**V–I**). The **V** is the high point of instability, containing the tendency tone (*ti*) that most strongly points to the final point of arrival (*do*, or tonic).

This harmonic cycle can be expanded by inserting a pre-dominant chord, a destabilized tonic chord, or both, as in the following examples:

**I IV V I**  
**I II V I**  
**I VI V I**  
**I VI II V I**

In *functional bass* terms, any harmonic progression that follows the pattern

**T1 → (P\_) → D5 → T1**

can serve as the basis for a complete idealized phrase. (Harmonies in parentheses are optional.)

Phrases are seldom 3–5 chords long, however, and a harmonic function can be expressed by more than a single chord. Thus we can understand the harmonic functions not simply as chords, but as *zones* of varying length in a phrase, which can be created by a number of chords or short chord progressions. More generally, then, our idealized musical phrase contains a single progression of functional zones **T → (P) → D → T**, begins with **T1**, and ends with an authentic cadence (**D5–T1**), as seen in the example below.

### Triggering and prolonging harmonic functions in an idealized phrase

To establish, or trigger, a harmonic functional zone, composers tend to use *a fixed scale degree in the bass*. In other words, tonic tends to be triggered by **T1** (always **I**), pre-dominant by **S2** or **S4** (including a variety of **II** and **IV** chords, in in root position or inversions, with and without sevenths), and dominant by **D5** (**V**, with or without a seventh, or a [*compound cadence*](cadenceTypes)). These four categories of chords — **T1**, **P2**, **P4**, and **D5** — are called *functional chords* (because they trigger the function) or *cadential chords* (because they can participate in a cadence).

Other chords are often called *contrapuntal chords* or *embellishing chords*, and are typically used to *prolong* a function throughout the zone.

Functional prolongations are shown in a harmonic analysis by writing/typing T, P, or D underneath the individual chord labels (Roman numerals or functional bass) and extending a line from the beginning of the functional zone to the end.

The following excerpt is from Mozart’s Piano Sonata in A Major, K. 331, I., mm. 1–4, with a harmonic reduction and analysis provided below the original score. Such an analysis is called an *interpreted* harmonic analysis, because the harmonies are interpreted according to the way they behave in the phrase, rather than merely labeled. In this phrase, note the following:

* The tonic zone is triggered by a root-position tonic triad (**I** or **T1**).
* Contrapuntal dominant chords (**D7** — first-inversion dominant chords) create a passing bass motion between the opening **I** chord, the **vi** in m. 3, and the return of **I** in m. 4.
* The [cadential progression](harmonicAnalysis) begins in m. 4 with the move from **I** to ii6 (**S4**) and then to the cadential six-four and dominant triad (**D5**). Note that the entirety of the cadential progression in m. 4 is made up of *cadential chords* — chords with fixed scale degrees in the bass.
* In contrast, the entire tonic-prolongation zone is made up of *contrapuntal chords* — variable scale degrees in the bass — with the exception of the **I** chord that triggered the tonic function.
* The **vi** chord is a root-position chord, but still an embellishing chord, while the ii6 is an inverted chord, but still a functional/cadential chord. The difference is not the inversion, but the scale degree of the bass.

Not all classical phrases as neatly fit the general trends outlined in this resource. As discussed in [Style and tendency](tendency), the principles of harmonic syntax are both reliable and bendable/breakable, and it is often the music that bends/breaks the “rules” in interesting ways that we care about the most. So in your own analyses, keep these principles in mind as *general* principles, and simultaneously look for where composers meet these expectations as well as where they break them.

## Prolonging harmonic functions

The following are the primary techniques used to prolong functional zones in an idealized classical phrase. Examples of specific progressions and notational conventions are provided.

### Change-of-figure prolongation

A *change-of-figure prolongation* occurs when the bass repeats (or is sustained, or drops an octave) while one or more of the upper voices change. The function remains the same (T/P/D), but the Roman numeral may change.

Examples include progressions like **V–V7** (both **D5**) or **IV–II6** (both **P4**).

### Change-of-bass prolongation

A *change-of-bass prolongation* occurs when two chords of the same function appear back-to-back, but with different bass pitch classes. In some cases, these are changes of inversion: **I–I6**, for example. In other cases, the root changes: **I–III** or **IV–II**, for example. What makes these progressions prolongations is that the function remains the same. **I–I6** prolongs tonic function (**T1–T3**), and **IV–II** prolongs pre-dominant function (**P4–P2**).

### Contrapuntal prolongation – passing chord

Many change-of-bass prolongations involve a skip of a third in the bass, such as **I–I6** (**T1–T3**). Just as in second-species counterpoint a melodic third from downbeat to downbeat invites the use of a weak-beat passing tone, a melodic third in the bass between these two chords invites the use of a *passing chord*.

The bass note of a passing chord will fill in the third with stepwise motion. The melody will also often contain passing motion.

A function is typically prolonged by contrapuntal chords belonging to the function that precedes it in the standard cycle. T is prolonged by D, D by P, and P by T.

A passing chord that prolongs the above **T1–T3** progression would then be a dominant chord (D precedes T) with scale-degree 2 in the bass (the passing tone between scale degrees 1 and 3): **D2**.

Common **D2** chords are **V6/4**, **V4/3**, and **VII6**. Thus, a **I–I6** prolongation can involve those as passing chords. The following **T1 D2 T3** progression uses a **viiº6** to prolong tonic. Listen to this example, and then try to change the progression to a properly voiced **I V6/4 I6** progression.

Note that while scale-degree 2 in the bass can support a **II** chord, **II** is pre-dominant, and so it is *not* used as a passing chord to prolong tonic.

### Contrapuntal prolongation – incomplete neighbor chord

In [second-species counterpoint](secondSpecies.html), variety could come by using a *substitution* in place of a passing tone. This leap of a fourth followed by step in the opposite direction still outlines a third from downbeat to downbeat, but offers a break from too much stepwise motion in the counterpoint.

In harmonic writing, the same effect is obtained by an *incomplete neighbor chord*. The bass follows the same incomplete-neighbor pattern as the second-species counterpoint, and the function of the contrapuntal chord is the same as its passing-chord counterpart. Thus instead of a passing motion of **T1 D2 T3**, a substitution pattern in the bass would produce **T1 D4 T3**. (In Roman numerals, that progression would almost invariably be **I V4/2 I6**, as it is in the following example.)

### Contrapuntal prolongation – complete neighbor chord

Just as a *neighbor tone* in second- or third-species counterpoint could be used to ornament a single tone and return to it, a *neighbor chord* uses a neighbor-tone motion in the bass to prolong a function and return to the original bass pitch. The function of a neighbor chord follows the same principle as the passing or incomplete neighbor chord. Following are some examples of neighbor-chord prolongations:

* **T1 D7 T1**
* **T3 D4 T3**
* **P4 T3 P4**
* **D7 P6 D7**

Here is a **T1 D7 T1** neighbor prolongation in strict keyboard style. What is the Roman numeral and figured bass for the **D7** chord? What is the least number of changes you can make to it in order to transform it into **T3 D4 T3**?

Just as third-species counterpoint has a *double neighbor* figure, harmonies can be prolonged by two chords using a double-neighbor figure in the bass. The most common double-neighbor prolongation is **T1 D2 D7 T1** (commonly **I V4/3 V6/5 I**).

### Contrapuntal prolongation - divider and embellishing chords

In second-species counterpoint, an *interval subdivision* divided a large leap between downbeats into two smaller leaps. Likewise, a *divider chord* takes a large leap between bass notes in a change-of-bass prolongation (or a simple octave leap in the bass) and divides it into two smaller leaps.

Divider chords almost always prolong tonic function, and can do so using either pre-dominant or dominant dividers. The most common divider-chord prolongations are:

* **T1 D5 T1** (**I V(7) I**), where the bass ascends or descends an octave between **T1** chords.
* **T1 P4 T1** (**I IV I**), where the bass ascends or descends an octave between **T1** chords.
* **T1 P6 T3** (**I IV6 I6** or **I IV6 III**), dubbed the *champagne progression* by theorist Gene Biringer, because it is “the progression you pull out when you want to impress a date.”

Following is a champagne progression. Which version is it (**I6** or **III**)? What one thing must change in order to form the other version? What default voice-leading rule is “broken” in this progression? (Note, because of rule conflicts, this progression will always break that rule, and it will always have these scale degrees in the melody.)

In the case of **T1 D5 T1** and **T1 P4 T1**, the same harmonic progression can occur without the bass changing register. In other words, the bass leaps from *do* to *sol* or *fa*, but returns to the original bass note. Instead of dividing a large leap, the bass note of the intervening chord looks like an *embellishing tone* from third species. (In third-species counterpoint, an *embellishing tone* ornaments another tone by leaping to another consonance — usually a third or fourth away — and returning to the original tone.) Thus, what would otherwise be a *divider chord* is instead an *embellishing chord*.

Following is a **T1 D5 T1** *divider* prolongation. What single change can make it an *embellishing chord* prolongation?

### Subsidiary harmonic progressions

The last type of prolongation is not contrapuntal, but instead involves weak versions of the typical **T–(P)–D–T** progression. When such a progression fails to produce a proper cadence — that is, it ends with contrapuntal chords such as **D7–T1** or **D4–T3**, or uses a “deceptive resolution” **D5–T6** (**V–VI**) in place of the cadential **D5–T1** — the progression is called a *subsidiary harmonic progression* (this term comes from Edward Aldwell & Carl Schachter; Steven Laitz calls the same progression an *embedded phrase model*). It is “subsidiary” (or “embedded”) because instead of occupying the whole phrase, it is subsidiary to (or embedded in) a larger progression.

These subsidiary progressions *always prolong tonic*. They are labeled in an analysis by following the initial T with a line:

**T—————**

For instance, consider the following possible harmonic progression for a phrase:

The first progression through the **T–S–D–T** cycle does not produce a cadence when it returns to T. However, it cannot be said to be a contrapuntal prolongation because it follows the normal functional cycle perfectly. Thus, it is a subsidiary progression.

### Plagal progressions

As a rule, **T** is used for contrapuntal prolongation of **P**, **P** prolongs **D**, and **D** prolongs **T**. However, there are some common patterns in which **P** is used to prolong **T**.

The *champagne progression* (**I–IV6–I6** or **I–IV6–III**) is one. Another is the **P4** divider, as well as the related **P4** embellishing chord. All are described above.

One other common pattern is to use **IV** (**P**) as a complete or incomplete neighbor to **I6** (**T**). Common progressions include **I IV I6** and **I6 IV I6**.

Also common is a *change-of-figure* prolongation of **T1**: I–IV6/4–I. The IV6/4 can be considered an **P** chord, but it is often more appropriate simply to consider the sixth and fourth above the bass in that chord to be neighbor tones to the fifth and third. Simply label such a progression **T———** underneath the Roman numerals.

### Prolonging a progression

Occasionally, a contrapuntal chord is used not to prolong a single function, but to connect chords of different functions — in other words, to prolong a progression.

The most common occurrence is when a bass line moves down by step from *do* to *sol*, which is especially common in minor. The bass line *do*–*te*–*le*–*sol* is harmonized by **T1 D7 P6 D5** (usually **i v6 iv6 V** — the chord qualities are important in this progression, called the “lament”). In this progression, the **P6** is a functional pre-dominant leading to the cadential **D5**. The **D7** chord, then, is simply a passing chord that connects **T1** with **P6**. To notate this, draw and arrow between **T** and **P** underneath the Roman numeral analysis.

In second-species counterpoint, the counterpoint line moves in half notes against a cantus firmus in whole notes. This 2:1 rhythmic ratio leads to two new “fundamental musical problems” – one metric and one harmonic: - the differentiation between *strong beats* and *weak beats* - the introduction of the *passing tone* dissonance.

The introduction of harmonic dissonance into second species adds to the variety of the musical texture. However, it brings a tension that must be balanced with consonance to promote a cohesive tonal progression, and it requires careful attention in order to maintain smoothness in and out of the dissonance.

If we consider first-species counterpart the most “basic” interaction between two melodies, adding this second note against a harmony also provides an opportunity to begin discussing the shapes and patterns that composers use to embellish a simple melody.

## Goals for this topic

Use the following examples of second-species (2:1) counterpoint to develop guidelines for writing in this style. Each of the following examples is in the major mode and has the counterpoint above the cantus firmus, but again, be aware that these two characteristics are not indicative of all counterpoint; we are using a simplified structure as our introduction.

**As you develop your rules for second-species counterpoint, look only at the *counterpoint (CP)* line; the *cantus firmus (CF)* was provided, so the counterpoint line was written by following the stylistic rules.**

Generally, your rules should be divided into three categories: - Acceptable *harmonic intervals (intervals between lines)* - Strong beats versus weak beats - Are dissonances viable? If so, when? - Starting and ending intervals - Approaching the final pitch - Approaching and leaving perfect intervals - Number of times that an interval size can be used consecutively - Differentiate between perfect and imperfect consonances - Constructing a *melodic line* - Length - Starting and ending pitches - Approaching the final note - Repeated pitches - Melodic intervals - Leaps - Resolutions following leaps - How would you describe the motion surrounding any dissonant intervals? - Range - Climax (position in melody and frequency) - Acceptable *motion between lines* - Acceptable types of motion

{% capture ex1 %}X:1 T:Second species (2:1) examples T:Each system is a new example. M:4/4 L:1/2 K:C V:1 name=CP1 z G| F G| A B| c e| d c|B d| c f| e f| g G| A B| c2|] w:P5 m3 P4 M3 A4 m6 P8 M6 P5 M3 P5 m3 m6 M6 m7 m3 m3 P5 M6 P8 z c| B c| d f| g c| d f| e d| c F| E F| G A| B2| c2|] w:P8 M6 m7 M6 P8 m3 m6 M6 P8 M6 P5 m3 m6 M6 m7 m3 P4 M6 P8 V:2 clef=bass name=CF C,2| D,2| F,2| E,2| F,2| G,2| A,2| G,2| E,2| D,2| C,2|] C,2| D,2| F,2| E,2| F,2| G,2| A,2| G,2| E,2| D,2| C,2|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Conclusions

### Second Species Counterpoint

Instead of the 1:1 ratio in first species between pitches of the cantus firmus and counterpoint, second species has a 2:1 ratio–most often notated as two half notes for every one whole note. This creates a pattern of strong and weak beats and consequently a series of rules that are defined by the contrapuntal place in the measure.

* Strong beats occur “on the beat,” meaning that they align with every change of pitch in the cantus firmus.
* Weak beats are “off the beat” meaning that they occur in the middle of each pitch in the cantus firmus.

### Harmonic Intervals:

Second species counterpoint also allows for a key element that is not an option in first species: dissonance. Strong beats must still only use consonances. Weak beats may use dissonance, although there are many restrictions.

For our studies, we will start the counterpoint with a rest on the strong beat followed by a perfect interval on the weak beat. From that point forward, you will follow these harmonic rules:

Consonances: - may occur at any point - strong beats will always be consonant - imperfect consonances are generally preferred because they do not cause issues when used in parallel motion

Dissonances: - only on weak beats - approached by step

Starting and Ending Intervals: - starts on P5, P8, or unison - ends on P5 or P8

Perfect Intervals - approached by parallel motion - same perfect interval (e.g. P5 to P5) can never occur consecutively, nor can they occur on consecutive strong beats

### Motion Between Lines

In discussing counterpoint, you may have noticed that the restricted melodic options create a variety of “standard” melodic shapes. We can describe a few of these here, and this will be explored fully when we begin studying non-chord tones in diatonic harmony in Unit 9.

**passing motion** (P): motion approached by step and left by step in the same direction

**neighboring motion** (N): motion approached by step and left by step in the opposite direction

* Note that these neighboring and passing motion are the only types of motion that allow you to use dissonant intervals in second species counterpoint.
  + Dissonance using neighboring motion is only allowed using a lower neighbor, never an upper neighbor.

**appoggiatura** (APP): motion approached by leap and left by step in the opposite direction

Now that we have the tools to understand and classify harmonies, we can analyze almost any piece of music written using the diatonic system. Of course, analysis implies a deeper understanding than simply labeling chords, but to begin this process, we must start with that basic idea.

When looking at a piece of music, the first step to labeling chords must be to sort which tones are functional and which are embellishments. The non-chord tones described in the previous topic can be combined with our rudimentary knowledge of common chord progressions in order to help in this differentiation. As always, chorales are the easiest place to begin understanding these patterns, but these principles can be applied to any piece of diatonic music because these non-chord tones reflect the patterns necessary to navigate tertiary harmony.

In short, creating harmony from stacked thirds produces a limited number of functional melodic patterns. Non-chord tones help us identify these.

## Examples

TBD

We have now studied the full array of part-writing errors for four-part chorale style compositions. Because there are so many possible errors, it can feel overwhelming to begin looking for errors, and it is easy to miss errors in long examples. I have developed a method for systematically identifying part-writing errors, and it not only helps to limit errors, it also helps students to understand the vertical and horizontal interactions that create part-writing errors.

Follow the steps from the list below when searching for errors. The next page gives specific examples of how to use this methodology for numbers 5 through 8.

1. *Voice-crossing*
   * Exception: alto and tenor may cross briefly if musically necessary
2. *Spacing*: In a four-part texture, are the top three voices within an octave of the adjacent voices?
3. *Range*
4. *Doubling*
5. *Similar 5ths and 8ves*
   * Follow the soprano line looking for leaps
   * When a leap is found, look to see if there is similar motion in the bass (not parallel)
   * Determine the interval between the outer voices of the second chord. - If this interval is either a P5 or P8, there is a similar 5th or 8ve.
6. *Parallel Perfect 5ths and 8ves*
   * Determine the interval between each pitch horizontally (melodically – NOT within each chord (vertically)
   * If one of the new vertical stacks of four intervals (numbers only) contains two matching numbers, check to see if the intervals within each chord (vertically) are P5s or P8s.
     + With triads, P5s must always have the root of the chord on the bottom of a major or minor chord. No other combination or chord can produce a P5.
     + P8s must come from doubled voices moving to doubled voices
   * If there are two consecutive P5s or P8s, those are parallel 5ths or 8ves.
7. *Unacceptable Unequal 5ths*
   * Should be found while looking for parallel 5ths using same method as above.
   * When completing step 2, if a d5 moves to a P5 and it involves the bass line, this is unacceptable unequal 5ths
8. *Contrary Perfect 5th and 8ves*
   * After the first part of the parallel perfect 5ths/8ves instructions, look for inverted pairs of numbers (e.g. 2 and 7, 3 and 6, 4 and 5) within each number stack
   * If one of the new vertical stacks contains one of these inversion pairs, check to see if the intervals within each chord (vertically) are P5s or P8s.
   * With triads, P5s must always have the root of the chord on the bottom of a major or minor chord. No other combination or chord can produce a P5.
   * P8s must come from doubled voices moving to doubled voices
   * If there are two consecutive P5s or P8s, those are contrary 5ths or 8ves.

We have already practiced finding errors in voicing: 1. *Voice-crossing* - Exception: alto and tenor may cross briefly if musically necessary 2. *Spacing*: In a four-part texture, are the top three voices within an octave of the adjacent voices? 3. *Range* 4. *Doubling*

Finding part-writing errors is considerably more time-consuming, and it can be easy to miss errors if you do not approach it systematically. I have created a system that uses horizontal intervals to make it simpler and more consistent to find the four major part-writing errors. Use the examples below to explore the concepts, and then apply these on your homework.

## Finding similar fifths and octaves

As mentioned in the previous topic, the restrictive rules of *similar fifths and octaves* make these the simplest of the part-writing errors to find.

* *Similar 5ths and 8ves*
  + Follow the soprano line looking for skip of a 3rd or more
  + When a skip is found, look to see if there is similar motion in the bass (not parallel)
  + Determine the interval between the outer voices of the second chord. - If this interval is either a P5 or P8, there is a similar 5th or 8ve.

**Practice on this example.**

{% capture ex1 %}X:1 T:Similar octaves (S8) M:4/4 L:1/2 K:C V:1 [Ge] [AA]| [FA] [FB]| [c2E2]|] V:2 clef=bass [C,C] [CA,,]| [F,,C] [DG,,]| [C2C,2]|] w:C:I vi IV V7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Finding unacceptable parallels

* *Parallel Perfect 5ths and 8ves*
  + Determine the interval between each pitch horizontally (melodically – NOT within each chord (vertically)
  + If one of the new vertical stacks of four intervals (numbers only) contains two matching numbers, check to see if the intervals within each chord (vertically) are P5s or P8s.
    - With triads, P5s must always have the root of the chord on the bottom of a major or minor chord. No other combination or chord can produce a P5.
    - P8s must come from doubled voices moving to doubled voices
  + If there are two consecutive P5s or P8s, those are parallel 5ths or 8ves.

**Practice these steps on the following two examples, even though it is fairly easy to find the parallel motion in these two examples visually.**

{% capture ex2 %}X:2 T:Parallel perfect octaves (PP8) M:4/4 L:1/2 K:C V:1 [cE] [AD]| [BF] [cE]|] V:2 clef=bass [C,G,] [F,A,] | [B,G,] [C,C]|] w:C:I ii6 V7 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X:3 T:Parallel perfect fifths (PP5) M:4/4 L:1/2 K:C V:1 [cE] [AF]| [BF] [cE]|] V:2 clef=bass [C,G,] [D,A,] | [DG,] [C,C]|] w:C:I ii V7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

## Finding unacceptable unequal fifths

Unacceptable unequal fifths will be found inadvertently while looking for parallel fifths and octaves using the steps outline above. Specifcally:

* *Unacceptable Unequal 5ths*
  + Should be found while looking for parallel 5ths using same method as above. Unequal fifths have parallel motion in that it is a fifth moving to a fifth; the only difference is the quality of the two intervals change.
  + When completing step 2, if a d5 moves to a P5 and it involves the bass line, this is unacceptable unequal 5ths

**Practice on the next example.**

{% capture ex4 %}X:4 T:Unacceptable unequal fifths (UU5) M:4/4 L:1/2 K:C V:1 [cE] [Fd]| [dF] [cG]|] V:2 clef=bass [C,C] [D,A,] | [B,,G,] [E,C,]|] w:C:I ii V6/5 I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Finding unacceptable contrary motion

{% capture ex5 %}X:5 T:Contrary perfect octaves (CP8) M:4/4 L:1/2 K:C V:1 [cE] [AD]| [BF] [cE]|] V:2 clef=bass [C,G,] [F,A,] | [B,G,] [C,C,]|] w:C:I ii6 V7 I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

{% capture ex6 %}X:6 T:Contrary perfect fifths (CP5) M:4/4 L:1/2 K:C V:1 [cE] [AF]| [BF] [cE]|] V:2 clef=bass [C,G,] [D,,A,] | [D,G,,] [C,C]|] w:C:I ii V7 I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

* *Contrary Perfect 5th and 8ves*
  + After the first part of the parallel perfect 5ths/8ves instructions, look for inverted pairs of numbers (e.g. 2 and 7, 3 and 6, 4 and 5) within each number stack
  + If one of the new vertical stacks contains one of these inversion pairs, check to see if the intervals within each chord (vertically) are P5s or P8s.
  + With triads, P5s must always have the root of the chord on the bottom of a major or minor chord. No other combination or chord can produce a P5.
  + P8s must come from doubled voices moving to doubled voices
  + If there are two consecutive P5s or P8s, those are contrary 5ths or 8ves.

## Needles in a haystack

The following excerpt from Bach’s Chorale no. 4 (“Es ist das Heil uns Kommen her,” mm. 9-10) has only one example of a part-writing error discussed above. Given his ability, it is safe to assume that he did this intentionally, so our goal is not to judge whether his part-writing was correct, only to see if you can use the methods above to find the error. He also chose to cross voices for a moment, but this is intentional and hidden in the inner voices.

NOTE: When one voice moves more quickly than the others, you must compare the intervals created on *both* sides to the vertical stacks of the other three voices.

{% capture ex7 %}X:7 T:Find the error M:4/4 L:1/4 Q:1/4=60 K:E V:1 [EG]| [DF] [CA] [B,G] [B,F]| [CC] [B,D] H[B,E]|] V:2 clef=bass [E,B,]| [B,B,,] [E/2C,/2]-[E/2D,/2] [EE,] [B,,/2D/2]-[B,,/2B,/2]| [F,A,,] [F,B,,] H[G,E,,]|] w:E:{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

## Conclusions

[Part-Writing Error Checklist and Guide](https://docs.google.com/document/d/1s9Xd3LPqoaEevshTopxHzLX9jCzxVCZocOBLD_dceMU/edit?usp=sharing)

When we practice voice-leading, we are really studying melodic intervals, the horizontal aspect of music. And because all part-writing errors are symptoms of poor voice-leading, this method finds part-writing errors by systematically comparing at the melodic intervals within each voice. It can be difficult at first to understand the method when only reading about it, but if you take the time to walk through each step above, you should be able to understand the process. It should not only teach you to identify the motion and tendencies behind the errors, but it also ensures that you will have a way to consistently double-check your work.

