Music Fundamentals – Lectures

Lecture 1
Pitch

1.1

The Drag Races

Imagine a motorcycle screaming down the street toward your direction, then as the motorcycle streaks passed your house the rider continues to drive away. What would you hear? The same sound I hear occasionally on my street: a distinct PITCH that is moving HIGHER (both because of the Doppler effect and increasing RPM) as it approaches my house, then a change to a LOWER pitch as the motorcycle passes the house and slows to the stop sign at the end of the street.

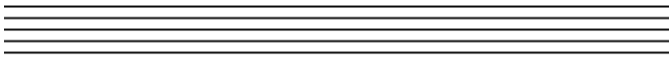
The topic of PITCH is the focus for this week. Pitch is one of the elements of music and we need to have a way of documenting it so that we can keep a copy of all of our great musical ideas. The system of music notation known as Standard Notation is the system we use in this class. It is by no means the only system of music notation. Guitarists are familiar with tablature and chord diagrams both of which are alternate notation formats. Other cultures in the world have different notation systems as well.

Standard notation is not necessary a perfect notation system but very useful for many styles of music and it is well suited for our purposes. It's best attribute is being the most widely accepted music notation system used throughout the world today. I have absolutely no data to back up that last statement, I just like the way that it sounds;−)

1.2

Standard Notation

The system of Standard notation evolved over the course of centuries and it now consists of a graphic system that uses five parallel lines grouped together and called a STAFF

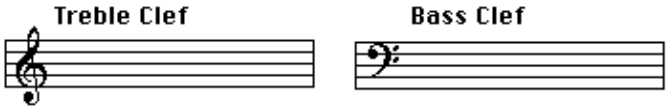


We use the first seven letters of the alphabet (A−G) to name pitches in the Standard notation system. This seems to indicate that there are 7 different PITCH names, i.e. A, B, C, D, E, F and G. Yes, that is correct, so far. As it turns out, there are more names that we will learn about later.

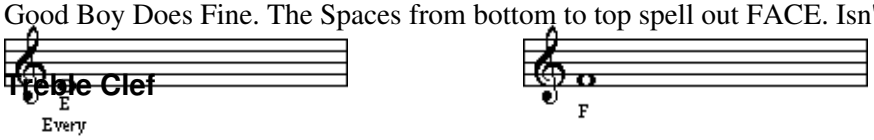
This five line system is used to distinguish between the different alphabetical PITCH elements of the notes. Not only are the lines used but also the spaces between the lines. An oval shape (called a NOTEHEAD) is placed on the five line STAFF on either a line or space position. A LOW NOTE would be placed lower on the five line system than would a HIGH NOTE. This is the basic idea. The vertical placement on the five line STAFF is related to the PITCH placement in sound. We'll see and hear some examples in a moment. In order to have a system that is truly usable we have to be able to notate pitches of a very wide range. From the low note of the contrabass to the high note of a piccolo, or for that matter the low note of the piano to the high note of the piano. A simple five line system won't provide enough different locations to notate all of the notes of a piano. There are several different notation elements that can be added to the staff to make it more useful.

First we discuss Clefs

A graphic symbol known as a Clef sign is used with staff to define the alphabetical locations on that staff. In this class we will focus on two different Clefs: **Treble Clef** and **Bass Clef**.

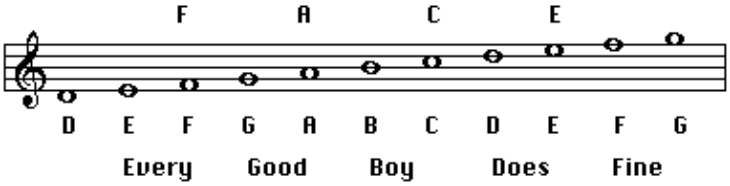


As the names imply, the Treble Clef is used for higher pitches and the Bass Clef is used for lower pitches. A flute uses the Treble Clef, a cello uses a Bass Clef. Let's look at the Treble Clef, sometimes called the G clef because the scroll part of the Clef is spiraling towards the second line −− defined as the letter G. Once the second line is defined as G, everything else must follow in sequence. The next space is A, the next line is B, the next space is C, etc. Most people memorize the lines (E G B D F) using a mnemonic gimmick of Every Good Boy Does Fine. The Spaces from bottom to top spell out FACE. Isn't that nice.