## Extending mode mixture

Please watch this wonderfully-made video on modal interchange – another name for mode mixture – created by Myles Yang for his Native Construct YouTube channel. In it, he demonstrates possible mode mixture beyond parallel major and minor modes. If you are not familiar with modes beyond major and minor (Ionian and Aeolian), please review Unit 2. You can also quiz yourself on modes at [musictheoryfundamentals.com](http://musictheoryfundamentals.com/MusicTheory/modes.php).

This video does a great job of explaining the concept of mode mixture, but as he mentioned near the end of the video, he is only “scratching the surface.” Having watched the video, you probably feel that you understand the extended *concept* of mode mixture, but if you were asked to compose a progression and melody the incorporated mode mixture, do you feel that you would be able to implement it? Where would you start? In short, this video explains the “what is it?” but it does not begin to approach the “why it works?” or “how it works?”

To begin exploring this, use the score below to try voicing one of the progressions taken from the video. Take risks, and break the “rules” as you try this. You must use the chord progression below, but you may alter the bass and soprano lines if you would like. You may also add as many or as few of the pitches as you need. Are you able to make this progression sound as pleasing as it does in the video? If not, what are the factors making this difficult? From a technical viewpoint, is it lack of knowledge or is it the medium (MIDI keyboard)? From a musical viewpoint, what aspects make the biggest improvement when you alter them?

{% capture ex1 %}X:1 T:Sample mode mixture M:4/4 L:1/2 Q:1/4=90 K:C V:1 [e] [f]| [f] [f]| [e2]|] V:2 clef=bass [C,] [\_B,,]| [F,,] [D,]| [C,2]|] w:C:I bVII IVM7(#11) ii%7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

Even though this is an entirely new style of progression, you can focus on the fundamentals of voice-leading to guide you. For example: - Resolve tendency tones correctly - Write smooth individual voices - Allow more spacing in your voices when writing in the lowest range - Avoid objectional parallels when possible - Don’t double tendency tones

If you do these things, it is fairly easy to write a smooth soprano line and then work your way backward through the progression to create something such as this:

{% capture ex4 %}X:4 T:Voiced sample mode mixture M:4/4 L:1/2 Q:1/4=90 K:C V:1 [EG] [F\_B]| [EA] [F\_A]| [E2G]|] V:2 clef=bass [C,C] [\_B,,D]| [F,B,] [D,C]| [C,2C]|] w:C:I bVII IVM7(#11) ii%7 I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Functional mode mixture

As you have hopefully come to realize, all tonal harmony – even the chromatic alterations – rely on voice-leading to create a sense of natural progression, and each harmony can be viewed through the lens of how it functions. From this, we derive primary harmonic functions such as tonic, dominant, and pre-dominant as well as embellishing functions such as passing, pedal, and cadential. Even the exceptions to these can be viewed as functional substitutions (e.g. deceptive progressions).

At its core, mode mixture borrows altered tones from parallel modes – thus altering chord *qualities* – but retains standard chord function. If a diatonic chord would have a pre-dominant function, altering an individual tone by a half-step will not alter the function. It creates color and often *strengthens* the voice-leading by changing whole-step resolutions into half-step resolutions. Moreover, if a chord functions as an embellishing chord such as a passing or pedal chord, then it will retain that function even if one or two pitches are borrowed from a parallel mode.

Even seemingly inexplicable choices can be explained – such as the iiø7 from the chord progression above – if you look at the voice-leading and compare it to standard diatonic function. 1. The iiø7 is inserted into the position where we would normally expect a dominant function. 2. If you compare the pitches within iiø7 to the pitches of viio7, you will realize that three of the pitches are the same (D, F, and A-flat) and the remaining pitch only changes by a half-step (B to C). In this progression, the C works best when it acts as an anticipation of the tonic chord, and this strengthens the voice-leading resolutions of iiø7. Therefore, the iiø7 can be viewed as an altered dominant function chord.

With this in mind, look at the following reduction of an excerpt from Mahler’s Symphony No. 2. How would you explain each of these borrowed chords? How do they function? Is this similar to the progression from above?

{% capture ex2 %}X:2 T:Mahler Symphony No. 2, Mvt. I T:Simplified reduction M:4/4 L:1/4 Q:1/4=60 K:C V:1 [G3EC] \_B/2>\_A/2| [G3EC] \_G/2>F/2| [G3EC] \_E/2>\_D/2| [G3EC] \_B,/2>\_A,/2| [G2EC] z2| [G2EC] z2| [Eceg] [\_E3c\_eg]|] V:2 clef=bass (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [B,DF]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [\_A,\_D]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [\_A,F,]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 C,/2z/2 [B,,D,F,]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 [C,2E,G,]| (3C,/2G,,/2C,/2 (3C,/2G,,/2C,/2 [C,2E,G,]| [C,,4C,]|]{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

Each Beat 4 of the first four measures of this passage has a colorful chord that contrasts the stateliness of the C major triad of the first three beats. In measure 1, the B-natural against the B-flat is not a typo; this dissonance is intentional. If you listen to the right-hand of this reduction alone, you will hear a clear descending melody in which the borrowed B-flat begins the te - le - sol melodic tendency that we associate with melodic minor.

{% capture ex5 %}X:5 T:Mahler Symphony No. 2, Mvt. I T:Simplified reduction - right hand only M:4/4 L:1/4 Q:1/4=60 K:C V:1 [G3EC] \_B/2>\_A/2| [G3EC] \_G/2>F/2| [G3EC] \_E/2>\_D/2| [G3EC] \_B,/2>\_A,/2| [G2EC] z2| [G2EC] z2| [Eceg] [\_E3c\_eg]|]{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

Underneath that B-flat, however, is B diminished triad, and when the B-flat moves downward to the A-flat, we hear a a clear borrowed viio7, which makes the B-flat an appogiatura. This figure is repeated down an octave in measure 4.

Measures 2 and 3 follow the same pattern of placing a non-chord tone on beat 4, followed by descending stepwise motion into a chord tone. In this case though, the resulting chord is a D-flat major triad. While we could consider this further mode mixture as a borrowed II chord from the Phrygian mode, it will be easier to wait until the next Unit to discuss Neapolitan chords.

## Chromatic non-chord tones versus mode mixture

Analyze the following two chord progressions. What factors help you decide how to label each chord? Which tones are chromatic passing tones, and which create new harmonies?

{% capture ex3 %}X:3 T:Mode mixture or non-chord tones? M:4/4 L:1/4 Q:1/4=60 K:C V:1 [cE] [cF](cantusFirmus.html) [cF](cantusFirmus.html) [cE]|| GA A/2\_A/2G|] V:2 clef=bass [C,G,] [C,A,] [C,\_A,] [G,C,2]|| [C,E] [C,F] [C,F] [C,E]|] w:C:{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

Chromatic passing tones often create harmonies that could be considered borrowed chords, but the determining factor should always be its function. If the resulting borrowed chord does not sound as a defined function (e.g. tonic, dominant, pedal, etc.), then the pitch should be classified as a passing tone. If the chord operates as a functional substitution (tonic, dominant, pre-dominant), then it is better to label it as a borrowed chord. If each member of the chord functions solely for smooth voice-leading purposes, then it should be labeled as a borrowed chord with an alternate function such as a passing or pedal chord.

In the example above, most will hear the first iteration as a I-IV-iv-I progression. The chromatic tone of the iv chord on beat 3 is present for the entirety of the beat and fits the harmonic rhythm of one chord per quarter note. Considering beats 2 and 3 as one chord would allow you to label the A-flat as a chromatic passing tone, but the A-flat is present long enough to make this difficult to hear as such. Conversely, the A-flat in the second measure is only present for an eighth note and occurs in a weak position. In this case, the A-flat is a clear chromatic passing tone and would not be labeled as a borrowed iv chord.

## Voice-leading exceptions for secondary dominants

In Unit 17, we will discuss how repeated patterns and sequences in voice-leading can override standard voice-leading practices. We can preview one such example by looking at seventh chords that require “incorrectly” resolved chordal thirds and sevenths. To demonstrate this, harmonize the excerpt below paying attention to the chordal resolutions between the ii7 and V4/3 chords. Which voices must use non-standard resolutions to accommodate the progression?

{% capture ex1 %}X:1 T:Harmonizing consecutive seventh chords M:4/4 L:1/2 K:C V:1 [c] [B]| [c2]|] V:2 clef=bass [D,] [D,]| [C,2]|] w:C:ii7 V4/3 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusion

In order to use complete chords, the chordal third of the ii7 chord must remain static to become the chordal seventh of the V7 like so:

{% capture ex5 %}X:5 T:Harmonizing consecutive seventh chords M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cF](cantusFirmus.html) [BF]| [c2E]|] V:2 clef=bass [D,A,] [D,G,]| [C,2G,]|] w:C:ii7 V4/3 I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

## Secondary dominant chord cycles

Because secondary dominant chords are so closely related to diatonic circle-of-fifths progressions, you may apply the same principle to repeated series of secondary dominant seventh chords. Try the same voice-leading on the following example. What changes? How does this affect accidentals within the bar.

{% capture ex2 %}X:2 T:Harmonizing consecutive seventh chords T:with a secondary dominant chord M:4/4 L:1/2 K:C V:1 [c] [B]| [c2]|] V:2 clef=bass [D,] [D,]| [C,2]|] w:C:V7/V V4/3 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusion

You may keep the same resolutions that you used in the diatonic example above–the chordal third of the first chord becomes the chordal seventh of the following chord. The static motion in the alto voice is altered though, because you must resolve down by half-step now that the chordal third has been raised.

{% capture ex6 %}X:6 T:Harmonizing consecutive seventh chords T:with a secondary dominant chord M:4/4 L:1/2 Q:1/4=90 K:C V:1 [c^F] [B=F]| [c2E]|] V:2 clef=bass [D,A,] [D,G,]| [C,2G,]|] w:C:V7/V V4/3 I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

## Series of secondary dominants

Unsurprisingly, this concept can be extended to encompass the entirety of the diatonic circle-of-fifths progression. Begin by harmonizing the following standard progression.

{% capture ex3 %}X:3 T:Consecutive secondary dominant chords M:4/4 L:1/2 K:C V:1 [cE] [c]| [d] [d]| [c2]|] V:2 clef=bass [C,G,] [A,,]| [D,] [G,,]| [C,2]|] w:C:I vi7 ii7 V7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

This progression is nearly identical to the progression we used in Unit 14 to introduce secondary dominant chords by altering the ii chord. We then altered the vi chord from the same progression in Unit 15a in order to demonstrate tonicization of chords other than V. Because the voice-leading is so similar, secondary dominant functions can lead into *each other* creating series of secondary dominant chords. In the example above, alter your voicing of the ii7 chord to create a V7/V chord and alter the vi7 chord to create a V7/ii creating a progression of:

I - V7/ii - V7/V - V7 - I

### Conclusions

This progression now simply extends your seventh chord resolutions from the examples above, although the fixed soprano line forces you to use an incomplete chord on your V7/ii.

{% capture ex7 %}X:7 T:Consecutive secondary dominant chords M:4/4 L:1/2 Q:1/4=80 K:C V:1 [cE] [^cG]| [d^F] [d=F]| [c2E]|] V:2 clef=bass [C,G,] [A,,A,]| [D,C] [G,,B,]| [C,2C]|] w:C:I V7/ii V7/V V7 I{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

Therefore, secondary dominant chords can be substituted freely within a circle-of-fifths progression.

## Deceptive resolutions of secondary dominant functions

There is a less common resolution of secondary dominant chords that relies on the voice-leading from a deceptive cadence. Analyze the following example, and you will notice that at first glance, the progression does not follow our established progressions between the second and third chords. To understand this, you must think in the *tonicized* key. What key would this chromatic chord *normally* tonicize? If you were in that key, how would label the progression between these two chords? It is helpful to use leadsheet symbols here.

{% capture ex4 %}X:4 T:Deceptive resolutions of secondary dominant functions M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [BD]| [AC] [GD]| [G2C]|] V:2 clef=bass [C,G,] [E,^G,]| [F,A,] [B,F,]| [C2E,]|] w:C:I V7/vi IV V4/2 I6{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

In this progression, the E7 chord is likely to function as the dominant in the key of A major/minor. But instead of resolving to an A minor chord–the diatonic vi of the current key of C major–it resolves to an F major triad. At first this seems almost nonsensical, but if you examine the tonicization in the key of A minor, you will realize that this is a common progression in that key–a deceptive progression of V7 to VI. In labeling this in our secondary key, you do not need to label anything further, but feel free to use the abbreviation of “dec” in parentheses between the two chords if you would like to make a note of this uncommon use of secondary dominants.

In short, if you find a root-position secondary dominant chord that does not resolve to its normally tonicized chord, check to see if it instead resolves to a diatonic chord with a root that is a step (M2/m2) above the root of the secondary dominant. If so, this is a deceptive resolution in a secondary key, so you should still label the secondary dominant in the secondary key.

Remember that all deceptive progressions create difficult voice leading in four-part harmony, particularly if both chords are triads. Please refer to the voice-leading guidelines for this progression in Unit 11 if you would like to review.

## Secondary function pivot chord

In the following excerpt, try to apply the principles of a common chord pivot modulation. Is there a possible common chord? If not, is there an altered harmony that could be used to pivot? Make sure to look at the voice leading around the modulation.

{% capture ex1 %}X:1 T:Bach - Chorale no. 95 T:(simplified) M:4/4 L:1/4 K:Bb Q:1/4=70 V:1 [dF] [eG] [fB] [fB]| [eA] [dB] [cA] H[cA]| [dB] [eG] [fF] [eG]| [cG] [cF](cantusFirmus.html) H[B2F]| [cF](cantusFirmus.html) [dF] [eE] [eG]| [d\_A] [dG] H[c2E]|] V:2 clef=bass [B,B,] [G,B,] [D,B,] [G,D]| [C,E] [D,F] [F,F] H[F,F]| [B,,F] [C,C] [D,A,] [G,B,]| [E,B,] [F,A,] H[B,,2D]| w:Bb: [F,A,] [D,=B,] [C,C] [E,C]| [F,C] [G,=B,] H[C,2G,]|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

We first hear the modulation on the second beat of the fifth measure. The B diminished triad is not diatonic to the original key of B-flat major but becomes the viio chord of the new key of C minor. If you try to find a common chord pivot by looking at the chord before the modulation point (the place where you first hear the modulation), you will notice that the F major chord works in B-flat major, but not in the new key of C minor in which F minor is the diatonic iv chord.

Even though there is no common chord pivot available, this excerpt still relies on the voice-leading and a functional progression to modulate. The listener expects the F major triad (m.5, beat 1) to resolve to a B-flat triad. Instead, Bach alters one pitch from the B-flat triad turning the B-flat triad into a B diminished triad, and thereby creates a pivot on a secondary function. This is a *secondary function pivot modulation*.

We label these using the same bracket system that we use for common chord pivot modulations, but one or both of the chords will be a secondary function. In this case, the top part of the bracket will contain “viio6/ii,” and the bottom part will containing “c: viio6.”

#### Secondary function pivot modulation principles

* Functions like all pivot modulations in that it relies on a functional progression on both sides of the pivot chord.
* Unlike common chord pivot modulations, there will not be a chord that is common to both keys before the modulation point. This then necessitates pivoting on a secondary chord.
* Typically occurs mid-phrase because of its reliance on a functional progression on both sides of the pivot.

## Direct modulation (or phrase modulation)

Analyze the following chorale excerpt. While you should be able to find a common chord pivot, how strong are the progressions on either side of the pivot? What aspect of the music mitigates the strangeness of these progressions? In other words, why doesn’t this sound like a “bad” progression leading into the modulation point? (Hint: Even though our MIDI playback does not play the fermatas, you should consider that the choir would breathe after the natural resolution of that phrase. Play it on piano if you are able to simulate this.)

{% capture ex2 %}X:2 T:Bach - Chorale - Erkenne mich, mein Huter T:(simplified) M:4/4 L:1/4 K:E Q:1/4=65 V:1 [EG]| [Ec] [EB] [A/2E][A/2F] [GE]| [FE] [FD] H[GE] [Fd]| [Ee] [eG] [dG] [dF]| H[c3E]|] V:2 clef=bass [E,B,]| [A,A,] [B,G,] [C,/2C][D,/2B,] [B,E,]| [A,,C] [B,,B,] H[E,B,] [D,^B,]| [G,C,] [E,C] [G,C] [^B,G,,]| H[C,3C]|] w:E:{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

Because you first hear the modulation on beat 4 of the measure 2, it would make sense to pivot on the previous chord (the fermata), an E major triad. Pivoting on this chord would give you a modulation bracket with a “I” on top and “c#: III” on bottom. The issue is that the modulation point is a B-sharp diminished triad, which is the iio6 in the key of C-sharp minor. III-ii not a diatonically functional progression, so this is not a pivot chord modulation.

The crucial factor for this modulation is that it occurs across two phrases. The first phrase clearly ends on an IAC in E major, and the following chord immediately begins the new key. A modulation that relies on the phrase is called a *direct modulation* or *phrase modulation*.

Because there is no pivot chord in these types of modulations, we label direct modulations without a bracket. Simply put the upper- or lower-case letter for the new key followed by a colon and the first chord in the new key. For this excerpt, the Roman numeral for beat 4 of the measure 2 would be: *c#:iio6*.

Because direct modulations are the only modulations we label without a bracket, you should know that if you choose to label a modulation that is not a direct modulation without using a modulation bracket, someone reading your analysis will assume that you misunderstood the modulation.

#### Direct modulation principles

* Occurs when a modulation begins abruptly after a phrase ending.
* May or may not have a possible pivot chord, but it will create a non-functional progression between the last chord of the first phrase and the first chord of second phrase.

## Common-tone modulation

The last type of common modulation relies on a non-harmonic principle. Look at the following excerpt from a Schubert Lied. This is noticeably more advanced harmonic language than anything we have studied to this point, so there are certain harmonies (e.g. beat 2 of measure 2, beat 1 of measure 6) that we will not study until a later unit. As you listen to this however, you should have a strong sense of D minor until the dramatic modulation in measure 10. What ties the two chords in measure 10 together? If you need help, try isolating the voice part by deleting the piano staves. (To do this quickly, delete everything from V:2and below in the textbox. You can hit the “Reset” button below the textbox to restore the example to its original form.)

{% capture ex3 %}X:3 T:Schubert - Wehmut M:2/2 L:1/4 K:F Q:1/8=60 V:1 z4| z4| D D/2D/2 A> A| d>e ^c>c| ^c>c c c| d>A A>A| e>d e>d| A2 z ^c| d>A A/2>A/2 A/2=B/2| ^c2- c/2c/2c/2c/2| c>A ^G/2=B/2A/2G/2| ^F3 z|] V:2 [D2A,F,] [A2EA,]| [FDA,][FD^G,] [^C2A,]| [D2A,F,] [A2EA,]| [dAD][d^GD] [A2^cE]| [^cBG]>[cBG][cBG][cBG]| [d2A^F] [d2A=F]| [e^cAG]>[dAF] [ecAG][dAF]| [^cAE]>[cBG][cBG][cBG]| [d2A^F] [d2A=F]| [^c2AE] [^c2B^E^C]| [^c2^A^F^C] [^c2^E^G=B,]| [^c3^F^A,] z|] V:3 clef=bass [D,2D,,] [C,2C,,]| [B,,2B,,,] [A,,2A,,,]| [D,2D,,] [C,2C,,]| [B,,2B,,,] [A,,2A,,,]| [A,,4A,,,]| [A,,4A,,,]| [A,,2A,,,][A,,2A,,,]| [A,,2A,,,] [A,,A,,,][A,,A,,,]| w:d: [A,,2A,,,][A,,2A,,,]| [A,,2A,,,][^G,,2^G,,,]| [^F,,2^F,,,] [^C,2^C,,]| [^F,,3^F,,,] z|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

The excerpt begins in D minor but modulates to F-sharp major by the end. These are distantly related keys, so a common chord pivot modulation would be difficult. Instead, Schubert emphasizes a particular common tone in the melody and upper voice of the piano: the C-sharp. This pitch is the seventh scale degree in D minor and the fifth scale degree in F-sharp major.

By accentuating a particular pitch that is common to two keys, a composer can bridge seemingly impossible gaps in the tonal language. In this particular example, the C-sharp was accentuated by placing prominently in the melody, but composers will often take this a step further and completely isolate the pitch without any accompaniment. Regardless of texture, a common-tone modulation functions by emphasizing a particular pitch.

**To label a common-tone modulation**, we use a bracket similar to a pivot modulation. Instead of using chord symbols, however, we use scale degrees. For the Schubert common-tone modulation above, the top of the bracket would contain “^7,” and the bottom of the bracket would contain “F#:^5.” (Remember that when writing the scale degree “caret mark,” you should place the caret *above* the numeral, not beside it as shown in an online text such as this.)

#### Common-tone modulation principles

* Functions by accentuating a particular pitch that is common to both keys.
* The pitch may be isolated entirely or just accentuated through normal musical means such as register, doubling, voicing, dynamics, etc.

## Final note

Some modulations may fall into more than one of these categories. In these cases, let your ear be the deciding factor. Focus on the basic premise of each modulation and decide which most closely describes your perception of the composer’s intent.

Pitch-class integer notation and the two primary forms of manipulation – transposition and inversion – allow for a tremendous amount of flexibility in analysis. This flexibility comes with the drawback of making comparison difficult, because there is no guarantee that a pc set is in the same order. For this reason, we use normal form to ensure that our comparisons between pc sets are built in a consistent manner. This is also why you should always normalize a pc set after inverting it.

## How many are there?

If you were to group all of the unique transpositions and inversions of a pc set, how many permutations would there be? To explore these ideas, first write out all unique inversions and transpositions of the following prime form pc set. This set represents a typical pc set in that every transposition and inversion is unique. - (014)

Because there are twelve possible starting pitches and for both the starting set and its inversion, there are typically twenty-four possible pc sets within a set class. And because we use normal form to represent each pc set within a set class, this means there is *only* one arrangement of the pc set for each starting pitch. (If every unique order of pitch classes was considered as well, there would be vastly more options depending on the cardinality of (i.e. the number of pitch classes within) a pc set.

## Set class

Theoretically, we can determine whether any two pc sets are related by transposition, inversion, or both. To try this, study the following four trichords. How are they related? What method(s) will you use to find the relationships? As you work through this, keep track of the manipulations you make to find compare them. Hint: It will be helpful to make sure that you are always working with the normal form. - (2,9,6) - (8,4,1) - (e,2,7) - (6,2,8)

For fairly simple trichords such as these, there are a variety of methods you could use to compare them. Some people will write them using traditional notation on a staff, yet others will attempt to visualize them on clock or number line. These visual methods may work to a degree for a simple trichord but fail on two accounts - It is difficult to scale to larger, denser pc sets. - It is difficult to see the relationship for anything other than transposition.

For these reasons, set theory has a system to reduce and compare any pc set into a group of all related pc sets. Any two pc sets that are related by transposition and/or inversion are considered to be part of the same *set class*. All of the trichords listed above belong to the same set class, and we can show this using simple manipulations.

If we put each of them into normal form, we get: - [2,6,9] - [1,4,8] - [7,e,2] - [2,6,8]

Just by doing this, it easy to use addition and subtraction to show that the first and third trichords are directly related by transposition: - T5[2,6,9] = [7,e,2])

And the second and fourth are related in the same manner - T1[1,4,8] = [2,6,8]

Because an inverted pc set often has no common tones with its original pc set, it is more difficult to see inverted relationships. For this, it would be easier to create a “standard” around which we can examine all pc sets in normal form within a set class. For this, let’s try reducing both sets above to begin with 0. If we do this the first pair of pc sets becomes [0,4,7] and the second pair becomes [0,3,7]. You can see that they are similar in that they both use pitch classes 0 and 7, but are they related by inversion? Let’s try inverting one of them, normalizing it, and then reducing it to a normal form that begins on 0.

* [2,6,9] reduces to [0,4,7] (by transposing by -2)
* [0,4,7] inverts to [0,8,5]
* [0,8,5] normalizes to [5,8,0]
* [5,8,0] reduces to [0,3,7] (by transposing by -5)

Therefore, we can see that all four of our original trichords are related by transposition and inversion. Or we could also say that *they all belong to the same* ***set class****.*

## Prime form

The process that we just demonstrated is the actual method for finding a pc set’s *prime form*. Prime form is the “most reduced” version of any pc set. It will always start with 0, and it is used to denote an entire *set class*–all possible transpositions and inversions of a given pc set.