When you add in the space locations above and below the staff you end up with eleven different pitch locations. It starts from the letter D, going through the music alphabet past the next D and all the way up to G. The immediate task at hand is to memorize all of these pitch locations. I'll wait..... OK, it might take more than just a few seconds. Work on memorizing the letter names of the staff locations during this week.

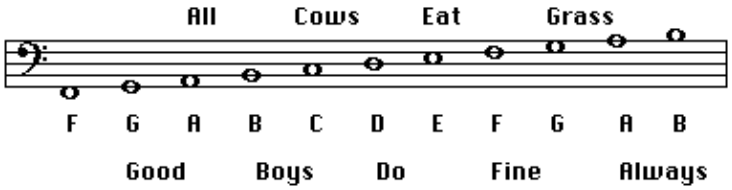
This is very important!!! I'm serious.



Lower pitched notes use the Bass Clef. It is sometimes called the F Clef because the two dots above and below the fourth staff line define the fourth line as F. This Clef redefines the alphabetical locations of the lines and spaces. In bass clef the lines from bottom to top are G B D F A and the spaces are A C E G. The off−the−shelf mnemonics are Good Boys Do Fine Always (lines) and All Cows Eat Grass (spaces).

Bass Clef

When you add in the space locations above and below the staff you again end up with eleven different pitch locations, this time starting from the letter F, going through the music alphabet past the next F and all the way up to the next B.

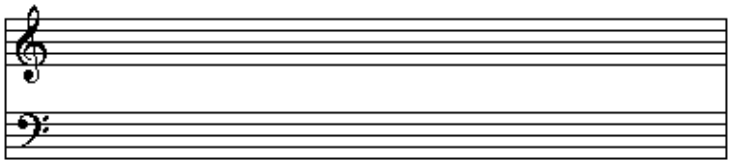


Yep, you have to memorize all of these too. You better get started.

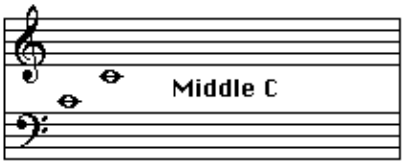
1.3

Grand Staff

If you have been thinking that with either Treble clef only or with Bass clef only, we still don't have enough different locations, you are correct. One way standard notation solves the limited pitch choices is by creating a Grand Staff. A Grand Staff (sometimes referred to as a Great Staff) is a two staff system that has a Treble Clef on top and a Bass Clef on the bottom. The piano uses a Grand staff for its notation.



This still doesn't give us as many different pitch locations as we need and another notation device used is the LEDGER LINE. The ledger line is a small line placed outside the staff area to become a sixth line of the staff. This ledger line can be ABOVE or BELOW the staff. It gets even better. There can be multiple ledger lines to extend the range of the Clefs. Isn't that wonderful? If you need to notate a really high note you simply add as many ledger lines as you need. (there is also a way to minimize ledger lines yet achieve the same effect, stay tuned.) Let's use a ledger line on the Grand Staff. As you know from your memorization exercises the high note of the Bass Clef is the letter B and the low note of the Treble Clef is the letter D. A single ledger below Treble clef will be a letter C, the very letter we need to connect the top Treble clef with the bottom Bass clef. If you wanted, you could notate that same note as the first ledger line above the bass clef, they are both the same note, letter C, this particular C is referred to as MIDDLE C, for obvious reasons.

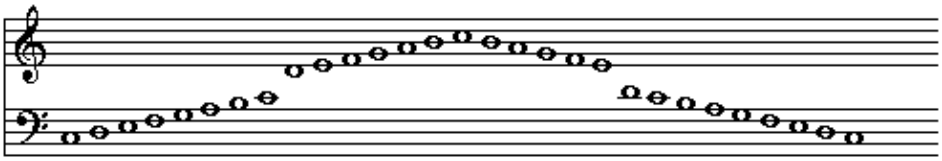


1.4

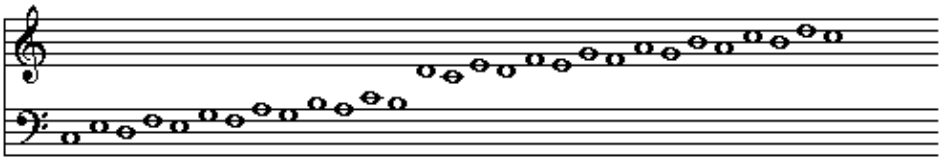
Lets hear some of this stuff.

Open MIDI file

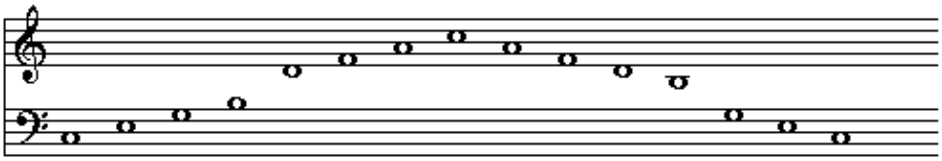
this first goes up two OCTAVES then back down



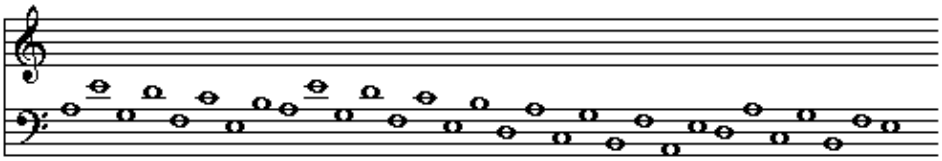
the next one goes up two staff positions then back one, up two back one, etc.



the next one uses only the spaces



the last one stays in the bass clef area and uses a pattern of up 5, down 6 with some variations.



You should continue to memorize the letter names of the positions on the staff so that you can say the names of the notes shown above at the same rate they are played in the MIDI file. Play it again, and try to say the letter names, see where you stand. Do you need work? Well, get to work then.

1.5

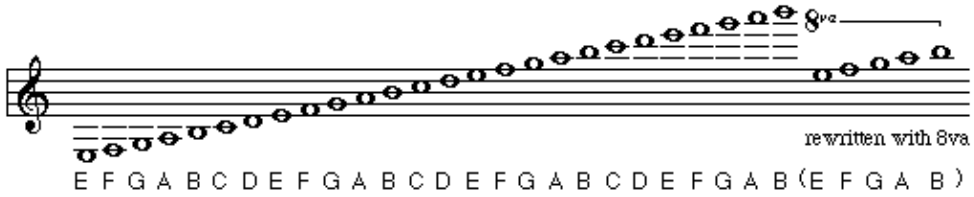
Extending the Range

We can use ledger lines to extend the grand staff both above and below. In addition, we can use an octave higher symbol (8va) or an octave lower symbol (8vb or 8basso) over a note or group of notes to indicate that

the note(s) should be played an octave higher (or lower) than written. In extreme ranges we can use 15va (2 octaves higher) or 15vb (2 octaves lower)

Using these symbols will help eliminate the use of ledger lines, which are a pain when writing music by hand. Ledger lines are also a pain to read, however most instruments have ranges that require the common use of ledger lines. Many instruments use a single staff even when that instrument has a wide range. The guitar is a good example of an instrument whose written range is very wide yet it uses a single treble clef staff and often requires the use of ledger lines. The lowest written note is E, space below the third ledger line below the staff. What a mouthful! The highest note varies, depending on whether you're talking about classical, flat−top, electric etc. Even with a classical guitar (the lowest range of the bunch) the high note is B, on the fifth ledger line above the staff! Thatsa lotta ledger lines. Sometimes the extreme upper range of the guitar is notated using 8va to minimize the ledger lines. The end of the example below shows the last 5 notes rewritten using the 8va symbol. Either way is correct, it's up to the individual composer or arranger to decide how many ledger lines he or she wants to tolerate. The lower range is rarely given a 8vb treatment, guitarists just get accustomed to seeing the lower ledger lines. Such is life.