In the above trichords, we had two possible prime forms [0,3,7] and [0,4,7]. These two trichords represent the reduced trichord of both inversions of this pc set. To determine which is prime form, we apply the same tie-breakers that we used when determining normal form: start by comparing the outermost intervals and then work your way inward. Both of these trichords have an outer interval of 7, but [0,3,7] has a smaller second interval (i.e. 0 to 3 is smaller than 0 to 4). Therefore, the prime form of **all** of the above trichords is:

Notice the notation of prime form. For this we use parentheses only with no commas. (All of the notation that we use for pc sets–unordered, normal, and prime forms–was standardized by Joseph Straus in his *Introduction to Post-tonal Theory*.)

## Finding prime form for any pc set

Now that you understand the goal of prime form – finding one pc set to represent all transpositions and inversions – let’s try another one to see if we can develop a step-by-step process for finding prime form of any pc set. Try finding the prime form of the following tetrachord. Remember that you need to check the inversions as well.

(4,t,8,3)

Hopefully you came to the answer of (0157)

To find prime form, you: 1. Put the pc set into normal form. 2. Transpose that set to begin with 0. - Remember this pc set, because it will be one of two possible options at the end of the process 3. Invert your pc set. - You may use either the normal form of the original or the reduced version that begins with 0. They will get you to the same answer after Step 5. 4. Put the new pc set into normal form. 5. Transpose this new pc set to begin with 0. 6. Compare the two pc sets that begin with 0 using the tie-breaker system that we outlined for identifying normal form. - These are the final forms taken from steps 2 and 5. - You will always end with a pc set that begins with 0. 7. Notate your prime form using parentheses and no commas.

## Symmetrical set classes

What could reduce the number of pc sets within a set class? Write out all unique inversions and transpositions for the two following pc sets for examples that deviate from the standard possibility of twenty-four unique permutations. What causes these to have so many less pc sets in the set class? - (048) - (0158)

The number of pc sets in a set class can be reduced if the pc set is symmetrical: augmented triads, diminished seventh chords, the whole tone scale, and the octatonic scales are all symmetrical set classes with less than twenty-four unique pc sets, but there are many others that have symmetry reducing the number of pc sets in the set class.

To this point, we have discussed formal labeling systems for a single pitch, as well as how we can combine these pitches to create scales. Our next step up the ladder of complexity will be develop a method to measure the distance between any two pitches, and we do this in Western music notation by looking at the distance between two pitches changes in function when in a scale.

## Intervals

Any two-note combination is called a *dyad*, and the distance between the two pitches of a dyad is an *interval*. Intervals are the fundamental building blocks of melody and harmony. At their simplest, intervals need only measure the distance between two pitches, but there are many variables in music for which we must account.

### Goals for this topic

In the example below, each interval represents the concept stated at the beginning of its staff, but each measure *also* has an important intervallic relationship to the measures above and below it. Using these, develop explanations for how we find each of the following: - the *size* of the interval between two pitches as represented by an Arabic numeral - the *quality* of the interval as represented by the labels *perfect, major, minor, diminished, and augmented* - which *sizes* can use which *qualities* as well as the hierarchy of *qualities* for each *size* - *chromatic* versus *diatonic* intervals - *simple* versus *compound* intervals and how this affects classifying of *quality* and *size* - how the *size* and *quality* change when the upper and lower pitches of an interval are inverted

### Important concepts

* ***Qualities***: P = perfect, M = major, m = minor, A = augmented, d = diminished
* ***Diatonic vs Chromatic*** *intervals in the examples below*
  + Diatonic intervals in the examples below
    - Perfect unison(1), major 3rd, and major 7th from the harmonic intervals
    - Major 2nd from the melodic intervals
    - Perfect unison(1) and major 6th from simple intervals
    - Perfect 15th and major 10th from the compound intervals
    - Minor 6th from the inversion pairs
  + ***Chromatic*** *intervals in the examples below*
    - All other intervals
* **Inversions**
  + The bottom row of intervals are the inversions of each interval in the top row. For example, the M7 in the bottom row is the inversion of the m2 directly above it in the first row.

{% capture ex1 %}X:1 T:Intervals M:1/4 L:1/4 K:C V:1 name=Harmonic [AA]| [\_BA]| [ce]| [\_e\_B]| [D\_A]| [^dF]| [CB]| [^f^F]|| w: P1 m2 M3 P4 d5 A6 M7 P8 V:2 name=Melodic B/2\_B/2| B/2A/2| c/2^e/2| e/2\_B/2| *D/2\_A/2| F/2\_d/2| ^C/2B/2| f/2^F/2|| w:A1*  M2 \_ A3 \_ A4 \_ P5 \_ m6 \_ m7 \_ d8 V:3 name=Simple [CC]| [\_B^A]| [^c\_e]| [\_eB]| D/2^A/2| d/2F/2| [C\_\_B]| [^fF]|| w: P1 d2 d3 d4 A5 \_ M6 \_ d7 A8 V:4 name=Compound clef=bass [D,\_D]| [^B,A,,]| [C,\_E]| [\_E\_B,,]| *A,/2\_D,,/2| F,,/2\_D/2| ^B,/2C,,/2| [FF,,]|| w:d8 A9 m10 P11 P12*  m13 \_ A14 \_ P15|| V:5 name=Inversions [Aa]| [\_B,A]| [cE]| [\_E\_B]| [d\_A]| [^df]| [Bc]| [^f^f]|| w: P8 M7 m6 P5 A4 d3 m2 P1{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Conclusions

Our goal when measuring intervals is intrinsically tied to the tonal system that we use, diatonic harmony. The simplest way to measure the distance between two intervals would be to measure the distance by the shortest possible interval–in this case, a half-step (minor second). While easily understandable, this method does not relate to our concept of tonality. Instead, counting half-steps creates *interval-classes* in which intervals are considered equal regardless of the pitches. For example, the interval of G to D-flat has six half-steps which is identical to the interval from G to C-sharp. Both even use the same pitch-classes, however, if you put those into the context of the scales from the previous unit, you will hopefully associate these two intervals with different key centers. (G to D-flat is strongly associated with the key of A-flat major/minor, whereas C-sharp to G likely implies D major/minor.) The context of these two intervals is critical in determining their function in tonal harmony, so we use a system that differentiates between the two.

In a diatonic labeling system, every interval has a *size* and a *quality*. For example, in a minor second, labeled m2, the **m** indicates the *quality* of the interval and the **2** indicates the *size* of the interval. Let’s look at how we find *size* first.

### Interval size

Interval *size* can be determined by considering either: - lines and spaces - letter names

Both these methods will correctly identify interval size, although counting letter names yields results without requiring the presence (or visualization) of a staff. Do not forget that you must include both letters when counting. (e.g. The ascending interval from A to C is a third, because you must count A (1), B (2), and C (3).)

This means that any interval that has the same two letters, regardless of accidentals or key signatures, will always have the same *size*. Using our previous example, the *size* of the interval between G and D-flat is a fifth: G (1), A (2), B (3), C (4), and D (5). We can change the bottom note to any other G (G-sharp, G-flat, etc.) and the top note to any other D (D-sharp, D-natural, etc.), but the *size* of that interval will **always** be a fifth. Yet if we exchange the D-flat for its enharmonic equivalent, C-sharp, we alter the letters and turn the *size* of the interval into a fourth.

### Interval quality

In the Western music notation system, interval *quality* is difficult to examine without beginning to think about our concept of tonality and keys, because it is designed to describe tonal intervals. It is easiest to understand *qualities* of intervals by comparing them to the major scale, so we will look at that below. If you do not yet feel comfortable with scales, however, you may look at the [Further Reading](02-int-scales-keys/a2-intervals.html) of this topic to find a useful method from the writers of *Open Music Theory*.

The most common and straightforward method for learning interval *quality* compares the interval to a major scale:

1. Find the size of the interval by counting through the letter between the two pitches.

* Remember that you must include the starting and ending pitches in your counting.
* Remember that size is independent of quality, so none of the following steps will affect the interval size.

1. To being finding the quality of the interval, consider the bottom pitch of the interval as the tonic of a major scale.
2. If the top pitch of the interval is a note that naturally exists in the major scale built off the lower pitch, it is either a major or perfect interval, depending on the *size* of the interval.

* Unisons, fourths, fifths, and octaves occur naturally in the major scale as *perfect* intervals.
* Seconds, thirds, sixths, and sevenths occur naturally in the major scale as *major* intervals.

1. Any alteration from the basic major and perfect intervals can then be labeled by looking at the direction of alteration and the number of half-steps that the interval was altered.

* If the original interval is *perfect*:
  + Raising the interval by a half-step creates an *augmented* interval.
  + Lowering the interval by a half-step creates a *diminished* interval.
* If the original interval is *major*:
  + Raising the interval by a half-step creates an *augmented* interval.
  + Lowering the interval by a half-step creates a *minor* interval.
  + Lowering the interval by a 2 half-steps creates a *diminished* interval.

#### Quality hierarchies

From this, our interval can be grouped into two distinct hierarchies: - The “Perfect” intervals - Interval *sizes* of 1, 4, 5, and 8 can only have the *qualities* of perfect (P), augmented (A), or diminished (d). - The “Major/minor” intervals - Interval *sizes* of 2, 3, 6, and 7 can only have the *qualities* of major (M), minor (m), augmented (A), or diminished (d).

Note that even though *perfect* intervals use a different hierarchy than *major/minor* intervals, both hierarchies share the terms *diminished* and *augmented*.

#### Interval quality practice

Let’s practice some examples using this method: - C to E: - Counting the letter names confirms that the *size* is a third - C (1), D (2), E (3) - If we consider the lower pitch, C, as the tonic of a major scale, we can use the C-major scale to find that the naturally occurring E in the key of C major is E-natural. - Because this is an interval size of a third, we must use the *major* hierarchy, so therefore, E-natural would be a \*\*major third \*(M3) **above C. - D to G-sharp - Counting the letter names confirms that the *size* is a fourth - D (1), E (2), F (3), G (4) - By setting the lower pitch, D, as a tonic, we can use the D-major scale to find that the naturally occurring G in the key of D major is G-natural. Therefore, G-natural is a perfect 4th above D, because all naturally occurring intervals in a major scale are either perfect or major depending on their size. - Because G-sharp is one half-step above the *perfect* interval, we go one step up the “perfect” hierarchy to find that this interval is an** augmented fourth (A4)**. - F to E-double-flat - Counting the letter names confirms that the *size* is a seventh (F, G, A, B C, D, E = 7) - By using the lower pitch, F, as do, we can use the F-major scale to find that the naturally occurring E in the key of F major is E-natural. - Because this is a seventh, we must use the *major* hierarchy, so therefore, E-natural would be a M7 above F. - Because E-double-flat is two half-steps below the *major* interval, we go two steps down the major hierarchy to find that this interval is an** diminished seventh (d7)\*\*.

### Melodic vs. Harmonic

Melodic and harmonic intervals are one of the simplest concepts to understand, although the describing them can be problematic. At first, students often describe harmonic intervals as occurring “at the same time” while melodic intervals occur “at different times.” While this is a simple explanation, we must be careful in how we apply the terms *interval* and *pitches*. The interval is the space between the two pitches, therefore, the interval cannot occur “at the same time” or “at different times.” The pitches can occur simultaneously or consecutively, but the interval always exists as a fixed measurement. This is how we can label harmonic and melodic intervals using the same system.

I recommend that we think of intervals as existing on either a horizontal or vertical axis, because we can visualize axes (as in the plural of axis) easily on musical staff notation. If two pitches occur “at the same time,” they will be aligned vertically on a staff. If two pitches occur consecutively, they will represent unique points on a horizontal line that runs parallel to the lines of the staff. This may seem overly technical, but it is an important distinction.

A final note: melodic intervals can have two modifiers attached to them, *ascending* or *descending*. Ascending intervals start with the lower of the two pitches, whereas descending intervals start on the the higher pitch. Harmonic intervals cannot be ascending or descending.

### Simple vs. Compound

Simple intervals include any interval that is equal to or smaller than an octave. Compound intervals are any interval larger than an octave.

To label compound intervals, we count letter names as we do for simple intervals. We can find a compound interval by adding 7 to any simple interval. For example, a 2nd becomes a 9th. A 4th becomes an 11th. An 8ve (octave) becomes a 15th.

Conversely, if we see a compound interval, we can find its simple equivalent by subtracting 7. A 12th is a 5th plus an octave. A 10th is a 3rd plus an octave.

You may ask why we don’t add eight considering that we are adding an octave. The answer lies in how we find the *size* of intervals. When we find interval *size*, we count the letter names *and include the starting pitch*. When we add an octave, we have already used the top note so we are missing one letter. For example, a fifth from A to E includes the letters A B C D E. If we add an octave, the first E was already included in the first interval of the 5th, so we are only adding seven letters F G A B C D E.

### Chromatic vs. Diatonic

The difference between chromatic and diatonic is probably the most straightforward of interval classifications in usage, but it has a level of nuance that students often miss and causes confusion later. Simply put, *diatonic* intervals contain only pitches that belong to the **current** tonality, whereas *chromatic* intervals contain at least one pitch that does not belong to the current tonality.

Of course, this relies on you knowing what the current tonality is. In many situations, this means that you can find chromatic pitches, and therefore chromatic interals, wherever you find a note with an accidental. So if the key signature matches the current tonality–for example, the key signature has two sharps and the tonality is D major–any pitch that does not have an accidental is a *chromatic* pitch and all intervals formed with that pitch would be chromatic intervals.

### Inversions

An easy way to think of inverted intervals is to consider an inversion to be an interval in which one pitch is fixed and the other is transposed by one octave toward the fixed pitch.

#### Inverting size

To determine the *size* of an inverted interval, it is easiest to simply memorize the interval pairs, so: - 4 inverts to 5 and vice versa - 3 inverts to 6 and vice versa - 2 inverts to 7 and vice versa - 1 inverts to 8 and vice versa

Each of these pairs adds up to nine, so if you ever forget or doubt your memorization, you can find an inversion by simply subtracting the interval size from 9. For example, if there is a written 3rd, subtract 3 from 9 to find that the inversion of a 3rd is a 6th. Note that for compound intervals, you must use subtract from 16 or use negative numbers and absolute values. Because of this, it is easier to reduce compound intervals to a simple interval before inverting.

#### Inverting quality

To find the qualities of inverted intervals, you simply need to memorize three pairs: - diminished becomes augmented and vice versa - major becomes minor and vice versa - perfect becomes perfect and vice versa

We will explore the mathematical underpinnings of why inversions form these pairs in Unit 23.

In looking at triads and seventh chords, we have only learned how to label and classify these musical objects without specifying a particular root. A major triad or a dominant seventh chord can be built off any of the twelve pitch-classes, and each of the pitch-classes have multiple options depending on which enharmonic equivalent you choose as the root.

There is one commonly-used method that allows us to label specific triads and seventh chords as well as their inversions: *leadsheet notation*. This is also sometimes referred to as *slash-chord notation*, *jazz chord symbols*, or *pop chord symbols*. This system for labeling chords is most commonly seen in jazz and pop music, but it is useful to all musicians because it is an efficient system for communicating chords *of any complexity*.

Even after we introduce Roman numeral analysis and harmonic function in Unit 6, we will continue to use leadsheet notation to provide a harmonic overview of complex analyses before we try to assign harmonic function and relationships. For example, if we have a C major triad and an F major triad and no other context, we cannot be sure of their key and function, so Roman numeral notation is not very useful. For those with a knowledge of diatonic function, it would seem most likely that these two chords belong to F major, but they could also exist diatonically in the keys of C major, D minor, A minor, as well as various modes. When analyzing harmonically ambiguous functions, it is critical to have a shorthand for labeling chords, so that we can look at the overview rather than re-analyzing each chord every time we come to a section of music.

### Labeling triads

Using the examples below: - determine the standard methods for labeling all chord qualities - match these to our current labels (e.g. Major minor (Mm) chords are the same as a dominant seventh chord which is then labeled as…) - determine the method for denoting inversions - match these inversions to their corresponding inversion figures for both triads and seventh chords

{% capture ex1 %}X:1 T:Leadsheet notation of triads M:2/4 L:1/2 K:C clef=bass “Bb+ (or Bbaug)”[\_B,,D,^F,]| “Bb”[\_B,,D,F,]| “Bbmin (or Bb-)”[\_B,,\_D,F,]| “Bbdim (or Bbo)”[\_B,,\_D,\_F,]||{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Labeling seventh chords

{% capture ex2 %}X:2 T:Leadsheet notation of seventh chords T:Everything other than the chord’s root is typically written in superscript T:————— M:2/4 L:1/2 K:C “Dmaj7”[DFAc]| “D7”[D^FAc]| “Dm7 (or Dmin7)”[DFAc]| “D/o7 or Dm7(b5)”[DF\_Ac]| “Do7(or Ddim7)”[DF\_A\_c]|| w: major~seventh dominant~seventh minor~seventh half~diminished fully~diminished{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Labeling inversions

{% capture ex3 %}X:3 T:Inversions in leadsheet notation T:————— M:2/4 L:1/2 K:C “D7”[D^FAc]| “D7/F#”[d^FAc]| “D7/A”[d^fAc]| “D7/C”[D^FAC]| w:root~position first~inversion second~inversion third~inversion w:7~(7/5/3) 6/5~(6/5/3) 4/3~(6/4/3) 4/2~(6/4/2){% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

## Conclusions

### Basic leadsheet notation

The general naming system that we have used thus far allows us to talk about general categories of triads and seventh chords, but does not allow us to specify the exact root of a chord. Leadsheet notation is a shorthand method written above the staff that specifies a chord’s root and quality. Leadsheet notation never had a centralized authority, so over many decades, it evolved various ways to denote the same chord qualities.

Leadsheet notation consists of a note name followed by a chord shorthand. The note name denotes the root of the chord, and is most commonly an upper-case letter regardless of the chord’s quality. Some systems use a lower-case letter for minor chords, but this is less common and is problematic for letters that have similar upper-case and lower-case versions such as c. (And of course can be exacerbated if the writer’s penmanship is poor.) For our course, I will always use an upper-case root in my leadsheet notation.

The chord quality shorthand can vary greatly, so we have listed the more common possibilities below for chords with a root of C. I have listed them in my order of preference – again taking student penmanship into account. Clarity should be valued above brevity.

* Major Triad: C (no shorthand necessary, just a capital root name)
* Minor Triad: Cmin, Cm, C-
* Augmented Triad: Caug, C+
* Diminished Triad: Cdim, Co
* Major major (major seventh chord): Cmaj7, CM7, CΔ
* Major minor (dominant seventh chord): C7
* Minor minor (minor seventh chord): Cmin7, Cm7, C-7
* Diminished minor (half-diminished seventh chord): Cø7, Cø, Cmin7(b5)
* Diminished diminished (fully-diminished seventh chord): Cdim7, Co7

### Inversions in leadsheet notation

We are also able to show chord inversions in leadsheet notation by using *slash-chords*. To use slashchords, you use standard standard leadsheet notation followed by a slash (/) and then the *bass* note. This allows you to show any inversion. For example:

* C7/E is a C dominant seventh chord in first-inversion.
* C7/G is a C dominant seventh chord in second-inversion.
* C7/B♭ is a C dominant seventh chord in third-inversion.

### Extensions and Using Sub vs. Add

Using the example below, you should: - define *extended harmonies* by contrasting the chords below from the chords above - find the key factor in determining a *sus* chord - understand the difference between using *sub* and *add* in your leadsheet notation

{% capture ex4 %}X:4 T:Labeling extensions in leadsheet notation T:————— M:2/4 L:1/2 K:C “D13”[D^FAcegb]| “D6/9”[D^FAeB]^c/2| “Dsus7”[DGAc]| “D9 or D7(add9)”[D^FAce]| “Dm7(add b5)”[DF\_a=Ac]| “Dm7(sub b5)”[DF\_Ac]|| w:\_ \_ implied{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Conclusions

### Extended harmonies in leadsheet notation

As tertian harmony evolved from its earliest roots, some composers began adding pitches to chords beyond the chordal seventh. We will use the term *extended harmony* to refer to these chords, but in common usage, this term can also encompass chords that do not adhere to standard triad and seventh chord structures.

For chords that extend beyond the seventh chord, we typically use the terms *ninth* for the second scale degree, *eleventh* for the fourth scale degree, and *thirteenth* for the sixth scale degree, because these extensions are a continuation of stacked thirds continuing above the seventh chord. A Cmin11 implies that it has the normal minor seventh chord with both the diatonic ninth and eleventh added above it.

As with standard leadsheet notation for seventh chords, if you have a number alone, it always implies a dominant seventh chord with extensions. A C13 is a dominant seventh chord built on the root C with extensions up to the thirteenth. The only notable exception to this rule is the 6/9 chord; the shorthand in this case implies a major seventh even though there is no signifier other than the two numbers.

### *Sus* chords

As we move into studying the ways that composers embellish their music later in the course, we will study *suspensions*–a note that *does not belong to a chord*, but instead adds extra tension and color before resolving downward by step. In modern music however, there exists a standalone chord called a sus chord, which resembles the non-chord tone suspension of previous eras, but because the sus chord can be used without resolution, it has its own leadsheet notation.

Csus

Any time that you see the abbreviation *sus* added to a chord in leadsheet notation, this implies that there is no chordal third. Instead, you will use the diatonic pitch that is a fourth above the *root*. So for a Csus, you will replace the E that would normally be present in a C major triad with an F. This would not change even if the bass note was altered; it will always replace the chordal third with the step above it. Any further alterations are best handled using…

### *Sub* and *Add*

The two commands *sub* and *add* are useful when writing leadsheet notation of non-standard chords. Admittedly, these will not be used much in diatonic harmony, but understanding their usage now will help when we move into chromatic harmonies.

Because triads and seventh chords are built in thirds, every third above the root has a predetermined quality based on the chord quality and root. If you would like to alter one of those chordal members, you can use the *sub* followed by an altered chordal member to imply that you are *replacing* that chordal member. For example, the alternate method for half-diminished seventh chords comes from this. Because a diminished triad is a minor triad with a lowered fifth chordal member, you could use the leadsheet notation for a minor seventh chord and substitute a lowered 5th. This would look like:

Cmin7(sub b5)

Admittedly, this method for notating half-diminished seventh chords is common enough that it is not required to use “sub” in this particular example, but this is still an excellent example of the proper way to use the sub command.

*Add*, on the other hand, does not alter any of the chordal members, but instead adds an extra chord tone. If you would like to add a raised ninth to a dominant 7th chord without altering the third, you could use:

C7(add#9)

If you master these two commands in your leadsheet notation, it is possible to denote any combination of altered pitches and substitutions for even the most complicated music. Of course, this assumes that the music still has at least its basic roots in tertian harmony, but even through the current day, almost all Western music does.

Having just explored how changing the tempo of a piece written in 3/x can change the classfication between compound and simple, it should be no surprise that aural interpretation of meter is a subjective process. Many factors play a role in determining how a listener perceives a meter including tempo, accented beats, melodic patterns, and previously established “grooves.”

The examples on the following page will help you explore a few of the many ways in which a composer or performer can alter the perception of meter.

## Syncopation

*Syncopation* occurs when a note emphasizes the “weak” beats of a measure, but as discussed in Topic 4b, meter is based on our perception and is therefore a subjective phenomenon. Listen to the first three bars of the following example without looking at the music. Try tapping your perceived pulse until the end of the excerpt, and then see if your mental construction of the rhythm matches the piece.

{% capture ex1 %}X:1 T:Syncopation M:4/4 L:1/4 Q:1/4=90 K:C V:1 z4| z4| z4|| g c d e| g c/2 d e/2- e/2c/4d/4| e4|] V:2 z/2 G G G G/2-| G/2G/2 G G c/2G/4F/4| G4|| z/2 G G G G/2-| G/2G/2 G G c/2G/4F/4| G4|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

The very idea of strong and weak beats relies on a recognizable, steady pulse. Even though the first line above is clearly written in a syncopated pattern that begins on the & of 1, most listeners hear the first pitch as the downbeat because it is the first pitch they hear. However, when the top line is added in the fourth measure, it becomes possible to hear the bottom line as syncopated because an earlier reference has been established. In general, a listener will hear the first sound of a piece of music as a downbeat unless other contextual clues–such as melodic shape, note shape, or accents–lead them to think otherwise.

Syncopation occurs when emphasis is put on the “weak” beats of the meter, but the above example shows the subjectivity of this. If a listener listens to the example without looking at the notation, it would be impossible to know that the example starts on an offbeat. It is therefore worth noting that strong and weak beats are determined by *context*, not by meter. Once the top line is added to the excerpt, the listener may still hear the bottom line as taking place on the beat if they listened to it without looking at the notation, while some may “switch” the beat in their mind to make the bottom line a strongly syncopated rhythm. Syncopation can occur within a single line if the beat is established first and then weak beat rhythms are introduced, but this is still an example of establishing the strong beats for the listener before syncopation can begin.

## Meters with different beat lengths but identical numbers of divisions

The next example contains a rhythmic pattern scored in two different meters. Discuss the differences between the two ways of notating the examples and which one best reflects your perception of the excerpt. Are there other methods of which you can think that could alter a listener’s perception of meter?

After you hit play, do not follow the part in order to allow your ear to determine how it hears the meter.

{% capture ex3 %}X:3 T:Melodic shape M:3/4 L:1/8 Q:1/4=100 K:C EA eB df| EA eB df:| [M:6/8] EAe Bdf| EAe Bdf:|]{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Written time signatures versus aural perception

This excerpt demonstrated how a variation–in this example, melodic shape–can affect listener perception. Aurally, both parts sounded identical regardless of the meter, but when listening and not looking at the excerpt, most listeners feel that the piece is in a compound duple meter. This demonstrates that even though a pattern can be written in various meters, there are other factors that can strongly pull toward a particular meter. In this case, the motif is melodically grouped into two groups of three, so it pulls most of the listeners toward a 6/8 feel. One may hear this in 3/4, but this would require other factors such as accents, silence, and tempo to affect how the listener perceives the passage.

It should be noted that many composers rely on using meters to evoke particular rhythmic biases in the performer, so it is disingenuous to say that meter is *entirely* subjective. Stravinsky was well-known to write the same passage in various meters (e.g. *Rite of Spring*, *L’histoire du Soldat*), so a good performer is aware of what the meter is trying to tell them.

## How previous material affects perception

Listen to the first 20 seconds of the following clip of *Sintra* from Snarky Puppy’s incredible collaboration with the Metropole Orkest. How would you classify the meter? What can you tell about the performers’ sense of the meter from their body language, particularly the conductor? Does it match yours?

The next clip starts slightly before the previous clip. How would you classify this meter? Does it affect how you perceive the material from the previous clip? What can you tell about the performers’ sense of the meter from their body language, particularly the conductor? Does it match yours?

The final clip starts in the introduction of this piece. This is clearly in a different meter than the previous two clips but it segues smoothly into the new section. How does this affect your perception of the material from the previous two clips? What can you tell about the performers’ sense of the meter from their body language, particularly the conductor? Does it match yours?

### Conclusions

By starting at this particular point in the piece, most listeners will hear this section in a slow, simple triple meter. But an observant student may have noticed the conductor in the background (around the 2:29 mark) conducting in a double-time three, which means that the conductor is placing an *off-beat* where the listener is likely hearing beat 2 of their slow simple triple meter. If we move our starting point backward by only ten seconds, we hear the original groove of this section of the tune, which is the origin of the double-time simple triple meter that we saw the conductor using.

By starting at this new point, many listeners will switch to a faster (double-time) simple triple meter. The listener may or may not carry this feel through the half-time section from the first clip, but given the conductor’s beat pattern, we can be fairly certain that the orchestra is counting this section as if there is no change in meter.

Perhaps even more interesting is the effect on the listener when we move our starting point back into the the intro of the piece.

The introduction is clearly in a slow compound quadruple meter. The melody happens mostly at the beat level, and the cellos have a constant arpeggio at the subdivision level. At the 1:20 mark, there is a slightly disconcerting two-beat transition, and then a new section starts that most listeners will hear as a continuation of the slow compound quadruple meter of the intro. This is reinforced by an ostinato in a contra-bass clarinet as well as the body language of the performers. When the trumpet and saxophone enter with a new melody at 1:32, we realize that this slow compound quadruple meter is the exact same feel and melody that we heard as a fast simple triple melody in the second clip.

The conclusion of this exercise should be that the listener’s perception of meter is not tied to what is on the page, only to a complex array of aural input. Therefore, we can discuss meter in an objective manner by looking at what is written, but a listener is not required to hear the meter similarly to an analysis or even in the way in which the composer intended.

First-inversion and third-inversion chords are used to make smoother, more melodic bass lines, but in doing so, we put tendency tones–and all of the accompanying expectations–into the bass. Even though this seems more restrictive, first- and third- inversion chords actually allow more freedom in part-writing because: - they remove the potential objectionable parallels that come from having the root in the bass. - the upper voices have one less tendency tone to distribute and resolve correctly.

## Resolving tendency tones

Use the voicing and voice-leading guidelines discussed in the previous topic to harmonize the following progressions as a four-part chorale. Assuming that the progression follows the circle-of-fifths, what inversion should follow a first-inversion chord? What about the chord following a third-inversion? As always, make note of any difficulties that you encounter for the class discussion.

{% capture ex1 %}X:1 T:First- and third-inversion chords T:in circle-of-fifths progressions M:3/4 L:1/4 Q:1/4=70 K:C V:1 [cE]xx| [cE]xx|| [cE]xx|] V:2 clef=bass [C,G,] [B,,] [C,]| [C,G,] [B,,] [C,]| [C,G,] [F,] [E,]|] w:C:I V6 I I V6/5 I I V4/2 I6{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

### Conclusions

With first and third inversion chords, we place either the chordal third or chordal seventh in the bass. Both of these chord tones are tendency tones, and tendency tones in outer voices follow fairly strict rules in this style.

For first-inversion triads and seventh chords in circle-of-fifths progressions, the bass note should resolve up by step to the root of the following chord, meaning that the chord following a first-inversion chord will likely be in root position. For third-inversion seventh chords (there are no third-inversion triads), the chordal seventh in the bass should resolve down by step, and if it is a circle-of-fifths progression, the bass will resolve to the chordal third of the next chord making it a first-inversion chord.

Of course, these guidelines assume that we are harmonizing circle-of-fifths progressions. If you do not have roots that are separated by P4/P5, we can create guidelines using functional substitutions.

## Function over form (Part 2)

When harmonizing the the root-position deceptive progression from the previous topic, we discussed that you should treat the vi chord in a deceptive progression as a *functional substitution* for tonic. Because the vi chord acts as a tonic function when part of a deceptive progression, we double the scale degree that works best for the standard tonic chord, do of the I chord, rather than the general part-writing doubling rule for root position chords in which you would prefer to double the root. This means that in the deceptive progression, it is correct to break standard doubling convention and double the chordal third of the vi chord. Now that we are looking at first inversion voice-leading, we have another *functional substitution* to discuss. - viio is a dominant function, so therefore functions as V7 chord without its root

Because of this, the viio chord must follow different *doubling* rules in order to avoid poor voice-leading. With this in mind, try to harmonize the following progressions; first a simple I-V6/5-I progression, and then with an added root-position viio chord. You will discover that: - the two chords have all but one pitch in common. - resolving a root-position viio is extremely difficult and will require one voice to make consecutive jumps of a P5 to avoid issues due to tendency tone resolutions.\*\*

{% capture ex2 %}X:2 T:Voicing a viio using functional substitution M:4/4 L:1/4 Q:1/4=70 K:C V:1 [cE] xx2|| [cE] xxx|] V:2 clef=bass [C,G,] [B,,] [C,2]|| [C,G,] [B,,] [B,,] [C,]|] w:C:I V6/5 I I viio V6/5 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

Because the root position viio triad is so difficult, it is rarely used. It is not possible to resolve a root-position viio triad to a I chord without breaking at least one part-writing norm. A root-position viio must either pass through another chord or be inverted to resolve directly to I.

As a general rule of thumb, any diminished triad (including the iio in minor) will typically need to have the chordal third doubled, because the tension of the diminished fifth and its tendency tones.

## Function over form (Part 3)

The pre-dominant function presents an issue that the functional substitutions in tonic and dominant functions do not. To this point, we have considered the circle-of-fifths as the voice-leading foundation for diatonic harmony. In this case, the ii chord would be the “primary” pre-dominant function, and in many ways, this is true. The IV chord, however, holds a special place in harmony because of its role as the *subdominant*–the opposite pole of the dominant–as well as the high frequency throughout history of the I-IV-V-I progression.

Generally speaking, root position ii chords and root position IV chords are equally strong and follow standard doubling conventions. When the ii chord is in first inversion, however, it can be voiced as if it is the functional substitution of a root-position IV chord meaning that a ii6 chord often takes its doubling from a root-position IV chord. (In the same way that a viio chord takes its doubling from a V7 chord.) Try this on the following progressions. (Make sure to consider the common direction and motion for upper voices tend to do when a root position IV chord moves to a V chord.)

{% capture ex3 %}X:3 T:Using functional substitutions for pre-dominants M:4/4 L:1/4 Q:1/4=70 K:C V:1 [cE]xxx| [cE]xxx|| [cE]xxx|] V:2 clef=bass [C,G,] [F,,] [G,,] [C,]| [C,G,] [F,,] [G,,] [C,]| [C,G,] [F,,] [G,,] [C,]|] w:C:I IV V I I ii6 V I I ii6/5 V I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Conclusions

While it is certainly possible to voice the pre-dominant function chords in these progressions following standard doubling conventions, it can create less than appealing voicings for the ii chord, particularly in its triad form. When in first inversion, you may choose to double the third of the ii, in which case, it is acting as a functional substitution of a root-position IV chord.

{% capture ex5 %}X:5 T:Using functional substitutions for pre-dominants M:4/4 L:1/4 Q:1/4=70 K:C V:1 [cE][dF][BD][cE]|] V:2 clef=bass [C,G,] [F,,A,] [G,,G,] [C,G,]|] w:C:I ii6 V I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

## Passing chords

Thus far, we have only described a chord’s function using the *primary* functions of tonic, dominant, and pre-dominant. We now add a new category of functions called *tertiary* functions–which we will discuss in detail in the next topic, Unit 11d–and our first type of tertiary function is the *passing chord*. (If you are wondering why we are skipping over secondary functions, we will cover those in Unit 14.) A *passing chord* is a chord that is inserted between two other chords to create stepwise motion within a voice–usually in the bass line. You can consider *passing* a function that removes a chord’s standard function (i.e. tonic, dominant, and predominant), and instead extends the function of the chords on either side.

Let’s see how this works by attempting an example that seemingly breaks all of our harmonic progressions norms. When you first look at the progression below, you should immediately notice that a V chord resolves to a IV chord–which does not follow our harmonic flowchart of primary functions. While this is generally true, there is something happening here that requires you to look at the bigger picture. Try to harmonize the following progression using your best voice-leading, and as you do so, pay particular attention to the motion within each voice. You will notice that there is no tenor voice in the first chord, so you may try multiple options to see if you can find a solution for a tenor voice that fulfills all guidelines thus far.

{% capture ex4 %}X:4 T:Passing chords M:4/4 L:1/4 Q:1/4=60 K:C V:1 [cE][d][c][d]| [c]4|] V:2 clef=bass [C,][B,,][A,,][G,,]| [C,]4|] w:C:I V6 IV6 V7 I{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

### Conclusions

In the example above, the melodic, stepwise motion of the bass line traps us into making some difficult harmonic choices. We want to end on a PAC, which means that as we extend the progression backward, we don’t have any choices that would follow our standard harmonic flowchart of primary functions. (Please refer to Unit 7a if you need a refresher on primary functions in diatonic harmony.) We can use a pre-dominant function on beat 3 to lead to our dominant function chord on beat 4, but there are no primary function harmonies that lead to a pre-dominant that also incorporate the leading tone of the bass line. (Of note, the IM7 is not used in this style of composition; you are welcome to try it and you will notice that it doesn’t sound to out of place, but we would analyze this as two beats of a I chord with a passing tone (non-chord tone) on the second beat of the bass line.)

The solution is to use another dominant chord on beat 2. Even though we would not normally have a dominant harmony resolve to a IV chord, in this case, the IV chord is not functioning as a IV chord with its typical primary function as a pre-dominant chord. Instead, it has taken on a *tertiary function* as a *passing chord*. Look at the voice-leading within each voice of this completed example:

{% capture ex6 %}X:6 T:Passing chord extending dominant function M:4/4 L:1/4 Q:1/4=60 K:C V:1 [cE][dD][cF][dF]| [cE]4|] V:2 clef=bass [C,G,][B,,G,][A,,A,][G,,B,]| [C,C]4|] w:C:I V6 IV6 V7 I{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

If you were to ignore the fact that beat 3 forms a standard triad, you can assign each voice on beat 3 to a standard non-chord tone label, as if it were not part of a harmony. - The soprano voice is a neighbor tone between the two Cs. - The alto voice is an anticipation of the F on beat 4. - The tenor voice is a passing tone between beats 2 and 4. - And most importantly, the bass voice is a passing tone between beats 2 and 4. So even though a V chord does not usually resolve to a IV chord, in this particular case, it only *looks* as if it is resolving to a IV chord. In reality, each voice is simply moving through a non-chord tone…which happens to form a standard triad on beat 3. So instead of trying to label the IV chord as having a standard function, you would say that it’s function is extending the dominant function on either side of it.

So when this happens, we still want to acknowledge that the chord exists, but we also want to note that it is no longer a primary function. We will discuss the notation of of tertiary functions more in the next topic, but for now, label them using their standard Roman numeral and inversion figure, but put the Roman numeral inside of parentheses with a label of “pass” directly beneath it. Note that passing chords–meaning chords who create passing motion in one or more voices–act as if they are a group of non-chord tones. You may even think of them as “non-chord tone chords” if that helps. A listener will hear this progression as an extension of the dominant function, not as an alternating dominant/pre-dominant/dominant pattern. Any inversion of a chord can be classified as a passing chord as long as it creates stepwise motion in one or more voices–usually the bass voice–and it is common for many first- and third-inversion chords function this way.

You may also notice that we have an unusual doubling on the IV6 chord, but once we discuss second inversion chords in the next unit, we will be able to update the guidelines for doubling chord tones to more closely reflect what exists in music.

# Class discussion

There are a lot of counterpoint rules, but you can eliminate possible errors by priotizing things that those rules don’t pertain to: - Stepwise motion! There’s a lot of rules that have to do with usage of skips and leaps, and by focusing on stepwise motion you avoid these - Your counterpoint will *always* end with re in one voice and ti in the other. If you put yourself in a position to get to those notes that bar before the penultimate bar, the last two measures will write themselves - Focus on using imperfect consonances/sixths and thirds. These have less rules than perfect consonances - Be mindful of how you approach skips and leaps if you have to use them

# Further reading

## From *Open Music Theory*

### Embellishing tones

#### Passing Tone (PT)

A passing tone is a melodic embellishment (typically a non-chord tone) that occurs between two stable tones (typically chord tones), creating stepwise motion. The typical figure is *chord tone – passing tone – chord tone*, filling in a third (see example), but two adjacent passing tones can also be used to fill in the space between two chord tones a fourth apart. A passing tone can be either accented (occurring on a strong beat or strong part of the beat) or unaccented (weak beat or weak part of the beat).

#### Complete Neighbor Tone (NT)

Like the passing tone, a complete neighbor tone is a melodic embellishment that occurs between two stable tones (typically chord tones); however, a complete neighbor tone will occur between two instances of the same stable tone. Also like the passing tone, movement from the stable tone to the neighbor tone and back will always be by step. A complete neighbor can be either accented or unaccented, but unaccented is more common.

#### Double Neighbor Figure (DN)

Like the complete neighbor figure, the double neighbor figure begins and ends on the *same* stable tone (typically a chord tone). Between those two instances of the stable tone are two embellishing tones — one a step above and the other a step below the stable tone being embellished. Though individually we may consider each of the two embellishing tones to be incomplete neighbors (below), working together in the double-neighbor figure they balance each other out and create a contiguous whole, with the overall stability of a complete neighbor. A double neighbor figure is typically unaccented.

#### Incomplete Neighbor Tone (INT)

The incomplete neighbor tone is an unaccented embellishing tone that is approached by leap and proceeds by step to an accented stable tone (typically a chord tone). Broadly speaking an incomplete neighbor tone is any embellishing tone a step away from a stable tone that proceeds or follows it (and is connected on the other side by leap), but other kinds of incomplete neighbor tones have special names and roles that follow below.

#### Appoggiatura (APP)

An appoggiatura is a kind of incomplete neighbor tone that is accented, approached by leap (usually up), and followed by step (usually down, but always in the opposite direction of the preceding leap) to a more stable tone (typically a chord tone).

#### Escape Tone (ESC)

An escape tone, or *echappée*, is a kind of incomplete neighbor tone that is unaccented, preceded by step (usually up) from a chord tone, and followed by leap (usually down, but always in the opposite direction of the preceding step).

#### Anticipation (ANT)

An anticipation is essentially an otherwise stable tone that comes too early. An anticipation is typically a non-chord tone that will occur immediately before a change of harmony, and it will be followed on that change of harmony by the same note, now a chord tone of the new harmony. It is typically found at the ends of phrases and larger formal units.

#### Syncopation (SYN)

[Syncopation](http://openmusictheory.com/syncopation.html) occurs when a rhythmic pattern that typically occurs on strong beats or strong parts of the beat occurs instead on weak beats or weak parts of the beat. Like the anticipation, the syncopated note is an early arrival — it tends to belong to the chord on the following beat. Unlike the anticipation, the syncopation is tied into a note in that chord; it is not rearticulated. Rather than anticipating a note in the chord that follows, a syncopation is simply an early arrival.

#### Suspension (SUS)

A suspension is formed of three critical parts: the *preparation* (accented or unaccented), the *suspension* itself (accented), and the *resolution* (unaccented). The preparation is a chord tone (consonance). The suspension is *the same note* as the preparation and occurs simultaneous with a change of harmony. The suspension then proceeds down by step to the resolution, which occurs over the same harmony as the suspension. The suspension is in many respects the opposite of the syncopation: if the anticipation is an early arrival of a tone belonging to the following chord, a suspension is a lingering of a chord tone belonging to the previous chord that forces the late arrival of the new chord’s chord tone. However, in composition and improvisation, the suspension must be treated with a great deal more care than the syncopation. The most common suspensions (and their resolutions) in upper voices form the following intervallic patterns against the bass: 9–8, 7–6, 4–3. (With the exception of 9–8, the pitch class of the resolution tone should never sound in another voice simultaneous with the suspended tone.) Instead of *SUS*, it is more typical to notate the intervallic pattern in the thoroughbass figures.

#### Retardation (RET)

A retardation is essentially an upward-resolving suspension. It is almost always reserved for the final chord of a large formal division (or a movement), and it frequently appears simultaneously with a suspension (as seen in the example). Instead of *RET*, it is preferable to notate the intervallic pattern in the thoroughbass figures.

### Second species counterpoint

## The counterpoint line

As in first species, the counterpoint line should be singable, have a good shape, with a single climax and primarily stepwise motion (with some small leaps and an occasional large leap for variety). However, because a first-species counterpoint had so few notes, in order to maintain smoothness in other aspects of the exercise, the melody frequently employed small leaps. In second species, the increase in notes and the added freedom involving the use of dissonance makes it easier to move by step without causing other musical problems. Thus, a second-species counterpoint is even *more dominated by stepwise motion* than in first species.

If the counterpoint must leap, take advantage of the metrical arrangement to diminish the attention drawn to the leap: leap from strong beat to weak beat (within the bar) rather than from weak beat to strong beat (across the barline) when possible.

Also, because there are more notes in a second species line, there should usually be one or two *secondary climaxes*—notes lower than the overall climax that serve as “local” climaxes for portions of the line. This will help the integrity of the line, by ensuring it has a coherent shape and does not simply wander around.

### Beginning a second-species counterpoint

As in first species, begin a second-species counterpoint above the cantus firmus with *do* or *sol*. Begin a second-species counterpoint below the cantus firmus with *do*. Unisons are permitted for the first and last dyads of the exercise.

A second-species line can begin with two half notes in the first bar, or a half rest followed by a half note. Beginning with a half rest establishes the rhythmic profile more readily, making it easier for the listener to parse, so it is often preferable. It is also easier to compose. Regardless of rhythm, the first pitch in the counterpoint should follow the intervallic rules above.

### Ending a second-species counterpoint

The final pitch of the counterpoint should be *do*, as in first species.

The penultimate note of the counterpoint should be *ti* if the cantus is *re*, and *re* if the cantus is *ti*, as in first species.

The penultimate bar of the counterpoint can either be a *whole note* (making the last two bars identical to first species), or two half notes. Which option you use will depend on how you are approaching the final bar. (This is simply a historical convention, not a musical necessity. But the added degree of freedom makes it easier to move into the final arrival smoothly without adding too many complicating factors.)

### Strong beats

*Because the inclusion of dissonance in a musical texture creates new musical problems that need to be addressed, second species introduces dissonance in a very limited way. This is not a musical necessity, and it’s not the only way to address dissonance, but it helps by introducing a small number of new musical difficulties in each species.*

Strong beats (downbeats) in second species are *always consonant*. As in first species, prefer imperfect consonances (thirds and sixths) to perfect consonances (fifths and octaves), and avoid unisons.

Because motion across bar lines (from weak beat to strong beat) involves the same kind of voice motion as first species (two voices moving simultaneously), follow the same principles as first species counterpoint. For instance, if a weak beat is a perfect fifth, the following downbeat must not also be a perfect fifth.

Likewise progressions from downbeat to downbeat must follow principles of first-species counterpoint. The following are some examples, but not an exhaustive list:

* Do not begin two consecutive bars with the same perfect interval.
* Do not outline a dissonant melodic interval between consecutive downbeats. (Exception: if the counterpoint leaps an octave from the strong beat to the weak beat, the leap should be followed by step in the opposite direction making a seventh with the preceding downbeat. This is okay, since it is the result of smooth voice motion.)
* Do not begin more than three bars in a row with the same imperfect consonance.

*Hidden* or *direct fifths/octaves* between successive downbeats are fine, as the effect is weak, and the intervening note in the counterpoint diminishes that effect.

### Weak beats

Since harmonic dissonances can appear on weak beats, a mixture of consonant and dissonant intervals on weak beats is the best way to promote variety.

Unisons were problematic in first species because they diminished the independence of the lines. However, when they occur on the weak beats of second species and are the result of otherwise smooth voice-leading, the rhythmic difference in line is sufficient to maintain that independence. Thus, unisons are permitted on weak beats when necessary to make good counterpoint between the lines.

Any weak-beat dissonance must follow the pattern of the *dissonant passing tone*, explained below. Also explained below are a number of standard patterns for consonant weak beats. Chances are high that if your weak beats do not fit into one of the following patterns, there is a problem with the counterpoint, so use them as a guide both for composing the counterpoint, and for evaluating it.

### Weak beat patterns

The following patterns (whose terms are either standard or taken from Salzer & Schachter’s *Counterpoint in Composition*) should guide your use of weak-beat notes in a second-species counterpoint line. A good general practice is to start with a downbeat note, then choose the following downbeat note, and finally choose a pattern below that will allow you to fill in the space between downbeats well.

Most of these are used as examples in the demonstration video at the bottom of the page.

#### Dissonant weak beats

*All dissonant weak beats in second species are dissonant passing tones*, so called because the counterpoint line passes from one consonant downbeat to another consonant downbeat by stepwise motion. The melodic interval from downbeat to downbeat in the counterpoint will always be a third, and the passing tone will come in the middle in order to fill that third with passing motion.

Since all dissonances in second species are passing tones, you will never leap into or out of a dissonant tone, nor will you change directions on a dissonant tone, nor will any dissonances occur on a downbeat.

#### Consonant weak beats

A *consonant passing tone* outlines a third from downbeat to downbeat, and has the same pattern as the dissonant passing tone, except that all three tones (downbeat, passing tone, downbeat) are consonant with the cantus. A consonant passing tone will always be a sixth or perfect fifth above/below the cantus.

A *substitution* also outlines a third from downbeat to downbeat. However, instead of filling it in with stepwise motion, the counterpoint leaps a fourth and then steps in the opposite direction. It is called a substitution because it can substitute for a passing tone in a line that needs an extra leap or change of direction to provide variety. Like the consonant passing tone, all three notes in the counterpoint must be consonant with the cantus.

A *skipped passing tone* outlines a fourth from downbeat to downbeat. The weak-beat note divides that fourth into a third and a step. Again, all three intervals (downbeat, skipped passing tone, downbeat) are consonant with the cantus.

An *interval subdivision* outlines a fifth or sixth between successive downbeats. The large, consonant melodic interval between downbeats is divided into two smaller consonant leaps. A melodic fifth between downbeats would be divided into two thirds. A melodic sixth between downbeats would be divided into a third and a fourth, or a fourth and a third. Not only must all three *melodic* intervals be consonant (both note-to-note intervals and the downbeat-to-downbeat interval), but each note in the counterpoint must be consonant with the cantus.

A *change of register* occurs when a large, consonant leap (P5, sixth, or octave) from strong beat to weak beat is followed by a step in the opposite direction. It is used to achieve melodic variety after a long stretch of stepwise motion, to avoid parallels or other problems, or to get out of the way of the cantus to maintain independence. It should be used infrequently. And as always, each note must be consonant with the cantus.

A *delay of melodic progression* outlines a step from downbeat to downbeat. It involves a leap of a third from strong beat to weak beat, followed by a step in the opposite direction into the following downbeat. It is called a “delay” because it is used to embellish what otherwise is a slower first-species progression (motion by step from downbeat to downbeat).