Pitch range of the Guitar



All instrumentalists must deal with ledger lines. You must too.

1.6

Chromatics

This section is a jump start on next week's lecture. Chromatics are best understood when related to the piano keyboard or guitar fretboard, but we're not going there this week. If this seems confusing, have patience, we revisit this topic in more detail next week.

This system of pitch letter names has evolved over the millennium. 5 or 6 centuries ago these letter names might have given the musicians all the notes their music needed. As the concept of tonality developed in the Renaissance and Baroque periods, there became a need for additional notes. "Musica Ficta" (false music) was a common composition and performance practice where new notes outside of the regular alphabet were used at phrase endings. The composers of the time would write the music, yet in performance often some of the notes would be changed. This change usually occurred at the phrase endings and the notes that were changed helped bring about a new concept in music, Dominant to Tonic relationships. They didn't think of it in the same way that we do now, but in retrospect, one can see that practice of Musica Ficta was the genesis of controlling tonality. Eventually the musicians of that time began writing the correct notes in the score that then had previously been performed correctly yet notated incorrectly. Thus was born the notation of chromatics.

To fully understand chromatics we need to understand a few terms first. The term **half−step** is used to describe the smallest distance on the keyboard and also the smallest distance in the 12 tone per octave system. The system we are currently studying has 12 tones per octave yet only 7 letter names per octave, what gives? What about the other 5 tones?

Read On.

Strange but True

The letter names of our musical alphabet are NOT all the same distance apart. Some adjacent letter names have more distance (musicians use the term 'Interval' instead of distance) between them than other adjacent letter names. As an example the letter names E and F have only one half−step between them while the letter names of F and G have two half−steps between them. I can't explain how or why things evolved this way, but you better be fully aware that not all adjacent letter names are created equal. The letter names of B and C as well as the previously mentioned E and F have the interval of only one half−step between them. All other adjacent letter combinations have an interval of two half steps between them. Remember B−C and E−F are one half−step apart, all other adjacent letters are two half−steps apart.

Wait a minute, let me pause and interrupt myself as I might in a traditional classroom...
If you are feeling lost at this point, perhaps checked out mentally, you can bail out and jump to the 'links' section at the end of the lecture. I've already covered the topics you need to know to take the practice quiz for this week. Without question this topic of chromatics is best understood by using a keyboard as a reference and we won't be doing that until next week. Soooo, if you have enough to keep you busy already and this topic isn't clicking with you right now, come back to this later.

OK, is anyone still with me? I'll continue with the story of chromatics.

So, if there is one half−step between B and C (and a half−step is the smallest interval in our system, remember?) then C is the next note after B (one half−step higher). That makes sense, but what about the two half−step intervals between most of the letter names, i.e. A to B. You start at A, and one half−step higher is a note (but it's not B). B is two half−step intervals away. The note in between A and B is a chromatic note.

Let's see what this looks like in table form.

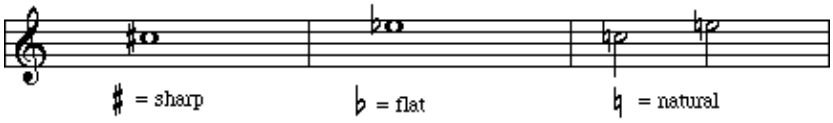
1	2	3	4	5	6	7	8	9	10	11	12
A	_	B	C	_	D	_	E	F	_	G	_

The 12 columns represent the 12 notes of our system, the blank squares are the 5 notes in our system whose names we have not yet learned. **They are the chromatic notes**. A chromatic note is a legitimate note, as valid as any other. We use them all of the time, but they need more than just a letter name to describe them. They have a chromatic sign also.