A *consonant neighbor tone* occurs when the counterpoint moves by step from downbeat to weak beat, and then returns to the original pitch on the following downbeat. If the first downbeat makes a fifth with the cantus, the consonant neighbor will make a sixth, and *vice versa*.

## Demonstration

In the following video, I illustrate the process of composing a second-species counterpoint. This video provides new information about the compositional process, as well as concrete examples of the above rules and principles.

# Class discussion

TBD

# Class discussion

**Parallel perfect octaves (PP8)** - What causes this part-writing error? - Both tones in our example are the leading tone of I–we have doubled thirds! - Why is this bad? - Lack of voice independency. A bunch of parallel motion can cause voices to bleed together, and then when they separate again it can be jarring to the overall texture - If you were going to fix this, how would you do it? - Have soprano sing a D in the first note of the second measure? (techincally yes, but it makes a jumpier melody which isn’t ideal) - In the same place, change the tenor to a D instead of the soprano? - Double the G in the lower two voices? - Have soprano sing a D on the second and third chords? - BASICALLY: fixing the errors is never as simple as you want it, and there’s a bunch of different ways to do it. Fixing them can be…trial and error :)

**Parallel perfect fifths (PP5)** - Still considered a PP5 even in distant voices? - Yes! Any of these movement errors can happen between any 2 voices

**Contrary perfect fifths and octaves (CP5, CP8)** - Usually happens when trying to fix a parallel movement error by moving one voice an octave down. It isn’t ideal to sing and usually creates spacing errors as a result - Red flag: if there’s a HUGE leap in one of the voices, there’s probably a contrary P5 or P8

**Unacceptable unequal fifths (UU5)** - movement from a d5 to a P5 - must involve the bass - Red flag: tendency tones not resolving the way they’re supposed to - Ex: in C, B and F resolving to C and G. F is the seventh of a G7 chord and is supposed to resolve downward by step to the third of the next chord, but it went up to G instead. - There is no octaves version of this one, fifths only

**Unacceptable similar fifths and octaves (US5, US8)** - The most restrictve of these movement errors, so if you look for the specifics it will be easy to find! - Can only happen in the soprano and bass - Red flag: Skip of a third or more in the soprano voice + similar motion in soprano and bass - Second interval must be a P5 or P8. What matters is what interval it lands on, not what it starts on

## Class Discussion

*(Only 8 diatonic intervals. The rest are chromatic)*

**How do you explain size?**

-How many lines and spaces are there? (Include the bottom and top; space, line, space; 3rd)

-Letter names (C, D, E; 3rd)

**How do you explain interval quality?**

-The way it sounds and fits in the major scale.

-You can find any interval starting on “Do” going up (ascending). These can be major, minor, or perfect in quality.

-You can group Perfect, Augmented, and Diminished together (Perfect heiarchy). Also, major and minor can be grouped together (major/minor heiarchy).

**How do inversions work?**

-You move one note an octave towards the other note. This is its inversion.

-Subtract the original interval from 9 (gives you size) and alter the quality (minor/major, augmented/diminished, perfect/perfect)

**Harmonic vs Melodic**

-Harmonic are played together.

-Melodic are played separate.

**What is the difference between a simple and compound interval?**

-Simple are 1-7

-Compound is adding an octave+ to a simple interval.

-Add 7 to the original interval to get the compound size.

**Diatonic vs Chromatic**

-Diatonic intervals occur within the key signature.

-Chromatic intervals have altered notes.

*(Add a note in “Important Concepts” about 7ths (?))*

## Further Reading

### From *Open Music Theory*

### Defining an Interval

An *interval* is the distance between two pitches, usually measured as a number of steps on a scale.

A *dyad* is a pair of pitches sounding together (in other words, a two-note chord). Since a dyad is defined by the interval between the two pitches, dyads are often simply called intervals.

Thus, the term *interval* regularly refers both to the distance between two pitches on a scale and to a dyad whose pitches are separated by that distance.

### Diatonic intervals

More commonly for tonal music, we are interested in the number of steps on the diatonic (major or minor) scale. This is a bit tricky—not because it’s difficult, but because it’s counter-intuitive. Unfortunately, the system is too old and well engrained to change it now! But once you get past the initial strangeness, diatonic intervals are manageable.

When identifying a diatonic interval, begin with the *letter names only*. That is, treat C, C-sharp, and C-flat all as *C* for the time being. Next, count the number of steps (different letters) between the two pitches in question, *including both pitches in your count*. This gives you the *generic interval*.

For example, from C4 to E4, counting both C and E, there are three diatonic steps (three letter names): C, D, E. Thus, the generic interval for C4–E4 is a *third*. The same is true for any C to any E: C#4 to E4, Cb4 to E#4, etc. They are all diatonic thirds.

Three kinds of generic thirds.

Three kinds of generic thirds.

Often more specificity is needed than generic intervals can provide. That specificity comes in the form of an interval’s *quality*. Combining *quality* with a generic interval name produces a *specific interval*.

There are five possible interval qualities:

* augmented (A)
* major (M)
* perfect (P)
* minor (m)
* diminished (d)

To obtain an interval’s quality, find both the generic interval and the chromatic interval. Then consult the following table to find the specific interval.

|  | unis. | 2nd | 3rd | 4th | 5th | 6th | 7th | oct. |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| i0 | P1 | d2 |  |  |  |  |  |  |
| i1 | A1 | m2 |  |  |  |  |  |  |
| i2 |  | M2 | d3 |  |  |  |  |  |
| i3 |  | A2 | m3 |  |  |  |  |  |
| i4 |  |  | M3 | d4 |  |  |  |  |
| i5 |  |  | A3 | P4 |  |  |  |  |
| i6 |  |  |  | A4 | d5 |  |  |  |
| i7 |  |  |  |  | P5 | d6 |  |  |
| i8 |  |  |  |  | A5 | m6 |  |  |
| i9 |  |  |  |  |  | M6 | d7 |  |
| i10 |  |  |  |  |  | A6 | m7 |  |
| i11 |  |  |  |  |  |  | M7 | d8 |
| i12 |  |  |  |  |  |  | A7 | P8 |

For example, C4–E4 is a generic third, and has a chromatic interval of i4. A third that encompasses four semitones is a *major third* (M3). Note that both generic interval and chromatic interval are necessary to find the specific interval, since there are multiple specific diatonic intervals for each generic interval and for each chromatic interval.

Note that some generic intervals can be augmented, perfect, or diminished, and other intervals can be augmented, major, minor, or diminished. There is no generic interval that can be both major/minor and perfect; if it can be major or minor, it cannot be perfect, and if it can be perfect, it cannot be major or minor. An augmented version of an interval is always one semitone wider than major or perfect; diminished is always one semitone smaller than minor or perfect.

Solfège can also help to determine the specific interval. Each pair of solfège syllables will have the same interval, no matter what the key, as long as it is clear which syllable is the lower pitch and which is the upper pitch. Memorizing the intervals between solfège pairs can help speed along your analysis of dyads as they appear in music. For example, knowing that *do*–*mi*, *fa*–*la*, and *sol*–*ti* are always major thirds and knowing that *re*–*fa*, *mi*–*sol*, *la*–*do*, and *ti*–*re* are always minor thirds will allow for faster analysis of dyads in major keys.

### Chromatic intervals

The simplest way to measure intervals, particularly at the keyboard, is to count the number of half-steps, or *semitones*, between two pitches. To determine the chromatic interval between C4 and E4, for example, start at C4 and ascend the chromatic scale to E4, counting steps along the way: C#4, D4, D#4, E4. E4 is four semitones higher than C4. Chromatic intervals are notated with a lower-case **i** followed by an Arabic numeral for the number of semitones. C4–E4 is four semitones, or **i4**.

Chromatic steps from C4 to E4.

Chromatic steps from C4 to E4.

### Compound intervals

The intervals discussed above, from unison to octave, are called *simple intervals*. Any interval larger than an octave is considered a *compound interval*. Take the interval C4 to E5. The generic interval is a tenth. However, it functions the same as C4 to E4 in almost all musical circumstances. Thus, the tenth C4–E5 is also called a *compound third*. A compound interval takes the same quality as the corresponding simple interval. If C4–E4 is a major third, then C4–E5 is a major tenth.

Simple and compound major thirds.

Simple and compound major thirds.

### Interval inversion

In addition to C4–E4 and C4–E5, E4–C5 also shares a similar sound and musical function. In fact, any dyad that keeps the same two pitch classes but changes register will have a similar sound and function. However, the fact that E4–C5 has E as its lowest pitch instead of C means that it has a different generic interval: E4–C5 is a sixth, not a third. Because of that difference, it will also play a different musical function in some circumstances. However, there is no escaping the relationship.

Dyads formed by the same two pitch classes, but with different pitch classes on bottom and on top, are said to be *inversions* of each other, because the pitch classes are *inverted*. Likewise, the intervals marked off by those inverted dyads are said to be *inversions* of each other.

Again, take C4–E4 (major third) and E4–C5 (minor sixth). These two dyads have the same two pitch classes, but one has C on bottom and E on top, while the other has E on bottom and C on top. Thus, they are inversions of each other.

Inversion relationship: major third and minor sixth.

Inversion relationship: major third and minor sixth.

Three relationships exhibited by these two dyads hold for all interval inversions.

First, the chromatic intervals add up to 12. (C4–E4 = i4; E4–C5 = i8; i4 + i8 = i12) This is because the two intervals add up to an octave (with an overlap on E4).

Second, *the two generic interval values add up to nine* (a third plus a sixth, or 3 + 6). This is because the two intervals add up to an octave (8), and one of the notes is counted twice when you add them together. (Remember the counterintuitive way of counting off diatonic intervals, where the number includes the starting and ending pitches, and when combining inverted intervals, there is always one note that gets counted twice—in this case, E4.)

Lastly, the major interval inverts into a minor, and vice versa. This always holds for interval inversion. Likewise, an augmented interval’s inversion is always diminished, and vice versa. A perfect interval’s inversion is always perfect.

major ↔ minor  
augmented ↔ diminished  
perfect ↔ perfect

Interval inversion may seem confusing and esoteric now, but it will be an incredibly important concept for the study of voice-leading and the study of harmony.

### Methods for learning intervals

Ultimately, [intervals](intervals.html) need to be committed to memory, both aurally and visually. There are, however, a few tricks to learning this quickly. One such trick is the so-called *white-key method*.

#### White-Key Method

The *white-key method* requires you to memorize all of the intervals found between the white keys on the piano (or simply all of the intervals in the key of C major). Once you’ve learned these, any interval can be calculated as an alteration of a white-key interval. For example, we can figure out the interval D4-F#4 if we know that the interval D4-F4 is a minor third, and this interval has been made one semitone larger: a major third.

Conveniently, there is a lot of repetition of interval size and quality among white-key intervals. Memorize the most frequent type, and the exceptions.

All of the seconds are *major* except for two: E-F, and B-C, which are *minor*.

All of the thirds are *minor* except for three: C-E, F-A, and G-B, which are *major*.

All of the fourths are *perfect* except for one: F-B, which is *augmented*.

Believe it or not, you now know *all* of the white-key intervals, as long as you understand the concept of *interval inversion*. For example, if you know that all seconds are major except for E-F and B-C (which are minor), then you know that all *sevenths* are minor except for F-E and C-B (which are major).

Once you’ve mastered the white-key intervals, you can figure out any other interval by adjusting the size accordingly.

### Melodic and harmonic intervals

The last distinction between interval types to note is *melodic* v. *harmonic* intervals. This distinction is simple. If the two pitches of a dyad sound at the same time (a two-note chord), the interval between them is a *harmonic interval*. If the two pitches in question are sounded back-to-back (as in a melody), the interval between them is a *melodic interval*. This distinction is important in voice-leading, where different intervals are preferred or forbidden in harmonic contexts than in melodic contexts. The difference is also important for listening, as hearing melodic and harmonic intervals of the same quality requires different techniques.

### Consonance and dissonance

Intervals are categorized as *consonant* or *dissonant* based on their sound (how stable, sweet, or harsh they sound), how easy they are to sing, and how they best function in a passage (beginning, middle, end; between certain other intervals; etc.). Different standards apply to melody and harmony. The following categories will be essential for your work in strict voice-leading, and they will be a helpful guide for free composition and arranging work, as well.

**Melodic consonance and dissonance**

The following *melodic* intervals are *consonant*, and can be used in strict voice-leading both for successive pitches and as boundaries of stepwise progressions in a single direction:

* All perfect intervals (P4, P5, P8)
* All diatonic steps (M2, m2)
* Major and minor thirds
* Major and minor sixths

All other *melodic* intervals are *dissonant*, and must be avoided for successive pitches and as boundaries of stepwise progressions in a single direction, including:

* All augmented and diminished intervals (including those that are enharmonically equivalent to consonant intervals, such as A2 and A1)
* All sevenths

**Harmonic consonance and dissonance**

The following *harmonic* intervals are *imperfect consonances*, and can be used relatively freely in strict voice-leading (except for beginnings and endings):

* Major and minor thirds
* Major and minor sixths

The following *harmonic* intervals are *perfect consonances*, and must be used with care in limited circumstances in strict voice-leading:

* All perfect intervals *except the perfect fourth* (P1, P5, P8)

All other *harmonic* intervals are *dissonant*, and must be employed in very specific ways in strict voice-leading, including:

* All diatonic steps (M2, m2)
* All augmented and diminished intervals (including those that are enharmonically equivalent to consonant intervals, such as A2 and A1)
* All sevenths
* Perfect fourths

### Class Discussion

**Definitions of new/unfamiliar terms for leadsheet notation:** - Extended Harmony: Adding notes past our normal triads and 7th chords. Ex. C9 - Sub: taking one note out of the chord and replacing it with another. Ex. D11^(sub #11) - Add: adding extra notes to the chord. Ex. Ab7^(add 4) - Note: ^ symbol indicates superscript text. How we’re “supposed” to interpret leadsheet notation can change depending on the composer. One might not care whether you interpret C^11 as adding an 11th or a 4th, whereas others will *specifically* want an 11th because of how its sound differs from a 4th

**What is the difference beteen an add 6 chord and an inverted minor seventh chord? (Ex: C^6 and Am7/C?)** - This is the point where roman numeral analysis becomes more useful! Leadsheet notation = construction, roman numeral analysis = finding function. The two chords have vastly different functions even though they contain the same notes and are shaped in the same way

**What do we sub out in a sub chord?** - Whatever is closest! Ex: C (sub 6) replaces the 5th with the 6th

**Why is leadsheet notation important for our class?** - Another way of organization? - Understanding a chord can be more than one thing? - Figured bass purposes? - Easily understandable without having to bring tonality into it - Yes! Roman numerals rely on context, but leadsheet notation doesn’t.

## Further Reading

### From *Open Music Theory*

#### Lead-sheet symbols

A triad can be summed up by a single symbol, such as a lead-sheet chord symbol. A lead sheet symbol includes information about both root quality, as well as which pitch class occurs in the lowest voice (called the *bass* regardless of who is singing or playing that pitch).

A lead-sheet symbol begins with a capital letter (and, if necessary, an accidental) denoting the root of the chord. That letter is followed by information about a chord’s quality:

* major triad: no quality symbol is added
* minor triad: lower-case “m”
* diminished triad: lower-case “dim” or a degree sign “°”
* augmented triad: lower-case “aug” or a plus sign “+”

Finally, if a pitch class other than the chord root is the lowest note in the chord, a slash is added, followed by a capital letter denoting the pitch class in the bass (lowest) voice.

A C-major triad’s lead-sheet symbol is simply **C**. A C-minor triad is **Cm**. A D-sharp-diminished triad with an F-sharp in the bass is **D#dim/F#**. And so on.

Four qualities of triads with lead-sheet symbols.

Four qualities of triads with lead-sheet symbols.

# Class discussion

For those that heard the measure in the syncopation example as a bar of 7/8: what pulls your ear that way? - The notes within the piece sound as if they could be in 7/8 in context–higher notes sound like they should be downbeats

Factors that changed how we heard the melodic shape example? - Made of ascending lines–melodic contour creates an accent

# Further Reading

## From Open Music Theory

### Syncopation

*Syncopation* occurs when a rhythmic pattern that typically occurs on strong beats or strong parts of the beat occurs instead on weak beats or weak parts of the beat. Most pop/rock songs have a mixture of syncopated and “straight” rhythms. The syncopated rhythms are usually easy to sing, since they often match speech better than straight rhythms. However, they are more difficult than straight rhythms to sight-sing, dictate, or transcribe.

## Straight syncopations

In contemporary pop/rock music, syncopation typically involves taking a series of notes of equal durations, cutting the duration of the first note in half, and shifting the rest early by that half duration.

For example, a series of four quarter notes, all sounding on the beat, can be transformed in this way by making the first note into an eighth note, and sounding each successive quarter note on eighth note early—all on the *offbeats*.

This process can occur on any metrical level. If the duration of the series of “straight” notes is two beats, they will be syncopated by changing the first note to a single beat and shifting each other note early by a beat. If the duration of the straight notes, like the figure above, is a beat, they will be syncopated by a division (one half beat in simple meter). If the straight notes are each divisions, they will be syncopated by shifting each note by a subdivision. The unit of syncopation (the duration of the first note, and the amount of shift applied to the following notes) is always half of the duration of the straight notes. All of these syncopations are realtively common in contemporary pop/rock music.

As a convention, when we take a series of notes that each have a duration of one beat and shift them early by half of a beat, we will call that *beat-level syncopation*. When we take a series of notes that each have a duration of one division and shift them early by a subdivision, we will call that *division-level syncopation*.

*Beat-level syncopation.*

*Division-level syncopation.*

(Note the use of ties to make each beat clear. Always do this in order to make it easy to read.)

## Transcribing straight syncopations

Straight syncopated rhythms are easily identified by the frequently occuring off-beat rhythms. For example, if you conduct or tap the counting pulse while listening to a song, several notes in a row that are articulated between your taps or conducted beats, with no notes articulated simultaneously with the counting pulse, indicate syncopation.

Once you identify a syncopated passage—which may only involve two or three notes—figure out on what metrical level the syncopation occurs. For example, in simple meter, if no notes are articulated directly on the counting pulse beats and one note is articulated in between each beat, the syncopation is occuring at the beat level. If no notes are articulated directly on the counting pulse beats and *two notes* are articulated in between each beat, listen to the passage again while tapping the *division*. If no notes are articulated directly on the division taps and one note is articulated in between each tap, the syncopation is occuring at the division level.

Once you have determined the metrical level on which the syncopation occurs, determine the durational value of the shift. If the syncopation occurs on the beat level (one note sounding between each counting pulse beat), the value of syncopation is a division: each beat-length note has been shifted one division early. If the syncopation occurs on the division level, the value of syncopation is a subdivision: each division-length note has been shifted one subdivision early.

Lastly, determine how the syncopated pattern begins. Does the offbeat pattern simply begin offbeat? Or does the pattern begin with two quick notes back-to-back as above—one short note on the beat followed by the first of the longer syncopated notes?

Once you have determinted the level of syncopation, the duration of the shift, and whether or not the pattern begins with a truncated onbeat note, the rhythmic pattern should be easy to notate. If, however, you are still having difficulty, try using the lyric syllables and the stress patterns of the lyrics to help you keep track of the individual notes and which ones are on/offbeat. Writing lyrics down before notating the rhythm can be a big help.

## Fake triplets

Another common rhythmic pattern in pop/rock is to divide a beat (or two beats) into three almost-equal groups. For example, dividing a half note into two dotted-eighth notes and an eighth note (3+3+2). Since this pattern approximates a triplet while still maintaining the simple division of beats by 2, 4, 8, etc., we can call them *fake triplets*.

Fake triplets are more common than “real” triplets in most pop/rock genres, but both do occur, so take care to distinguish between the two. “Cathedrals” by Jump, Little Children contains examples of both (as well as some straight syncopation), and is an excellent example for practicing performing and identifying fake and real triplets.

While fake triplets occur most often in 3+3+2 groupings, 3+2+3 and 2+3+3 are also possible.

A related pattern is what we might call *fake sextuplets*. Here the 3+3+2 pattern is doubled, resulting in 3+3+3+3+2+2.

In the opening of “Electric Co.” by U2, the guitar plays subdivisions (sixteenths) grouped 3+3+3+3+2+2, while the kick drum plays straight beats (quarters) under the hi-hat playing straight subdivisions.

## Demo

The following video walks through the process of transcribing straight syncopations in the song “Shh” by Frou Frou.

# Class discussion

What strategies are you using to voice these progressions with modal mixture?

-Try to find stepwise motion in each voice. Voice leading!

-Write parts chord by chord? or write parts one voice at a time?

-Keep in mind our traditional voice leading rules. We want to keep our voices independent.

-Start from the beginning? (maybe not) The voice leading can be easier to manage if you start from the end and work backwards.

-In a weird kind of way, smooth voice leading trumps function and can make these progressions with modal mixture sound convincing. ii should not go to I by our traditional rules, but ii%7 sure can because it has such good voice leading.

Modal Mixture or non-chord tone?

-Look for whether or not it is on or off the beat. This can determine the strength of the chromatic pitch

-Is it in the melody? If so, it can be heard as a passing tone.

-Look at the duration of the pitch. A longer note could more easily be argued into being a chord tone of modal mixture.

## Harmonizations demonstrated in class

*Poor voice leading* {% capture ex1 %}X:1 T:Sample mode mixture M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cEG] [\_BDF]| [cABF] [DF\_Ac]| [C2EGc]|] V:2 clef=bass [C,] [\_B,,]| [F,,] [D,]| [C,2]|] w:C:I bVII IVM7(#11) ii%7 I{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

*Reasonable* - Each line is independent. {% capture ex2 %}X:2 T:Sample mode mixture M:4/4 L:1/2 Q:1/4=90 K:C V:1 [cE] [dF]| [BF] [cF](cantusFirmus.html)| [c2E]|] V:2 clef=bass [C,G,] [\_B,,\_B,]| [A,C,] [\_A,D,]| [C,2G,]|] w:C:I bVII IVM7(#11) ii%7 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

*Expanding beyond four voices* {% capture ex3 %}X:3 T:Sample mode mixture M:4/4 L:1/2 Q:1/4=90 K:C V:1 [GE] [\_BF]| [BF] [cF](cantusFirmus.html)| [c2G]|] V:2 clef=bass [C,C] [\_B,,D]| [A,C,E] [\_A,D,D]| [C,2G,E]|] w:C:I bVII IVM7(#11) ii%7 I{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

## Advanced Mode Mixture

When can we use mode mixture chords? - when it functions - tonic - pre-dominant - dominant - functional substitution - passing - pedal

What modes can you borrow from? - any parallel mode - the key here is parallel; the tonic can not change

#### Example: Sample Mode Mixture

Chord Symbols: C - Bb - Fmaj7(#11) - D%7 - C

Progression: I - bVII - IVM7(#11) - ii%7 - I - the I, IVM7(#11), and V are from major - the bVI and ii%7 are from aeolian - borrowed chords still follow voice leading rules - that’s how they can sound functional in a key they don’t belong in

mere exposure effect: when you hear something enough times that it begins to sound good regardless

The iiø7 (Dø7) shares 3 of 4 tones with viio7 (fucntional substitution for the dominant, also a borrowed chord). This allows the ii%7 to function as the dominant because of voice leading. A bII7 has even more tendancy tones.

Mahler’s Symphony No. 2 Mvt. 1 is full of mode mixture.

#### Example: Mode Mixture or Non-Chord Tones

Chord Symbols: C - F/C - F-/C - C Soprano: C5 - C5 - C5 - C5 Alto: E4 - F4 - F4 - E4 Tenor: G3 - A3 - Ab3 - G3 Bass: C3 - C3 - C3 - C3 Progression: I - IV - iv - I - if the Ab in the iv is positioned as a passing tone, it may not even function as a iv. - the function of the IV - iv acts as pedal plagal motion.

# Class discussion

# Further reading

## From Open Music Theory

### Combining Periods and Sentences

Hybrid themes mixes the [functional features](themeFunctions.html) of [sentences](sentence.html) and [periods](period.html). William Caplin has identified four primary types:

#### Hybrid 1

Hybrid 1 combines an [antecedent phrase](themeFunctions.html#antecedent) with a [continuation phrase](themeFunctions.html#continuation).

Antecedent + Continuation: Mozart, Piano Sonata in C major, K. 330 II, mm. 1–8

A prototypical example is found in the first eight measures of Mozart’s Piano Sonata in C major, II. The antecedent phrase contains a basic idea characterized by the repeated notes forming its anacrusis. This is followed by a contrasting idea formed from a scalar ascent leading to the phrase’s half cadence in m. 4. Following the antecedent phrase, the music begins to express continuation function, primarily through fragmentation and an increase in surface rhythm. In the middle of m. 6, the characteristic melodic motives are liquidated into conventional scalar figuration leading to a V:PAC.

#### Hybrid 2

Hybrid 2 combines an antecedent phrase with a four-measure cadential progression.

Antecedent + Cadential: Haydn, String Quartet in G major, Hob. III:66, II, mm. 1–8

Here, the four measures subsequent to the antecedent support a single cadential progression:

**I6 ii6/5 V I**

Notice that this four-measure phrase does not display any markers of [continuation function](themeFunctions.html#continuation).

#### The Compound Basic Idea

Just as we sometimes find composers combining different features of the two primary thematic types, we also often find combinations of different types of phrase. The “compound basic idea,” or CBI, combines the melodic characteristics of the [antecedent function](themeFunctions.html#antecedent) with the harmonic characteristics of the [presentation](themeFunctions.html#presentation) function. Like an antecedent, it presents a basic idea followed by a contrasting one. But like a presentation, the compound basic idea simply prolongs tonic, without ending in a cadence.

#### Hybrid 3

The third hybrid type strongly resembles the [first hybrid](hybridThemes.html#hybrid-1). Rather than beginning with an initiating antecedent, however, its first phrase is a [CBI](hybridThemes.html#the-compound-basic-idea). Following the CBI, Hybrid 3 concludes with a continuation that ends with a cadence.

Compound Basic Idea + Continuation: Beethoven, Violin Sonata, Op. 30, No. 2, III, mm. 1–8

In this example, from Beethoven’s Violin Sonata, Op. 30, the melodic structure of the initiating phrase contains two contrasting ideas, each of which begins with the same dotted figure. However, unlike a typical antecedent, the phrase only prolongs tonic as the V6 on the last beat of m. 3 only decorates the tonic through a lower neighbor motion rather than creating cadential articulation. Thus, the phrase is best understood as a [“compound basic idea.”](hybridThemes.html#the-compound-basic-idea)

The concluding phrase is a typical continuation expressed through fragmentation, melodic sequence, and increased harmonic rhythm.

#### Hybrid 4

Hybrid 4 resembles the period, with the exception that the first phrase is comprised of a “compound basic idea” rather than an antecedent. Following the [CBI](hybridThemes.html#the-compound-basic-idea), the concluding phrase expresses the function of a consequent, typically altering the return of the contrasting idea so that the theme ends with a strong cadence.

Compound Basic Idea + Consequent: Beethoven, String Quartet in G major, Op. 18/2, IV., mm. 1–8

The cello’s presentation of the initiating phrase contains two distinct melodic ideas. But this phrase’s conclusion, on the C4 in m. 4, is not sufficient to create cadential closure. When the remaining strings enter in m. 5, they work through the same basic and contrasting ideas, but are able to create a I:PAC to close the consequent phrase.

#### Compound Periods

The compound period (also called the *16-bar period* because its typical form is 16 bars long) is made of *two themes* instead of *two phrases*. Like an [8-bar period](period.html), the two halves of the compound period exhibit [antecedent](themeFunctions.html#antecedent) and [consequent](themeFunctions.html#consequent) function. To distinguish them, we will call these “large antecedents” and “large consequents.”

The thematic types available to the two halves of the compound period must be conducive to the functions of antecedent and consequent. Thus,

* the initiating phrase of the *large antecedent*, usually four bars long, will act as a basic idea - either presentation, antecedent, or compound basic idea;
* the concluding half, also typically four bars long, will act as a contrasting idea and will always be a continuation;
* the *large consequent* should return the BI from the first theme (often varied), and its concluding CI will end with a strong cadence.

These functional requirements tend to result in three types of compound period.

#### A Compound Period Comprised of Two Sentences

Both sentences in the compound period will have the same basic idea, each exhibiting presentation function. In the first sentence, the presentation is followed by a continuation that ends with a weak cadence. In the second, the continuation culminates in a strong cadence, most commonly a PAC.

Compound Period (Sent. + Sent.): Mozart, Piano Sonata in D major, K. 284, II, mm. 1–8

The large antecedent is constructed as a sentence whose basic idea is a presentation and whose contrasting idea is a continuation. Following the HC in m. 8, the next phrase restates the presentational basic idea in varied form. The final four measures culminate in a PAC.

#### A Compound Period Comprised of Two Hybrids

If the initiating phrase is composed of an antecedent, rather than a presentation, the 8-bar antecedent phrase will be a hybrid of the [“antecedent + continuation”](hybridThemes.html#hybrid-1) variety.

Compound Period (Hybrid 1 + Hybrid 1): Mozart, Piano Sonata in F major, K. 332, I, mm. 41–56

In this example the large antecedent begins with a small antecedent, comprising mm. 41-44, that acts as a basic idea. In the large consequent, this basic idea returns (mm. 49-52) in varied form.

By contrast, if the initiating phrase is composed of a [“compound basic idea”](hybridThemes.html#the-compound-basic-idea), the large antecedent will be a type-3 hybrid: compound basic idea + continuation. This type of compound period is *very similar* to the previous variety. The only distinction is that the initiating phrase will not culminate in a cadence, thus giving the theme’s initiation a looser quality.

### Compound Sentences

The compound (or 16-bar) sentence expands both the presentation and continuation phrases of a regular [sentence](sentence.html) to a length of eight bars each.

Each 2-bar basic idea is replaced by a 4-bar [compound basic idea](hybridThemes.html#the-compound-basic-idea) in the expanded presentation.

A “typical” continuation would have approximately four bars of continuation function followed by four bars of cadential function, but in a compound sentence, this varies greatly. The continuation is commonly shortened or [expanded](internalExpansions.html).

The eight bars that comprise the continuation of the main theme below are constructed from two compound basic ideas, the first beginning on tonic and moving to dominant (mm. 1-4), and the second beginning with dominant harmony and moving back to tonic (mm. 5-8).

Initially, the continuation seems as if it will end after only 4 bars, in m. 12. But the clarinet is missing at the the downbeat of m. 12, and instead begins a link to a [four-bar repetition](internalExpansions.html#phrase-expansion). In this repetition (mm. 13-16), the clarinet melody from mm. 9–12 is played by the piano, who cadences clearly with a PAC at the downbeat of m. 16.

Compound Sentence: Mozart, Trio in E-flat major for Clarinet, Viola, and Piano, K. 498, I, mm. 1-16

# Class discussion

**Harmonizing consecutive seventh chords** - We have some weird voice leading happening between the first and second chords - This is how we set up a seventh chord sequence, where instead of thirds resolving upward to the root of the next, they remain static, become sevenths, and then resolve *down* to the third of the chord after that in circle of fifths progressions. - All you have to do to turn ii7 into a V7/V is raise the third, then add a natural to the F in the G7 after that. This looks weird on paper and sucks to sight read, but for the purposes of harmonic analysis we write it this way.

**Consecutive secondary dominant chords** - It’s that fancy thirds to sevenths through static motion thing again!! - Sequences of consecutive secondary dominants can work well if you know what you’re doing! Don’t try and do this with secondary leading tone chords though, that can get really messy really quickly because voice leading for one on its own is already a nightmare. When in doubt, remember to keep it simple

**Secondary dominants and their related chords** - V/V and ii - V/ii and vi - V/vi and iii - For all of these, you identify them by listening to/noting the quality of the chord. Secondary dominants are always going to be major, while all their counterparts listed above (aka normalsauce variants) will be minor

**Deceptive resolutions of secondary dominant functions** - V7/vi should resolve to vi, but we have it going to IV instead which is weird - It’s a deceptive progression!! V7/vi - IV is V - VI in C’s relative minor, A minor - To ID this correctly, be looking for a secondary dominant chord that… - Doesn’t go where it’s supposed to - Is followed by a root position chord WITH root movement up by step

# Class discussion

**Secondary function pivot chord** - What do we do when there is no good pivot chord? Like both of them are *really* ugly? - We pivot on a secondary function chord, which isn’t ideal but, hey, it works. In our Bach example, we debated modulating on one chord vs. the other: the F chord, or the B0/D. Ultimately, 99% of the time pivoting on the B0/D is gonna be the move: we end up with vii06/ii in Bb and vii06 in the new key, C minor. This is a more sudden, dramatic sound than a common chord pivot modulation - Secondary function pivot chords are obviously possible, but if you can use a common chord pivot modulation (where both IDs are diatonic) use that instead! It’s better. - Again, you will usually see pivot modulations in the middle of a phrase. This is because they have to have a functional progression on both sides of the pivot.

**Direct modulation/Phrase modulation** - Pretty common in Broadway and country music. It’s that thing where you repeat everything you just did but up a step or a up a third! - The signal for this modulation is, to nobody’s surprise, the end of a phrase. This requires a cadence: phrases are defined by cadences, so you *have* to have a cadence right before a phrase modulation. - After this they can modulate pretty much wherever, but a lot of times you get a modulation to the iii/III because it’s a really dramatic sound, since I and iii are so far away from each other - This type of modulation is not labeled with a bracket. Instead, you designate the new key in the same line as the old one and continue as normal

**Common tone modulation** - Requires a bracket to label, but instead of the chord you label the common tones used to move between keys. We label the scale degrees, putting the scale degree in the old key above the bracket while we put the new one below (make sure to use ^ to designate the numbers as scale degrees!!) - Ex: in the Schubert excerpt we looked at in class, we modulate in the third to last measure, using the C# in the melody and the piano as our common tone. We’re moving from D minor to F# major, so we would put “^7” in the upper part of the bracket, then “F#: ^5” in the lower part. Remember that even though you’re labeling pitches instead of chords with this type of modulation, you still designate the new key in the same way as with a pivot modulation.

# Class discussion

Prime form is useful for making pitch class sets easy to compare with other pitch class sets.

Prime form is also another way we can say that pitch class sets are related. Now we can say they are related by transposition, inversion, and/or same prime form.

## Prime Form

Prime form is the way we classify types of PC sets. - commonly how we describe a PC set that creates a major triad, minor triad, etc…

#### Ex: (2,6,9)

Take (2,6,9) and align it to 0. (0,4,7) major triad. Invert (0,4,7) to (0,8,5) minor triad. Normal form for (0,8,5) is [5,8,0]. Take the normal form and realign it back to 0 (037). - prime form is written in parenthesis without commas between the intergers

#### Ex: (4,t,8,3)

What are our order options? - (3,4,8,t) / 7 - (4,8,t,3) / 11 - (8,t,3,4) / 8 - (t,3,4,8) / 10

So our normal form is [3,4,8,t]. Take the normal form and set it on zero: [0,1,5,7]. NOW invert the original normal form. - [3,4,8,t] to (9,8,4,2). - find the inversion’s normal form: - (2,4,8,9) / 7 - (4,8,9,2) / 10 - (8,9,2,4) / 8 - (9,2,4,8) / 11 - our normal form for the inversion is [2,4,8,9].

And set the inversion’s normal form on zero [0,2,6,7]. NOW you compare the two normal forms on zero. - [0,1,5,7] and [0,2,6,7] - first you find the smallest interval between the first and 4th intergers (in this case it is the same). - then you check the interval between the first and 3rd intergers (in this case the first option has a smaller interval).

**Our prime form is (0157).**

# Further reading

## From *Open Music Theory*

### Set class relationships

Lots of concepts in pitch-class set theory are best viewed along a sliding scale of “concreteness” or “abstractness.” A concept like *pitch*, for example, is very concrete, while *pitch class* is somewhat more abstract. We can perform a pitch, but we can’t really perform a pitch class. We’ve seen similar examples in the intervallic realm. Ordered pitch intervals are associated with a very specific sound (e.g., +15); unordered pitch-class intervals (e.g., interval class 1) are less vivid or real. A basic concept in pitch-class set theory is that these levels of concreteness and abstractness encompass not only pitch and interval, but groups of pitch classes as well. These groups of pitch classes are called *pitch-class sets*.

We’ve already seen sets of pitch-classes, though we haven’t really been calling them that. When we extract a group of notes from a passage of music and put them in “[normal order][1],” that group of notes is a pitch-class set. As we’ve seen in class, one very interesting way of looking at a lot of post-tonal music is by studying the [transpositional][2] and [inversional][3] relationships between pitch-class sets. In the short example below (from Bartók’s “Subject and Reflection”) you’ll notice that the right hand of the two passages is *T5*-related, as is the left-hand. Within each passage, the right and left hands are \_T8I \_and *T6I* related, respectively.

*In order for a pitch-class set to be transpositionally or inversionally related to some other pitch class set, they must share the same collection of intervals*. This is most easily grasped by remembering that all major and minor triads have the same interval content (M3, m3, and P5). Major triads are transpositionally related to one another, while major and minor triads are inversionally related to one another. The same observation applies in Bartók’s “Subject and Reflection.” The four pitch-class sets in those two passages all have the same intervallic content and that’s why we can label transpositional and inversional relationships between them.

All pitch-class sets that are transpositionally and inversionally related belong to the same *set class*, and they are represented by the same *prime form*. We follow a simple process to put a pitch-class set in prime form:

1. Put the pitch-class set in normal order.
2. Transpose it so that the first pitch class is 0.
3. Invert the results from step 2 (any inversion will work) and put the result in normal order.
4. Transpose it so that the first pitch class is 0.
5. Compare the results of steps (2) and (4). Prime form is the most compact version.

The example below walks demonstrates using the motive from Bartók’s “Subject and Reflection.”

### Prime form

*Analytically*, the concept of set class is useful because it can show coherence in a composition. Bartók’s “[Subject and Reflection][1],” for example, uses the (02357) set class nearly exclusively—though it appears in many transpositions and inversions.

*Theoretically*, the concept is useful because it provides a prism through which we can begin to study the *possibilities* provided to us by the twelve pitch-class universe. For almost 500 years, composers mostly used only a small subset of those possibilities (triads, seventh chords, and so forth). Set class lists reveals all of the other possibilities. They also give us hints as to why tonal composers used only a small portion of them and suggest entire worlds organized through other means. Fortunately for us, we don’t need to create such a list because many others have! A particularly good list is found [here][2], and I’ll give you another to keep in class.

Most of these set-class lists are organized similarly. Set classes that have the same number of notes in them (we say that they have the same “cardinality”) are grouped together: trichords (three-note pitch-class sets) sit together, as do nonachords (nine-note pitch-class sets), and so on.

Prime form for each set class is show in parenthesis. The “Forte Number” (3-1, 9-1, etc.), often adjacent to the prime form, was given to each set class by the famous music theorist [Allen Forte][4], who was one of the first to describe the set class list.

### Interval Class Vector

The interval class vector next to each set class’s prime form is particularly valuable. Think of it as a numeric representation of the “intervallic flavor” of each set class. IC vectors have six places <\_ \_ \_ \_ \_ \_> that are placeholders for interval classes 1–6. If a set class has a single interval class 1, it will have the digit 1 in the interval class vectors first placeholder. The IC vector <001110>, for example describes a trichord with 1 interval class 3, 1 interval class 4, and 1 interval class 5; that is, the major or minor triad, set class (037)!

# Class Discussion

**First- and third-inversion chords in circle-of-fifths progressions** - I - V6 - I - Melody: C D C. Can’t use C B C because we end up with a PP8 - Inner voices: alto voice is really the only one with options. D or G on the second beat are both fine, but the latter has a skip. - I - V6/5 - I - Melody: C D C again - Inner voices: we started with G F E in T, but this creates a spacing error. Keeping it simple with G G G instead takes care of that - I V4/2 - I6 - Third inversion chords in this type of progression will always move to a first inversion chord because chordal sevenths resolve down to the third of the next chord

**Voicing a viio using functional substitution** - Can’t double the root of a viio because it’s a tendency tone - The fifth is acting as the chordal seventh and follows the same resolution rules. Ex: in C, viio is B diminished. The fifth of the chord, F, will resolve down by step to E in I - Frustrated sevenths are not a thing. We can only have a frustrated leading tone - Don’t try and do viio in root position. As demonstrated in class, it doesn’t really work–we tried multiple inner voicings and all of them had a bunch of errors - I - viio - V6/5 - I - This is the one time you can double the fifth in a root position viio because it will result in a doubled root for V6/5, but honestly…it’s better to try and avoid them whenever possible

**Using functional substitutions for pre-dominants** - 1: I - IV - V - I - For the IV, we have to take out the D. - 2: I - ii6 - V - I - We have to take out the C because ii is no longer a IV. t - To avoid this, double the third in ii6! ii and IV, as explained before, are similar in the same way as V and viio. ii6 can follow the same doubling rules as IV–its third is IV’s root, which we saw in #1 - 3: I - ii6/5 - V - I - Voicing for ii6/5, SATB: C D A (F). - Essentially: this is a rare thing, much like a frustrated leading tone, but it’s still good to know about for the purposes of analysis. This one also happens a lot, so it’s especially good to know about in advance

**Function** - Primary: tonic, dominant, predominant. When we assign these to chords in a progression, we’re saying they fill a certain slot - Secondary: chords that borrow the functions of primary chords - Tertiary: using a chord in a way that has nothing to do with primary or secondary function. There are four kinds, but today we’re only talking about passing chords

**Passing chords** - Creates passing motion. If you identify a chord as “passing,” you’re saying it has no primary function. Instead, we’re using it for smooth voice leading. To ID these chords, you put the Roman numeral in parentheses and write “passing” underneath it - Like other tertiary functions, these extend the primary functions on either side of them. If you insert a passing chord between two dominant function chords, you’ve simply lengthened the dominant section - V6 - IV6 - V. We made the IV6 a vi and V6 to vi is good, but vi to V is not…. so we label it a passing chord. - There’s no good option for this one, really…each one has its own errors, whether actual or just “not ideal,” so it’s a matter of picking the one that is the least bad

For many people, the terms *tone row* and *matrix* are synonymous with post-tonal theory. Luckily, your basic understanding of set theory comprehending tone rows fairly simple.

## Starting small

Let’s use set classes as a way to build up to understanding tone rows. To do this, start by writing out each unique, normal-form pc set represented in the set class of (013). Use your ability to transpose and invert that pc set to find them quickly. You can also think of this as listing every pc set represented by a single prime form.

### Conclusion

Because of your study of prime form, you probably realized that there are twenty-four possibilities. Because each of the pc sets will be in normal form, we know that there is only *one* pc set for each possible starting pitch. We can represent these using transposition notation. - T0[0,1,3] = [0,1,3] - T1[0,1,3] = [1,2,4] - T2[0,1,3] = [2,3,5] - T3[0,1,3] = [3,4,6] - T4[0,1,3] = [4,5,7] - T5[0,1,3] = [5,6,8] - T6[0,1,3] = [6,7,9] - T7[0,1,3] = [7,8,t] - T8[0,1,3] = [8,9,e] - T9[0,1,3] = [9,t,0] - Tt[0,1,3] = [t,e,1] - Te[0,1,3] = [e,0,2]

There are a further twelve unique pc sets that result from inverting our prime form pc set. Of course, for each of these, you should normalize the pc set after inversion. - T0I[0,1,3] = [9,e,0] - T1I[0,1,3] = [t,0,1] - T2I[0,1,3] = [e,1,2] - T3I[0,1,3] = [0,2,3] - T4I[0,1,3] = [1,3,4] - T5I[0,1,3] = [2,4,5] - T6I[0,1,3] = [3,5,6] - T7I[0,1,3] = [4,6,7] - T8I[0,1,3] = [5,7,8] - T9I[0,1,3] = [6,8,9] - TtI[0,1,3] = [7,9,t] - TeI[0,1,3] = [8,t,e]

Each one of these twenty-four pc sets contains a unique collection of pitch classes.

## Visually representing a set class

In the above example, you could describe T0 and T0I as the reverse order of the same *intervals* moving away from a central pitch. The only obvious correlation between the actual *pitch classes* is that both of the pc sets contain 0–which happens to be the interval of transposition for those two sets. (The interval of transposition is the “0” in T0.) If you look at each pair of transposed and inverted pc sets, you will notice the same thing; they always center the interval of transposition. If you wanted to represent this visually, you could plot each transposition and inversion on a chart, on which this central, shared pitch for each transposition shows the inversion and transposition branching out. Look at our trichords charted this way.

| Inv pc set | inv pc 1 | inv pc 2 | **common pc** | tran pc 2 | tran pc 3 | Tran pc set |
| --- | --- | --- | --- | --- | --- | --- |
| T0I | 9 | e | 0 | 1 | 3 | T0 |
| T1I | t | 0 | 1 | 2 | 4 | T1 |
| T2I | e | 1 | 2 | 3 | 5 | T2 |
| T3I | 0 | 2 | 3 | 4 | 6 | T3 |
| T4I | 1 | 3 | 4 | 5 | 7 | T4 |
| T1I | 2 | 4 | 5 | 6 | 8 | T5 |
| T6I | 3 | 5 | 6 | 7 | 9 | T6 |
| T7I | 4 | 6 | 7 | 8 | t | T7 |
| T8I | 5 | 7 | 8 | 9 | e | T8 |
| T9I | 6 | 8 | 9 | t | 0 | T9 |
| TtI | 7 | 9 | t | e | 1 | Tt |
| TeI | 8 | t | e | 0 | 2 | Te |

Here, the “common pc” column shows the pitch class that is common to both the inversion and the transposition pc sets. (Note that to create this chart, the inverted form of the pc set is written in descending form rather than ascending form, so you must read it backwards to find its normal form.) You can make a chart like this for any pc set, and this would extremely helpful if you were analyzing a piece of music that had this trichord present. Rather than only looking for intervallic patterns, you could quickly refer to your chart to identify whether a specific trichord belongs to this set class. As you begin searching pieces for set classes, you will appreciate not having to transpose and invert every time; it is much easier to have a complete list for reference, and you could use our new (013) trichord “matrix” for this purpose.

## Tone rows, serialism, and 12-tone music

Before we go further, we should briefly define the genre of music most associated with set theory and matrices. (Although set theory can be used to study *any* type of music as long as it uses the twelve pitches from the chromatic scale.) *Serialism* is any music in which some aspect of the composition is based on a pre-defined repeatable pattern; this can be the melodic intervals, harmonic intervals, harmonies, rhythm, or any other aspect of music that could be described in a series.

*12-tone music* is a sub-genre within serialism in which a fixed series of all twelve pitches is used to generate both the melodic and harmonic content of the piece. There are a variety of ways in which composers have employed this, but in its strictest form, all twelve pitches must be used before a pitch can be repeated. The series that determines the order of all twelve pitch classes is called a *tone row*; this will always be a listing of all twelve pitch classes with a fixed interval order. To provide compositional variety, the tone row may be altered to any of its transpositions or inversions, and any tone row may also be played in *retrograde* – all pitches in reverse order. So from this, there are four forms of a tone row. - Prime (P) - a tone row or any of its transpositions - Retrograde (R) - any *prime* row played in reverse order - Inversion (I) - the inversion of the original prime tone row and all its transpositions - Retrograde inversion (RI) - any inverted row played in reverse order

Because any of these tone row orders can start on all twelve pitches, there are forty-eight possible arrangements of any tone row: twelve prime tone rows, twelve inverted tone rows, twelve retrograde tone rows, and 12 retrograde inversion rows. We label these using the abbreviations P, R, I, and RI followed by a subscript number to represent the transposition. (e.g. P5 or RI6).

## Expanding the set

Now imagine that you were trying to create a visual representation for all forty-eight tone row possibilities in the same way we did above for the (013) trichord. You would have to create one of our charts for both the prime form and retrograde, and each row would twenty-three pitch classes in it. Luckily, there is a simpler, space efficient way to do this–a tone row matrix, so let’s set some ground rules. If you were to use the normal and/or prime form, there is technically only one form for an aggregate pitch set: (0123456789te). But for tone rows, we treat the intervallic pattern as a fixed part of the pc set–meaning we do *not* put the pc set into normal form. So you know, we can create nearly a million different distinct combinations of all twelve pitch classes if we fix the intervallic structure as well!

To illustrate this, try creating the first two lines of our twenty-three pitch class chart, T0/T0I and T1/T1I, for the following pc set: T0 = (0,e,6,7,t,9,4,3,5,8,1,2)

Start by writing T0, and then write the inversion backwards from the first number. Then do the same for, T1.

### Conclusion

The answer to the pc set would take up too much screen for me to succinctly write in a table here, but I’ve written it in plain text. (Remember that the inverted row must be read from the center note, the bolded note, moving backward.) - T0I t e 4 7 9 8 3 2 5 6 1 **0** e 6 7 t 9 4 3 5 8 1 2 T0 - T1I e 0 5 8 t 9 4 3 6 7 2 **1** 0 7 8 e t 5 4 6 9 2 3 T1

What do you notice as you work through this? Can you think of a different way to visually represent this rather than just mirroring T1? While the trichord’s chart above was not too unwiedly for addressing all possible variations, can you think of a way to create a chart that shows every combination (transposed and inverted) of a tone row that would take less space than the clunky chart above?