We have three different chromatic signs in music.

1. Sharp (#) − raises a note one half−step
2. Flat (b) − lowers a note one half−step
3. Natural − restores a note to non−chromatic letter name.

Notice that the chromatic sign always goes to the left of the notehead. First shown is the note C−sharp, followed by E−flat, then lastly a C−natural and E−natural.



Every letter name can be sharped or flatted, creating more names than there are notes (and confusion shall reign). In the table below all of the sharped notes are represented by a shift of one column to the right and the flatted notes are one column to the left (with a wrap−around at the end of the line). All of the notes of any single column have the same pitch (sound), yet usually two different names.

1	2	3	4	5	6	7	8	9	10	11	12
_	A#	_	B#	C#	_	D#	_	E#	F#	_	G#
A	_	B	C	_	D	_	E	F	_	G	_
_	Bb	Cb	_	Db	_	Eb	Fb	_	Gb	_	Ab

Here is the same thing with most of the air squeezed out.

1	2	3	4	5	6	7	8	9	10	11	12
A	A#	B	C	C#	D	D#	E	F	F#	G	G#
	Bb	Cb	B#	Db		Eb	Fb	E#	Gb		Ab

As you can see from this table, most notes have more than one name. The note in between A and B is named A# (A−sharp) or Bb (B−flat). Yes, that note has two names. Sometimes it's called A#, other times its called Bb. Sometimes I'm called Mike, sometimes I'm called Sult. It's no big deal. It's just a couple of different names. In this class, we will learn when it is appropriate to use one name vs. another name.

The bottom line is this:

- There are 12 different pitches, but there are only 7 letter names.
- When sharps and flats are attached to the the letter names, there is a total of 21 different pitch names.
- Most of the pitches share two different names. (we'll discover later that ALL pitches have at least two names.)

If you are getting a headache with all of this technical chromatic name stuff, take solace in the fact that this will become clearer when we study the keyboard layout, next week.

1.7

Enharmonics

You've taken some Excedrin and are feeling better, I assume.

"Enharmonic" is the term we use to describe the 'double name' syndrome. As an example, A# and Bb are enharmonic equivalents (or simply 'enharmonics'). Another look at the table above reveals the following enharmonic pairs: A#−Bb, B−Cb, B#−C, C#−Db, D#−Eb, E−Fb, E#−F, F#−Gb, G#−Ab. Two names for the

same note. Enharmonics are as simple as that. You need to be aware (and we learn more about this later) that usually one of the names is appropriate for a specific context whereas the other name may be appropriate in a different context.

1.8

Pitch Contour

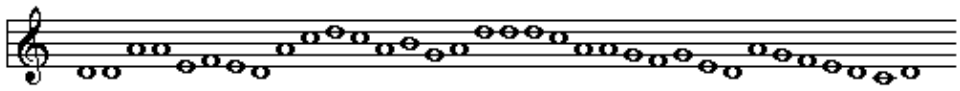
Let's listen to some more examples

These examples are melodies that many of you will recognize, they have a rhythmic component that I am ignoring for now. The notation will show the pitches only. Follow along with the music and notice how some notes are played long or short, fast or slow. We have not yet discussed rhythm. We will continue to study the topic of pitch for a couple of more weeks before we tackle the topic of rhythm. If you can't wait, you can read about 'Rhythm' in the text.

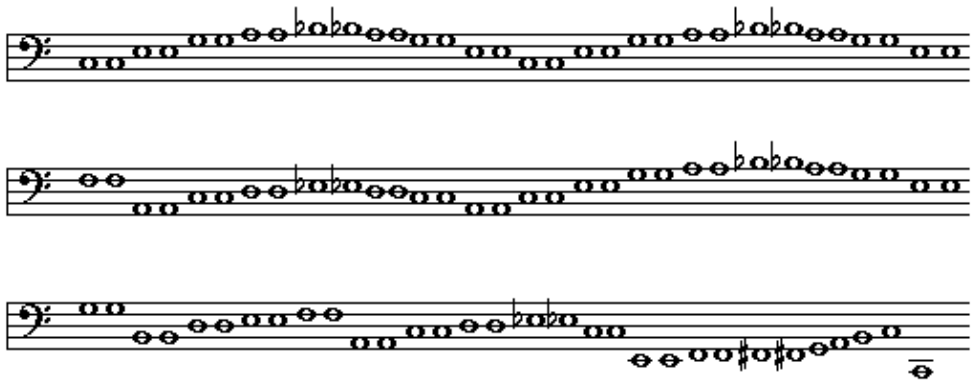
When listening to and reading the music, notice the pitch contour of these melodies. Some of them jump around, some move in small intervals. Which one has the smallest pitch range? Which one has the largest interval leap? Can you name all of the notes played? (Of course, this is too fast to say the names AS it is playing)

Open MIDI file

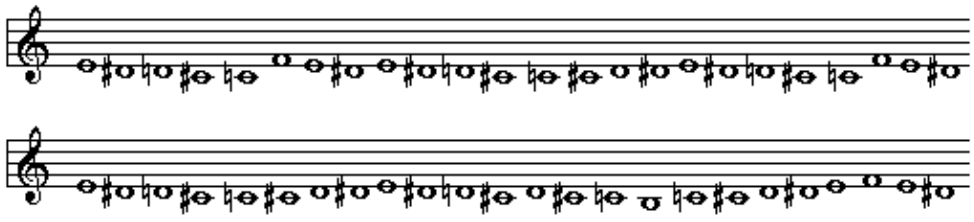
[*** Pitches from 'Scarboro Faire' – Folk Song ***]



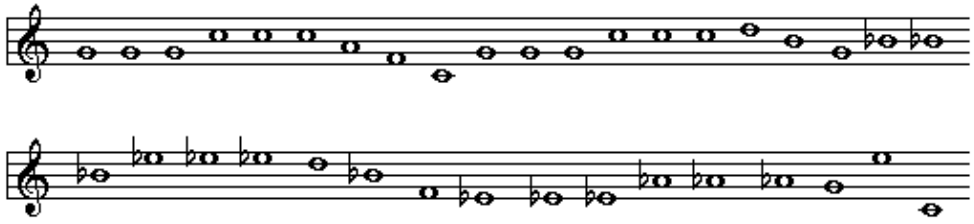
[*** Pitches from a typical 'Boogie Woogie' Bassline ***]



[*** Pitches from 'Flight of the Bumblebee' – Nicolai Rimsky–Korsakov ***]



[*** Pitches from 'America' – Leonard Bernstein ***]



1.9

Links

Here are links to both Apple's Quicktime and Yamaha's MIDPLUG sites. (They're Free!)
Click on the underlined words and you will be connected to the different sites listed. You can then download (save) a copy of the desired plugin. Get Yamaha's MidPLug for class use.

Foothill FGA students should now download MIDPLUG for class use.

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- Quicktime
- Yamaha's MIDPLUG site

If you are having trouble getting things to work properly, check out the Problems, Bugs and Quirks page

- PROBLEMS, BUGS AND QUIRKS

  Here are the links to this week's reading from the text. Note that the chapter is spread out over two files. You can link to part two from part one using the 'next' link found in these files.
- Chapter 1 pt 1 – Pitch
- Chapter 1 pt 2 – Pitch

  Below is a link to this week's OPTIONAL online practice/quiz.