## Developing a matrix

What if rather than writing T0 and T0I in a straight line, we rotated the inversion pc set, T0I, downward at 90 degree angle to create a vertical column? This would create the outline for a 12 by 12 grid with T0 as the top row and T0I as the first column.

| – | T0I |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T0 | 0 | e | 6 | 7 | t | 9 | 4 | 3 | 5 | 8 | 1 | 2 |
| – | 1 |  |  |  |  |  |  |  |  |  |  |  |
| – | 6 |  |  |  |  |  |  |  |  |  |  |  |
| – | 5 |  |  |  |  |  |  |  |  |  |  |  |
| – | 2 |  |  |  |  |  |  |  |  |  |  |  |
| – | 3 |  |  |  |  |  |  |  |  |  |  |  |
| – | 8 |  |  |  |  |  |  |  |  |  |  |  |
| – | 9 |  |  |  |  |  |  |  |  |  |  |  |
| – | 7 |  |  |  |  |  |  |  |  |  |  |  |
| – | 4 |  |  |  |  |  |  |  |  |  |  |  |
| – | e |  |  |  |  |  |  |  |  |  |  |  |
| – | t |  |  |  |  |  |  |  |  |  |  |  |

This grid is a called a *matrix*. We could then fill in each *row* of our matrix with the transpositions of the original pc set and each column with inversions. For example, where would the other two pc sets that we figured out in our original example, T1 and T1I, fit in this grid?

## Filling out the matrix

Because the top row is the original, prime version of this pc set and the column is its inversion, it makes sense to place the next pc sets, T1 and T1I, in the row and column respectively that begin with the pitch class “1.” It would look like this:

| – | T0I |  |  |  |  |  |  |  |  |  | T1I |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| T0 | 0 | e | 6 | 7 | t | 9 | 4 | 3 | 5 | 8 | 1 | 2 |
| T1 | 1 | 0 | 7 | 8 | e | t | 5 | 4 | 6 | 9 | 2 | 3 |
| – | 6 |  |  |  |  |  |  |  |  |  | 7 |  |
| – | 5 |  |  |  |  |  |  |  |  |  | 6 |  |
| – | 2 |  |  |  |  |  |  |  |  |  | 3 |  |
| – | 3 |  |  |  |  |  |  |  |  |  | 4 |  |
| – | 8 |  |  |  |  |  |  |  |  |  | 9 |  |
| – | 9 |  |  |  |  |  |  |  |  |  | t |  |
| – | 7 |  |  |  |  |  |  |  |  |  | 8 |  |
| – | 4 |  |  |  |  |  |  |  |  |  | 5 |  |
| – | e |  |  |  |  |  |  |  |  |  | 0 |  |
| – | t |  |  |  |  |  |  |  |  |  | e |  |

Because of the intervallic relationships in a tone row, you’ll notice the pitch classes T1 and T1I fit perfectly with the pitch classes in the old columns.

The great thing about this system is that once each of the transpositions (rows) are filled in correctly, each *column* will be a correctly transposed version of the inverted tone rows. Once filled in, a matrix such as this shows every transposition and inversion of any tone row.

## Completing our tone row matrix

Using our terminology of P, R, I, and RI, complete the tone row matrix above by filling in each row and then labeling. Is it necessary to go in a particular order? What is the easiest way to fill it out for you? Knowing that we use P, I, R, and RI to label each direction of the matrix, how would you differentiate each tone row? Would retrograde tone rows be labeled by their starting pitch or their corresponding prime label?

### Conclusions

The correctly completed tone row matrix for our original row would be:

| – | I0 | Ie | I6 | I7 | It | I9 | I4 | I3 | I5 | I8 | I1 | I2 | – |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P0 | 0 | e | 6 | 7 | t | 9 | 4 | 3 | 5 | 8 | 1 | 2 | R0 |
| P1 | 1 | 0 | 7 | 8 | e | t | 5 | 4 | 6 | 9 | 2 | 3 | R1 |
| P6 | 6 | 5 | 0 | 1 | 4 | 3 | t | 9 | e | 2 | 7 | 8 | R6 |
| P5 | 5 | 4 | e | 0 | 3 | 2 | 9 | 8 | t | 1 | 6 | 7 | R5 |
| P2 | 2 | 1 | 8 | 9 | 0 | e | 6 | 5 | 7 | t | 3 | 4 | R2 |
| P3 | 3 | 2 | 9 | t | 1 | 0 | 7 | 6 | 8 | e | 4 | 5 | R3 |
| P8 | 8 | 7 | 2 | 3 | 6 | 5 | 0 | e | 1 | 4 | 9 | t | R8 |
| P9 | 9 | 8 | 3 | 4 | 7 | 6 | 1 | 0 | 2 | 5 | t | e | R9 |
| P7 | 7 | 6 | 1 | 2 | 5 | 4 | e | t | 0 | 3 | 8 | 9 | R7 |
| P4 | 4 | 3 | t | e | 2 | 1 | 8 | 7 | 9 | 0 | 5 | 6 | R4 |
| Pe | e | t | 5 | 6 | 9 | 8 | 3 | 2 | 4 | 7 | 0 | 1 | Re |
| Pt | t | 9 | 4 | 5 | 8 | 7 | 2 | 1 | 3 | 6 | e | 0 | Rt |
| – | RI0 | RIe | RI6 | RI7 | RIt | RI9 | RI4 | RI3 | RI5 | RI8 | RI1 | RI2 | – |

Read below for important notes on building and using a matrix.

## Properties of the matrix

Finally let’s touch on some general important concepts and common mistakes that you will encounter when creating tone row matrices.

### Important concepts

* The most often used labeling method for tone row matrices is fixed-zero notation, but movable-zero is preferred by some. Either is possible, but make sure that you are consistent in your application and clearly state which method you are using in any analysis.
  + In fixed-zero, 0 will always be the pitch class that includes C.
  + In movable-zero, the analyst chooses a primary pitch to designate as 0 based on the important features of the piece (e.g. it is often the first pitch class of the piece) and then determines each other pitch class’s number based on the intervallic relationship to the designated 0 pitch class.
* In a tone row matrix, label each prime and inversion tone row by the abbreviation P or I respectively, followed by a subscript integer of the first pitch class for that row.
* However, label retrograde (R) and retrograde inversion (RI) rows by their corresponding prime (P) and inversion (I) rows. If you don’t have a completed matrix available, but you know that a tone row is a R or RI form, you can just label it using the **last** pitch of the tone row, because that is the first pitch class of the corresponding P or I row. Therefore, R and RI rows are always labeled using their last pitch.
* When building a matrix, there are two ways to arrange the prime and inversion tone rows of the matrix depending on which transposition of the tone row that you choose to place in the top level of the matrix.
  + One possible layout prioritizes a specific iteration of the tone row by placing it in the top row of the matrix *in its non-transposed iteration*. Typically, your original tone row will be taken from a piece of music, so many theorists prefer to format the original row in the top position of the matrix. You must then determine each prime row based on this original row.
    - For example, if the first iteration of the row started on A-flat, the first row in the matrix would be that row. If you are using fixed-zero notation this would be labeled P8, but if you are using movable-zero, this would be labeled P0.
  + On the other hand, a matrix is meant to be a useful tool for composers and analysts, so it’s primary role is to help you track all possible uses of the row. It is easier to create a matrix that starts on 0, because creating the first inverted row (I0) can be created using your standard fixed-zero inversions. (i.e. 0 becomes 0, 1 becomes e, 2 becomes t, etc.) If using fixed-zero, though, it is rare that the piece will begin on pitch class 0 (C). Instead, you can simply transpose your entire tone row to start on 0, write this as the top left row of your matrix, and then create the matrix as we did above. Even though your rows will be in a different order, every row will be *labeled* identically to the other method because you are using fixed-zero notation.
    - For example, if the first iteration of the row started on A-flat (pc 8 in fixed-zero), you would subtract 8 (or add 4) to transpose the entire row to begin on pitch class 0. You can then place this as the top row of your matrix and build the matrix normally. All rows will be labeled correctly according to fixed-zero notation. To make sure that you remember which row is the original row, you will probably want to mark it in some way. I do this by circling the row label (e.g. P8) of the row that begins the piece.
* When done correctly, any tone row matrix will have a pitch class that extends diagonally from the top left cell of the matrix to the bottom right cell. In the correct chart above, you can see that the pitch class 0 is in the first cell and then connects diagonally across the entire matrix.

### Common mistakes

* The most common mistake when creating a matrix, other than simply mis-transposing, is the mislabeling of the tone rows. Remember that the labels for R and RI rows are based on their corresponding prime and inverted rows, NOT the starting pitch of the R or RI rows.
* When using a matrix to analyze a 12-tone piece of music, you will occasionally encounter tone row *elision*. Two rows are said to be elighted if the ending pitch class(es) of of one row are actually shared to become the beginning pitch class(es) of the next row. If you encounter a tone row that seems to have less than twelve pitch classes, this is likely the reason.
* If you use movable-zero, you will need to be careful in creating your first inverted row because you will not be inverting around C=0. Proponents of this method usually suggest inverting interval by interval away from the first pitch class. (e.g. If the first interval of the row is an *ascending* M3, then the first interval of your inverted row will be a *descending* M3. You will continue this process for each interval.)

## Technology is great…to a point

As with most things, some enterprising people have created a shortcut to all of this work. There are now free-to-use matrix calculators such as the 12-tone assistant at [this excellent website](http://in.music.sc.edu/fs/bain/software/tta-v2.4d/default.htm). These are great to speed up your analysis, but as a student, make sure that you understand the principles of why and how these work before becoming entirely reliant on them. Even when trying to use this website, you must understand exactly what output you are trying to achieve before you can choose the correct option.

Admittedly, it is unlikely that you will ever be required to create a tone row matrix without access to a calculator (unless you are taking a music theory exam.) But the tedium of transposing each of the rows by hand will help you notice patterns in the tone row and help you to remember the nuances of the tone row as you analyze. This often provides insight into the analysis that would be missed by those relying on a calculator to create the matrix.

As discussed in the previous topics, scales represent a pitch collection, centered around a tonic pitch. Because we can transpose these pitch collections to center around any pitch-class, we create twelve unique pitch centers–called *keys*–and even more if we include enharmonic equivalents. Because writing accidentals for many of these keys would be clunky and difficult to read, we use a system of key signatures to give the performer a simple way of knowing which pitches in the key are raised and lowered.

## Key signatures

Diatonic music is built around perfect intervals, although as we will see below, introducing one non-perfect interval to a series of perfect intervals creates the major scale and consequently diatonic tonality. Because of this non-perfect interval, key signatures follow a very simple pattern that can be reversed whether you are raising or lowering pitches.

### Goals for this topic

In the examples below, you will find sets of three keys. Use these to find: - the order of sharps and flats - including any mnemonic devices to remember these - and the intervallic structure of the order of sharps and flats - what differentiates *diatonic* and *chromatic* pitches - a method for determining the *relative* and *parallel* minor keys from a major key - as well as the *relative* and *parallel* major keys from a minor key

### A caveat

Please note that any *scale* that shares a tonic note is considered to be one key. Even though this may contradict your intuitive thoughts, this means that G major and G minor are considered the same **key**! Instead, we call them *modes* of each other, not different keys. The explanation for this terminology is best left for once we have more tools to examine it, but for now, practice using the correct terminology to avoid a confusing “re-learning” moment later in the course.

### Keys that use sharps and the minor keys that are related to them

Use these examples to determine the order of sharps. Pay particular attention to which **scale degrees** are affected in each key as sharps are added. Is it the same scale degree in each key? How is this related to the tonic? If you continue the pattern, are you able to discern the name of the next key and which accidentals are added? You should also be able to determine the relationship between a major key and its parallel and relative minors.

{% capture ex1 %}X: 1 T:3 major scales that use sharps M:4/4 L:1/8 K:G clef=bass G,,A,, B,,C, D,E, F,G, ||[K:D] D,E, F,G, A,B, CD||[K:A] A,,B,, C,D, E,F, G,A,|] w: G maj \_ \_ \_ \_ \_ \_ D maj \_ \_ \_ \_ \_ \_ A maj{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

{% capture ex2 %}X: 2 T:3 natural minor scales that use sharps T:Each of these minor keys is a *relative* minor to the major key listed in parentheses M:4/4 L:1/8 K:G clef=bass E,,F,, G,,A,, B,,C, D,E, ||[K:D] B,,C, D,E, F,G, A,B,||[K:A] F,,G,, A,,B,, C,D, E,F,|] w: E min (G maj) \_ \_ \_ \_ B min (D maj) \_ \_ \_ \_ F-sharp min (A maj){% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

{% capture ex3 %}X: 3 T:3 more natural minor scales T:Each of these minor keys is a *parallel* minor to the major key listed in parentheses M:4/4 L:1/8 K:Bb clef=bass G,,A,, B,,C, D,E, F,G, ||[K:F] D,E, F,G, A,B, CD||[K:C] A,,B,, C,D, E,F, G,A,|] w: G min (G maj) \_ \_ \_ \_ D min (D maj) \_ \_ \_ \_ \_ \_ A min (A maj){% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

### Keys that use flats and the minor keys that are related to them

Use these examples to determine the order of flats. Pay particular attention to which **scale degrees** are affected in each key as flats are added. Is it the same scale degree in each key? How is this related to the tonic? If you continue the pattern, are you able to discern the name of the next key and which accidentals are added? You should also be able to determine the relationship between a major key and its parallel and relative minors.

{% capture ex4 %}X: 4 T:3 major scales that use flats M:4/4 L:1/8 K:Bb clef=bass B,,C, D,E, F,G, A,B,|| [K:Eb] E,F, G,A, B,C DE|| [K:Ab] A,,B,, C,D, E,F, G,A,|] w: B-flat maj \_ \_ \_ \_ \_ E-flat maj \_ \_ \_ \_ \_ A-flat maj{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

{% capture ex5 %}X: 5 T:3 natural minor scales that use flats T:Each of these minor keys is a *relative* minor to the major key listed in parentheses M:4/4 L:1/8 K:Bb clef=bass G,,A,, B,,C, D,E, F,G,|| [K:Eb] C,D, E,F, G,A, B,C|| [K:Ab] F,,G,, A,,B,, C,D, E,F,|] w: G min (B-flat maj) \_ \_ \_ C min (E-flat maj) \_ \_ \_ F min (A-flat maj){% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

{% capture ex6 %}X: 6 T:3 more natural minor scales T:Each of these minor keys is a *parallel* minor to the major key listed in parentheses M:4/4 L:1/8 K:Db clef=bass B,,C, D,E, F,G, A,B,||[K:Gb] E,F, G,A, B,C DE||[K:Cb] A,,B,, C,D, E,F, G,A,|] w: B-flat min (B-flat maj) \_ \_ E-flat min (E-flat maj) \_ \_ A-flat min (A-flat maj)(A maj){% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

## Conclusions

In the next topic, we will discuss how the overtone series creates our perception of pitch, tonality, and music as a whole. But for now, we can observe that one aspect of the overtone series, the circle-of-fifths, plays a critical role in defining diatonic function and key signatures. The order of sharps and flats follows a series of ascending perfect 5th intervals. - Order of sharps: F - C - G - D - A - E - B - Order of flats: B - E - A - D - G - C - F

Note that the two orders are simply reversed sequences of each other.

### Tips for finding major key signatures

Your ultimate goal for key signatures should be the ability to instantly recall all key signatures from memory, but there are two common tricks that you can use to find the major key implied by any key signature.

1. For any key signature with two or more flats, the name of the key is the *second to last flat* when reading from left to right. For example, in a key signature with four flats, the four flats from left to right are B-flat, E-flat, A-flat, and D-flat. The second to last flat is A-flat, so A-flat major is the implied major key of this key signature.
2. For any sharp key signature, you can go up a half-step (minor 2nd) from the last sharp to find the tonic of the implied major key. For example, in a key signature with four sharps, the sharps are F-sharp, C-sharp, G-sharp, and D-sharp when read from left to right. The last sharp is D-sharp and a minor 2nd above D-sharp is E-natural. So E major is the implied major key of this key signature.

Of course, these tricks do not work for C major (no sharps or flats) or F major (one flat), but you should be able to remember those two keys.

### Tips for finding minor key signatures

You can combine the two tricks above with your knowledge of relative major and minor keys to quickly find the implied minor key of a key signature, because relative major and minor keys *share a key signature*. For example, if you know that a key signature of four sharps implies E major, you can go to the sixth scale degree of E major to find the tonic of the relative minor–in this case, C#. Therefore, E major and C-sharp minor both share a key signature of four sharps.

In diatonic harmony, second-inversion chords do not function in the same way as other inversions. Whereas root-position chords are stable, and first- and third-inversion chords create momentum by placing tendency tones in the bass, second-inversion chords are generally considered “weaker.” For example, listen to the following sonority repeatedly. It contains both a P4 and P5 above the a root. Because there is a dissonance between the upper two voices, you will likely hear this as wanting to resolve in some way. Isolate the voice that you would like to resolve and then figure out how you are naturally resolving it by singing it.

{% capture ex6 %}X:6 T:Perfect 4th versus perfect 5th M:4/4 L:1/2 Q:1/4=80 K:C V:1 [C2FG]| [C2FG]| [C2FG]|]{% endcapture %} {% include abc-example.html number=“6” abc=ex6 %}

Most people will resolve this sonority as if it were a root position major triad that has a suspended third, although some might hear this as a minor triad instead. The P5 seems more stable as opposed to the P4. These resolutions would sound like this:

{% capture ex7 %}X:7 T:Resolving the perfect 4th M:4/4 L:1/2 Q:1/4=80 K:C V:1 [CFG]“major”[CEG]| [CFG]“minor”[C\_EG]|]{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

Conversely, if you were to hear the P4 as the more stable interval, you would resolve the P5 upward to create a second-inversion triad in either major or minor.

{% capture ex8 %}X:8 T:Resolving the perfect 5th M:4/4 L:1/2 Q:1/4=80 K:C V:1 [CFG]“major”[CFA]| [CFG]“minor”[CF\_A]|]{% endcapture %} {% include abc-example.html number=“8” abc=ex8 %}

Not only are these examples effective in demonstrating your ear’s natural inclination toward root position, but they also show the basic diatonic underpinning of for limiting the use of second-inversion chords. In the above example that resolved the original sonority to an F major/minor chord, you can see how closely-related any key is to the key of its subdominant. Therefore, if used incorrectly, second-inversion chords can destabilize your part-writing by pushing toward a different key.

## Tertiary functions

Because second-inversion triads are not as stable as the other inversions, they must be used differently in your part-writing. Instead of fulfilling a primary function such as tonic, dominant, or pre-dominant, they will have one of the four tertiary functions, one of which we already discussed in the previous unit: - cadential - passing - pedal - arpeggiated

For each of these functions, the chord will be extending the primary function of another chord rather than defining its own.

## Doubling

As a general rule, 6/4 chords function best when the bass voice is doubled. As you harmonize the chords in each of the examples below, notice how often this doubling occurs naturally in your part-writing.

## Cadential 6/4s

A cadential 6/4 chord is the most straightforward usage of second inversion chord, because it has the most specific rules. - It occurs when a I6/4 chord precedes a *root-position* V or V7 chord. - It cannot move to an inversion of a V chord or any version of a viio chord. - The I6/4 loses its tonic function and instead acts as an extension of the dominant function. - Some consider this chord a suspension of some of the chord tones of the dominant chord. - It always occurs as part of the cadence for a phrase, hence the name.

Harmonize the following three examples to see how well the voice-leading works for a cadential 6/4 chord.

{% capture ex1 %}X:1 T:Cadential 6/4 chords M:4/4 L:1/4 Q:1/4=70 K:C V:1 [cE]xxx|| [cE]xxx|| [cE] [c] [c] [d]|] V:2 clef=bass [C,G,] [G,,] [G,,] [C,]|| [C,G,] [G,,] [G,,] [C,]|| [C,G,] [F,,] [G,,] [G,,]|] w:C:I I6/4 V I I I6/4 V7 I I IV I6/4 V{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Conclusions

Cadential 6/4 progressions are often used to correct part-writing errors in approaching the V chord. Look at the third progression that you just harmonized. If the cadential 6/4 were removed, it would create parallel perfect 5ths between the soprano and bass.

Some theory methods teach that a cadential 6/4 should not be labeled as a I6/4; instead, they label it as a V6/4 - 5/3. The reasoning behind this is twofold: - The I chord does not have a tonic function. - The cadential 6/4 chord resembles a 4-3 suspension and a 6-5 suspension occurring at the same time. These reasons ensure that students understand the true function of the cadential 6/4.

I prefer to label it as a I6/4 chord, however, because: - We do not create special usage cases in our Roman numeral system for any other chord. It creates an unnecessary exception for students to learn and often confuses students. - By having two different chords labeled as a V6/4, it is easy for students to confuse a cadential 6/4 with an actual V6/4, a chord that occurs regularly as a passing chord. (Read more on this below under the *passing 6/4* section.) - When looking at an analysis, we are required to understand that almost every 6/4 chord has a tertiary function (i.e. passing, cadential, passing, and arpeggiated), but we do not create special Roman numeral cases for the other three types of tertiary functions. Students are more than capable of learning the other three usages of second inversion chords, and they can remember that a I6/4 followed by a root-position V or V7 chord is a cadential 6/4 and has a dominant function.

As with all tertiary function chords, it is helpful to label a chord when it is not functioning as a primary function. For example, if a strange chord is functioning as a passing chord, we do not simply label it with a Roman numeral, because a Roman numeral without an explanation assumes that the chord is functioning in its primary role. For tertiary functions, it is helpful to note somewhere in the analysis that it is functioning as a passing chord. It is helpful to apply the same strategy for cadential 6/4 chords, so I recommend bracketing the I6/4 and V chord together and putting an abbreviated “cad” below the bracket.

## Passing 6/4s

Passing chords are the second alternate function for second-inversion chords, and they function identically to our description of how [first- and third-inversion chords are used as passing chords](11-further-part-writing/b1-voiceleading1stand3rdinv.html)–a chord inserted between two other chords to create a bass line with stepwise motion. As before, *passing* is a function that replaces a chord’s primary function, and instead extends the function of the chords on either side. Harmonize the following example of a passing 6/4.

{% capture ex2 %}X:2 T:Passing 6/4 chords M:4/4 L:1/4 K:C V:1 [cE][B][A][G]| [G4]|] V:2 clef=bass [C,G,] [G,,] [A,,] [B,,]| [C,4]|] w:C:I V ii6/4 V6 I{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

### Conclusions

Understanding that the ii chord in this example acts as a passing chord rather than a pre-dominant chord also explains how a V chord moves convincingly to a ii chord. When a chord resolves against the normal flow of a circle-of-fifths flowchart (see [Unit 7a](07-harmonic-functions/a1-diaprogcirclefifths.html)), we call that a *regression*. In the example above, the first V chord *should* resolve to a tonic chord but instead regresses to a ii chord. This works because of the strength of the bass line, so it is the *passing function* that extends the dominant harmony through a stepwise bass line.\*\*

## Function over form (Part 4)

Now that we have practiced using a passing 6/4 chord, we can also clarify why viio6 chords function well as a passing chord. When studying first inversion chords [Unit 11b]](11-further-part-writing/b1-voiceleading1stand3rdinv.html), we discussed two important ideas regarding viio chords: - The viio is a functional substitution for the V7 chord and therefore takes its voice-leading and doubling conventions from the V7 chord. - The viio6 is often employed as a passing chord between I and I6 to create a bass line with stepwise motion.

This explains why a viio6 chord functions as a passing chord; it is actually a functional substitution for a passing V6/4 chord. Harmonize the following two progressions to see how similar these two chords are.

{% capture ex3 %}X:3 T:V6/4 and viio6 M:3/4 L:1/4 K:C V:1 [e][d][c]|| [e][d][c]|] V:2 clef=bass [C,] [D,] [E,]|| [C,] [D,] [E,]|] w:C:I V6/4 I6 I viio6 I6{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

## Pedal

Like the cadential 6/4 and passing 6/4 chords, the pedal 6/4 is defined by the motion that it creates within a voice–most often the bass line. A pedal 6/4 occurs when a voice remains static across multiple chords by employing a second inversion chord. *Note that this is different from a non-chord tone pedal*, because a pedal 6/4 chord uses only chord tones to create the static pedal; it does not use non-chord tones to create the pedal. Harmonize the following two examples of common pedal 6/4 chords.

{% capture ex4 %}X:4 T:Pedal 6/4 chords M:3/4 L:1/4 K:C V:1 [cE]xx[][]|| [dG]xx[][]|] V:2 clef=bass [C,G,] [C,] [C,]|| [G,,B,] [G,,] [G,,]|] w:C:I IV6/4 I V ii6/4 V{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

## Arpeggiated

The fourth and final acceptable usage of 6/4 chords occurs when the bass line arpeggiates through a chord. When part-writing arpeggiated chords, you will not have stepwise motion unless you use non-chord tones, because the chord tones will either remain static or skip between chord tones. Try the following example, and you will see how this requires voices to jump between chord tones.

{% capture ex5 %}X:5 T:Arpeggiated 6/4 chords M:4/4 L:1/4 Q:1/4=70 K:C V:1 [cG] [c] [c] [B]| [c4]|] V:2 clef=bass [CE] [G,] [E,] [G,]| [C,4]|] w:C:I I6/4 I6 V I{% endcapture %} {% include abc-example.html number=“5” abc=ex5 %}

### Conclusions

The most common question regarding arpeggiated chords is how to handle them in your analyses. Depending on the harmonic rhythm of the piece, an arpeggiated chord may be viewed as either a melodic bass line that does not change inversion or an entirely new instance of the chord in a different inversion.

Your decision should ultimately reflect how you hear the piece. If you have a repeated harmony but each reiteration of the harmony sounds like a new phrase or statement, then you should label each inversion of the chord according to its bass note. On the other hand, if it sounds like one continuous harmony, particularly if a melody and phrasing implies this, then you do not need to mark every inversion of the chord.

Regardless, you should label the chord’s inversion by the *strongest* note in the bass. This will often be the lowest note in the arpeggiation, but your perception can shift depending on the order in which you hear the arpeggiation as well as which pitches are in the strongest metric position. Take time to listen to the passage carefully, and choose the pitch that most closely reflects your perception.

## Class Discussion

**Frequency Ratio**

-1:2 is the most basic ratio we can create with two frequencies. 1:2 creates an octave difference.

-When we have two waves (frequencies) that line up evey two waves (in the crest), our ear hears that repetition as a pitch but one is higher than the other.

-The next simplist ratio is 2:3. This creates a P5 sound.

**P5** When we stack the first five P5 around the circle, we get a major pentatonic scale. When F# is changed is changed after B (instead of F), the cycle only repeats after seven pitches instead of all twelve.

**What is a key signature?** - A set of sharps or flats defining the scale that you’re playing in? - Close: the wording implies a key signature where sharps and flats occur together, which isn’t the standard key signature we’re trying to come up with a definition for

**What is a key?** - A pattern that results in a tonal center? - Yes, though the “tonal center” part is what we are especially concerned with!

**For diatonic purposes:** - Key is defined by a tonic - Key signature acts as a shorthand in reference to the notes organized *around* the tonic (like a legend on a map)

**Tricks (other than memorization) for figuring out what key signature you’re in** - Sharps: last sharp + up a half step = the key - Flats: second to last flat = the name of the key

# ## Further reading

## From *Open Music Theory*

When you’re writing in a single key for an extended period of time, it gets tedious to write out the accidentals over and over again.

Here is a simple melody in D major, without a key signature.

To avoid this, composers used *key signatures* at the beginning of each staff to remind performers of which pitch classes should have flats or sharps.

Here is the same melody, with the key signature at the beginning of the staff to remind the performer that F and C should be sharp.

### The circle of fifths

The circle of fifths is an illustration that has been used in music theory pedagogy for hundreds of years. It conveniently summarizes the key signature needed for any key with up to seven flats or sharps.

But *which* notes are flat or sharp in a key? To properly use the circle of fifths to figure out a key signature, you’ll need to also remember this mnemonic device, which tells you the order of flats and sharps:

**F**ather **C**harles **G**oes **D**own **A**nd **E**nds **B**attle.

For sharp keys (clockwise on the circle of fifths), read the mnemonic device forward. For example, the circle of fifths tells us that there are 3 sharps in the key of A major. Which three notes are sharp? The first three notes in the mnemonic device: F(ather), C(harles), and G(oes).

For flat keys (counter-clockwise on the circle of fifths), read the mnemonic device backwards. For example, the circle of fifths tells us that the key of A-flat major has four flats. Which flats? Reading backwards: B(attle), E(nds), A(nd), D(own).

### Minor key signatures

Of course, minor keys can use key signatures, too. In fact, for each major key signature, there is a corresponding minor key that shares its signature. Major and minor keys that share the same key signature are called *relative* keys. For example, both C major and A minor have zero sharps or flats. A minor is considered the *relative minor* of C major; likewise, C major is considered the *relative major* of A minor. Compare the minor key circle of fifths below with the major key circle of fifths above, and you’ll see the remaining relative key pairs.

### Writing key signatures

Below is a reference that shows how all of the key signatures should be written on treble, alto, tenor, and bass clefs.

# Class discussion

**What is serialism?** - Using set rules/creating your own rules to follow in order to systematically compose a piece of music

**Using the transposition/inversion system we’ve used so far, it becomes clear that there are 24 total vesion of any default pitch class set. How do we represent this information in a streamlined, easily interpreted format?** - Put it in a matrix! See examples in the textbook. - Matrices can have any number of pitches in their pitch class sets, but we will deal most with 12-tone music, where a matrix is made up of a tone row with all 12 pitches

**12-tone music** - Prime (P): a tone row or any of its transpositions - Retrograde (R): any prime row played in reverse order - Inversion (I): the inversion of the original prime tone row and all its inversions - Retrograde Inversion (RI): any inverted row played in reverse order - When you make a matrix, these four groups will be easily labeled and organized! It ends up looking like a big square.

**Developing a matrix** - When we construct a matrix, we write the original row across the top (horizontally) and its inversion down the side (vertically). This only works when your row begins with 0 (since 0’s inversion is 0), so if you start your row with a first number other than 0, zero it out and use that one for your top row instead - Once you have these two, you can transpose for each horizontal line going off of the first digits provided in the inversion/first veritcal column. The lines represent transpositions, and the columns are inversions - You can check yourself by making sure that you have 0’s in a diagonal across the middle from the upper left corner to the bottom right corner - The subscript numbers will always match for P/R and I/RI. Retrograde and retrograde inversion labels *must* match the prime and inversion labels so that we know what they are a retrograde *of*. So, R and RI rows will have subscripts that don’t match the number they start with.

The primary purpose for a tone row matrix is to use it as a point of reference to analyze 12-tone music. It gives us a list of all the possible rows a composer might use in their piece.

You can have a tone row with less than 12 tones, but our matrix method only works with a full 12-tone row. So don’t use it for hexachords and stuff

# Class Discussion

Secondary Functions: replace the primary functions Tertiary chords: take on the function of those around them by extending/embellishing; they work in chromatic and diatonic harmony

If you see a I6/4, it is most likely functioning as something other than the tonic.

**There are four types of second inversion chords:** - Cadential - Passing - Pedal - Arpeggiated

Second inversion triads have to be tertiary function.

**Doubling rules:** - Double the bass! In this case, that would be the fifth of the chord. Doubling the root is possible, but more difficult than doubling the fifth

**Cadential 6/4 chords** - I6/4 will ALWAYS come before V(7). V(7) must be in root position because the bass movement must be static between the two chords. I6/4 - V(7) - I gives us a very smooth soprano line, but in order to do that there needs to be a common tone in the bass at some point - I6/4 has dominant function because it extends V(7) - Label it using a bracket to show dominant function:

I6/4 V I

|\_\_\_\_\_\_\_\_\_\_\_\_| V D ———– T

**Passing 6/4 chords** - I - V - ii6/4 - V6 - I - Whenever you have a passing chord, its “primary function” becomes that of the chords around it, no matter was Roman numeral it is. In this example, ii6/4 has a dominant function because it acts as part of the V’s around it - Their tertiary function is basically just to act as a bridge between other chords–to make voice leading easier. We wouldn’t have been able to set up our cool contrasting motion soprano and bass in this example without the passing 6/4 in the middle

I - V - (ii6/4) - V6 - I pass T D————— T

**Pedal 6/4 chords** - Centered around the idea of the pedal tone, whereas a passing chord is defined by (majority) passing motion - How to differentiate a pedal chord from a pedal non-chord tone: if the bass is a chord member, it’s a pedal chord! If it isn’t, it’s an NCT - Static motion in perfect octaves is a PP8…unless it’s a pedal - Just like cadential and passing chords, these chords extend the harmonies on either side of them - The pedal does NOT have to be in the bass, but it is almost always in the bass

I (IV6/4) I ped T——————

To be completed at later date

Used workbook examples of Chapter 38 to work with class

See class discussion notes for outline

You have likely heard the terms *overtone series* and *harmonic series* while discussing music, but unless you have studied them previously, you may not realize the importance of this concept in creating tonality. The overtone series occurs naturally in all non-synthetic tone production. When a person sings, a harmonic series is present above every pitch. When any woodwind, string, or brass instrument creates a pitch, a harmonic series is present above every pitch. Perhaps even more importantly for our discussions, we can study the acoustics–or the math–behind this overtone series to explain the fundamentals of Western harmony.

The overtone series can help you to understand: - why we divide the octave into twelve parts. - why we hear some intervals as consonant and others as dissonant. - how we determine if an interval is in tune. - why we use a harmonic system based on perfect intervals and thirds.

## The Structure of the Overtone Series

The overtone series is a series of intervals, or a *harmonic series*, above a given pitch. We call the lowest pitch the *fundamental*, and every tone above it is considered an *overtone*. In the example below, C2 is the fundamental, C3 is the first overtone, G3 is the second overtone, and so on.

You may also describe the tones of the overtone series by labeling each overtone as a *partial*. In this system, the fundamental is considered equal to all other tones, so it is labeled as the first partial. In the example below, C2 is the first partial, C3 is the second partial, G3 is the third partial, and so on.

For the example below, determine the numbering for each of these notes as both overtones and partials. Then practice transposing the entire series to other pitches.

{% capture ex1 %}X:1 T:The overtone series M:2/2 L:1/2 K:C V:1 x x x x E G \_B c d e ^f g|] V:2 clef=bass C,,C,G,C x x x x x x x x|]{% endcapture %} {% include abc-example.html number=“1” abc=ex1 %}

## Bernstein on the importance of the overtone series

Next, please watch this wonderful video of Leonard Bernstein explaining how the overtone series explains harmony’s evolution throughout the ages. Keep in mind that each evolutionary step he discusses adds another partial from the overtone series.

### The Physics of Music

The division of the octave into twelve parts is our brains’ interpretations of a simple mathematical phenomenon. When the frequency of a soundwave doubles, our brains hear those two frequencies as sharing some fundamental commonality, so it interprets those two pitches as the “same” but separated by an octave. Therefore, octaves always have a 2:1 ratio. (A110, A220, A440, and A880 are all A separated by octaves.) The next two simplest ratios ares a 3:2 ratio and a 4:3 ratio, which create a perfect 5th and a perfect 4th respectively.

The importance of these ratios is most easily observed in the circle of fifths. If you begin on any pitch-class and begin moving by ascending perfect 5ths (or 4ths), you will find yourself back at the beginning after cycling through all twelve pitch-classes. We call this the circle of fifths.

C - G - D - A - E - B - F-sharp - C-sharp - G-sharp - D-sharp/E-flat - B-flat - F - *C*

Perhaps more important for our discussion, though, is what happens when we introduce a diminished 5th into the pattern. Try this quick exercise: 1. Choose any starting pitch, and then write your starting pitch and the next six pitches from the circle of fifths on a separate piece of paper. - If you’ve done this correctly, you should have one pitch for every letter name. e.g. one ‘A,’ one ‘B,’ etc. 2. Choose any pitch within your seven pitches, and lower it by one half-step thus creating the interval of a diminished 5th between it and the previous pitch. 3. We will consider the two pitches of this diminished 5th to be our starting interval. Starting with the first pitch after your interval, begin altering the pitches to create perfect 5ths based on your altered note. - For example, if you chose to alter A to A-flat, you would have created a diminished 5th between D and A-flat. You will then lower all pitches after A-flat to create perfect 5ths again, starting by lowering E to E-flat. 4. Continue lowering pitches (and creating perfect 5ths) through the circle of fifths until you wrap around to your original interval. - If you started by altering A, you created a diminished 5th between D and A-flat. You will then lower every pitch until you get back to D, but leave D unaltered. In this example, you would end with: D - *A-flat* - E-flat - B-flat - F - C - G 5. If you re-arrange the seven pitches that you’ve created, you will notice that you have created a diatonic collection of seven pitches. - Continuing our example that we started by altering A to A-flat, you can see that we have three flat notes, and if you use your knowledge of key signatures, you know that the major scale with three flats starts on the tonic of E-flat. If you re-arrange these pitches, you will see: E-flat - F - G - A-flat - B-flat - C - D

This slight change–the addition of one diminished 5th–creates the necessary tension for keys to function diatonically, so diatonic function could be described as a slight imperfection on an otherwise perfect series of intervals.

This can be further shown by looking at the naturally occuring intervals if we write diatonic 5ths above the notes of a major scale.

{% capture ex2 %}X:2 %%staffsep 100% T:Diatonic 5ths in the Major Scale M:C L:1/2 K:C [CG] [DA]| [EB] [Fc]| [Gd] [Ae]| [Bf] [cg]|| w:P5 P5 P5 P5 P5 P5 d5 P5{% endcapture %} {% include abc-example.html number=“2” abc=ex2 %}

Because we explored harmonic function in Unit 6, the tension provided by the one non-perfect 5th and its subsequent release should now be obvious.

Key signatures reflect the importance of the one non-perfect interval. When studying the consecutive key signatures, you should focus on *which scale degree* is changed between consecutive keys. - When a sharp is added to a key, it always raises the 7th scale degree in the new key, thereby creating the new ti. - When a flat is added to a key, it always lowers the 4th scale degree in the new key, thereby creating the new fa.

### Order of sharps and flats

This directly reflects how diatonic function works; if we change *where* the one non-perfect 5th occurs, we change the key. We did not need to spend time determining the order of sharps and flats, because the class was already familiar with this from previous courses. It did not surprise them that circle-of-fifths plays a critical role in defining diatonic function and key signatures. The two orders are simply the reverses of each other. - Order of sharps: F - C - G - D - A - E - B - Order of flats: B - E - A - D - G - C - F

## Conclusions

The *overtone series*, often referred to as the *harmonic series*, is a series of intervals built off of a pitch. There are two ways to label the overtone series. - Label the the first pitch of an overtone series the **fundamental** and every pitch above it is then numbered as an **overtone**. - Fundamental, 1st overtone, 2nd overtone, etc. - Label each pitch as a numbered **partial**. - 1st partial, 2nd partial, 3rd partial, etc.

The overtone series built off of C2 would be:

{% capture ex3 %}X:3 T:The overtone series T:Labeled as a fundamental with numbered overtones M:2/2 L:1/2 K:C V:1 x x x x E G *B c d e ^f g|] w:*  \_ \_ \_ 4th 5th 6th 7th 8th 9th 10th 11th V:2 clef=bass C,,C,G,C x x x x x x x x|] w:fund. 1st 2nd 3rd{% endcapture %} {% include abc-example.html number=“3” abc=ex3 %}

{% capture ex4 %}X:4 T:The overtone series T:Labeled as partials M:2/2 L:1/2 K:C V:1 x x x x E G *B c d e ^f g|] w:*  \_ \_ \_ 5th 6th 7th 8th 9th 10th 11th 12th V:2 clef=bass C,,C,G,C x x x x x x x x|] w:1st 2nd 3rd 4th{% endcapture %} {% include abc-example.html number=“4” abc=ex4 %}

The overtone series occurs naturally and can be explained mathematically, so it is one of the few objective ways in which we can discuss the origin of music. Any interval can be viewed as a ratio comparing the frequncies of the two pitches that create the interval. The simplest ratio, other than 1:1, is 2:1. For example, C2 has a frequency of about 65.4 hertz (hz = vibrations per second), and C3 has a frequency of about 130.8: a ratio of 2:1. When we hear two frequencies that have a 2:1 ratio, our brains interpret this as “the same pitch separated by an octave” – an elegant solution to interpreting a physical phenomenon. This example demonstrates that all concepts associated with music, such as pitches, dividing octaves, intonation, etc., are human creations trying to organize and interpret the physical phenomenon of soundwaves entering our ear.

The overtone series orders intervals by decreasing size but increasing complexity. The first interval of the overtone series, a P8, is the “simplest” interval of 2:1. As the overtone series moves upward, each interval becomes smaller but more complex. A P5 has a ratio of 3:2, a P4 has a ratio of 4:3, a M3 has a ratio of 5:4, and onward.

## Concepts derived from the overtone series

The overtone series is notable because: - The overtone series is present above every note played by a standard musical instrument or the human voice. - When a person sings a pitch, we hear the fundamental as the pitch name, but the strength of each overtone above that fundamental determines many qualities that we associate with the pitch such as timbre. - The overtone series is the basis for intonation. - Using the ratios from the overtone series, we can determine what is “in tune.” For example, an octave is a frequency that is exactly twice as high as the given pitch, and a true P5 is a frequency that is 1.5 times higher than the given pitch. - Fixed pitch instruments (e.g. piano) use a system of *equal temperament* to play in all twelve keys without having to re-tune the instrument every time the key changes. This means that we intentionally tune these instruments “out of tune” when compared to the overtone series ratios, because being always slightly out-of-tune is a far better compromise than being perfectly in-tune sometimes and grossly out-of-tune at others. - The overtone series defines why the octave is divided into 12 parts, because it is from the overtone series that we derive the circle-of-fifths. Please refer to the discussion of the circle-of-fifths and tonality in Lesson 2c. - The overtone series provides a visual example of why we find certain intervals more consonant or dissonant. - We hear simpler ratios of intervals as consonant and complex ratios as dissonant. So intervals at the beginning of the overtone series represent consonant intervals, but as the intervals decrease in size as the overtone series moves upward, the ratios become more complex and therefore more dissonant. - The overtone series provides a good foundation for voicing chords. - Idealized voicing for chords often mimic the overtone series by placing each voice along the overtone series of the lowest voice.

### Remembering the overtone series

There are many ways to remember the overtone series. - The first is to remember the intervals. This is easy at the beginning of the series, but becomes repetitive and easy to mess up as the series ascends. - P8-P5-P4-M3-m3-m3-M2-M2-M2-M2-m2. - You can also think of them as a sequence of scale degrees above the fundamental. - 1 - 1 - 5 - 1 - 3 - 5 - b7 - 1 - 2 - 3 - #4 - 5 - And for some, it is easier to divide the series into groupings. For example, when looking at the first 12 partials - The first four pitches are a tripled fundamental and one fifth. - The second set of four pitches is a first inversion dominant triad built off of the fundamental. - The final three pitches represent re-mi-fi-sol or the beginning of the Lydian mode of the fundamental.

When looking at this final method for remembering the first 12 pitches of the overtone series, I find it fascinating that each group of four pitches implies a different key area: - The first four pitches strongly imply a key that uses the fundamental as tonic. - The next 4 partials imply a key with a tonic based on the *subdominant* of the fundamental, because the dominant seventh chord would be a V chord in the key of the subdominant. - The third set of four paritals imply a key with a tonic based on the *dominant* of the fundamental as demonstrated by thinking of this pattern as sol-la-ti-do in the key of the dominant.

### FROM END OF KEY SIGNATURE TOPIC

**INCORPORATE INTO MATERIAL ABOVE now that we’ve moved this out of its own unit**

The division of the octave into twelve parts is our brains’ interpretations of a simple mathematical phenomenon. When the frequency of a soundwave doubles, our brains hear those two frequencies as sharing some fundamental commonality, so it interprets those two pitches as the “same” but separated by an octave. Therefore, octaves always have a 2:1 ratio. (A110, A220, A440, and A880 are all A separated by octaves.) The next two simplest ratios are a 3:2 ratio and a 4:3 ratio, which create a perfect 5th and a perfect 4th respectively.

Not only does your brain’s interpretation of these ratios create the ideas of consonance and dissonance, it is also the reason we divide the octave into twelve instead of a “simpler” number such as ten. You can observe this effect most easily in the circle of fifths. If you begin on any pitch-class and begin moving by ascending perfect 5ths (or 4ths), you will find yourself back at the beginning after cycling through all twelve pitch-classes. We call this the circle of fifths.

C - G - D - A - E - B - F-sharp - C-sharp - G-sharp - D-sharp/E-flat - B-flat - F - *C*

Perhaps more important for our discussion, though, is what happens when we introduce a non-perfect 5th into the pattern. If we begin on a pitch-class and begin moving through ascending perfect 5ths, each new perfect 5th will move us to a *new letter*. After the first six letters, we begin adding accidentals and then repeating letters as seen in the circle of fifths above. If, however, we alter the last perfect 5th by a half-step to create a diminished 5th, we can break the pattern and shortcut to the end with one final perfect 5th.

C (P5) G (P5) D (P5) A (P5) E (P5) B (d5) *F* (P5) C

This slight change creates the necessary tension for keys to function diatonically, so diatonic function could be described as a slight imperfection on an otherwise perfect series of intervals.

This can be further shown by looking at the naturally occurring intervals when we write diatonic 5ths above the notes of a major scale.

{% capture ex7 %}X:7 %%staffsep 100% T:Diatonic 5ths in the Major Scale M:C L:1/2 K:C [CG] [DA]| [EB] [Fc]| [Gd] [Ae]| [Bf] [cg]|| w:P5 P5 P5 P5 P5 P5 d5 P5{% endcapture %} {% include abc-example.html number=“7” abc=ex7 %}

When we begin exploring harmonic function in Unit 6, the tension provided by the one non-perfect 5th and its subsequent release will become obvious.

Key signatures reflect the importance of the one non-perfect interval. When studying the consecutive key signatures, you should focus on *which scale degree* is changed between consecutive keys. This will likely lead to two basic principles: - When a sharp is added to a key, it always raises the 7th scale degree in the new key, thereby creating the new ti. - You can find the new do by going up a half-step from the new ti. - When a flat is added to a key, it always lowers the 4th scale degree in the new key, thereby creating the new fa. - You can find the new do by going down a P4 (or up a P5) from the new fa.

### Order of sharps and flats

This directly reflects how diatonic function works; if we change *where* the one non-perfect 5th occurs, we change the key. From this we can determine a permanent order of flats or sharps, which cycles to the beginning if you need to continue raising or lowering pitches.

# Class discussion

**Two different systems for labeling the overtone series, either one is good** - Fundamental + x overtone. Ex: in C, the Bb in the treble clef staff is the sixth overtone. - Partials, which do not differentiate between the fundamental and the other overtones. Ex: in C, the Bb in the treble clef staff is the seventh partial.

**Methods for memorizing how to write out an overtone series** - 854-3332 + Lydian scale to the fifth - This method requires you to remember the quality of the intervals in the “phone number,” and also that the “scale” includes the last note of the phone number as do - Can think of it as tonic, subdominant, dominant - Working in C, the first 4 notes suggest C, the next 4 suggest the dominant of F (C’s subdominant), and the last 4 are sol la ti do in G (C’s dominant)

Timbre = how your brain interprets the overtone series

A “big” sound (the kind we usually hear in professional musicians) just means that there’s a strong fundamental and a LOT of overtones in that person’s sound.

**If the overtone series exists everywhere, how did different systems of music evolve?** - In the case of gamelan and some types of Indian music, these systems were based off of the instruments constructed to play that music, not the voice

# Class discussion

How do you decide normal form with a semetrical chord? - they are all normal form, but in reference to music, whichever occurence is more common is normal form

## Ascending Order vs. Normal Form

The order a PC set goes through is: 1. Unorder - (e,6,0) 2. Ascending order - (e,0,6), (0,6,e), (6,e,0) 3. Normal form - (6,e,0) - this is normal form because the distance between the two outer intergers is smaller than the other ascending orders. 4. Prime form - (056) - you take normal form and orient the intervals on zero. - even though we have a new set of numbers, the intervals between each interger is the same.

Ascending order is not normal form, but normal form occurs in ascending order. Ascending order takes the unordered PC set and puts it in a number of orders, one of which is normal form. Normal form is a PC set in ascending order with the notes as close together as possible. - one way to find normal form is to find the smallest interval between intervals. - this is after you have found the ascending orders that are our options for normal form.

With ascending order, you have different options to order a PC set into, like inversions in tonal harmony.

### Structure for each form

1. Unordered PC set (x,x,x)
2. Ascending order (x,x,x)
3. Normal order [x,x,x]
4. Prime form (xxx)

* the only form that uses brackets is normal form
* the only form that doesn’t use commas is prime form

#### Allen Forte

Allen Forte created a numbering system for each kind of PC set. - cardinality: the number of pitch classes in a PC set. The cardinality is how Forte labels PC sets x-x. For example, 5-1, like (0,4,7), is a major triad. - the problem with refurring to this system is unlike (0,4,7), writing 5-1 gives you no information about what kind of chord you have unless you look up the Forte table.

**The reason we use numbers is to represent all enharmonic equivilants and narrow the idea down to how it exists sonically: as 1 note. 1 note gets 1 number.**

## Using Pitch Class Sets in Analysis

How many possible combinations of (015) are there? - this includes any PC set that shares the same intervals, or the inversion and its shared intervals - this gives us 24 combinations.

Ex: (015) - could be [1,2,6], [2,3,7], [3,4,8], [4,5,9] etc… - inversion: (0,e,7), normal form [7,e,0] - could be [8,0,1], [9,1,2], [t,2,3] etc…

Finding pitch class set lets you know the basis for an entire piece of music.