  This quiz DOES NOT work on the Windows platform, sorry

  This quiz is NOT REQUIRED, it if for practice only. The required tests begin next week.
- Quiz 1 – Practice the Note Names

If you are experiencing problems or have questions about how to use the quiz, or anything else regarding the course, PLEASE EMAIL ME, mikesult@guitarland.com. The most important issue of this week is getting the MIDI files to play on your computer. Of secondary importance is the notation quiz. If you are having trouble with the MIDI files, don't worry about the quiz (although it doesn't require MIDI), you will be allowed to make it up once your system is working. I want to be sure that everyone has success playing MIDI files by

this week. I will try to answer questions on a Frequently Asked Question page that I'll add to throughout the quarter (no names will be used). If you have questions, so do others, don't be shy. Let's talk.

End of Lecture 1

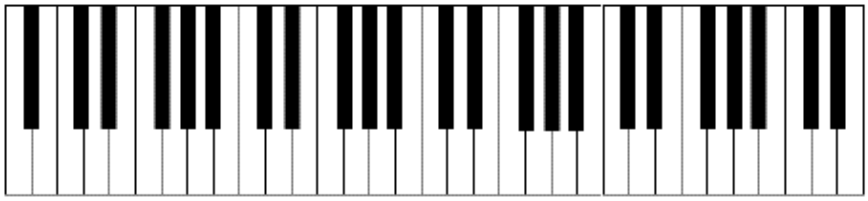
Lecture 2
Keyboard and Guitar

Open MIDI file

2.1

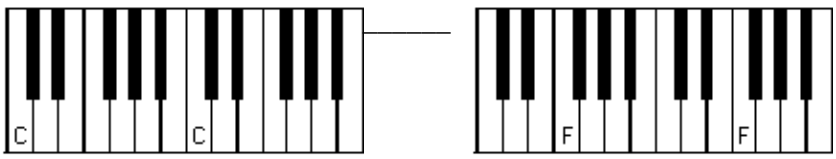
Real World Applications

Trying to relate the concepts of pitch without the use of an instrument is sometimes difficult. In last week's lecture the topic of pitch was discussed. This week we apply the concept of "musical pitch" to the keyboard and guitar.



Soon it will become apparent that the keyboard was designed to implement the "7 letter name –12 tone system" in keyboard form. The names of the white keys are the musical alphabet letters A–G, in a repeating pattern. Once you know where "A" is located, you can find all of the other Keys. The white key to the immediate right of "A" is "B", the next white key is "C" and so on.

So, where is A? Well, strange as it may seem, our system is usually taught from a different perspective than letter "A". Usually music theory starts with the letter "C" and later when we study scales, we start with a C major scale. The keyboard is visually and tactually layed out in a repeating pattern. Look at the keyboard diagram, do you see the repeating pattern in the center portion of the keyboard? The pattern at both ends of the diagram is "chopped off" to coincide with the pitch range of the exercises used in this course. The diagram above is not as large as the standard 88 key layout of a grand piano but the repeating pattern is the same. The key "C" is an easily recognizable landmark on the keyboard. Notice the pattern of black keys that are intermixed with the white keys. Two black keys, three black keys, two black keys, three black keys etc. We will define the letter "C" as the white key to the immediate left of the group of TWO black keys. ALL of the keys to the immediate right of the group of two black keys are named "C". There are several "C" keys on a full size keyboard. By the way, the white key to the immediate left of the group of THREE black keys is named "F". Now that you know where "C" and "F" are, you can figure out where "A" is located, can't you?.



At the risk of sounding redundant, let me say that each time the pattern (2 black keys, three blacks) repeats, you are moving up (or down) to a new octave. The keys within any single pattern use all of the letter names of the notation system. These names are repeated in each octave. In other words not only are there several octaves of "C"s there are several octaves of all of the letter names.

On a scientific level, when you jump up an octave the frequency of the note is doubled. We use a tuning standard of A–440, which means that the note A, above middle C should be tuned to vibrate at 440 vibrations per second (hertz). The next A, one octave up, is tuned to 880 hertz. The A one octave lower is tuned to 220 hertz. The 2:1 ratio of frequencies with regard to octaves is an important musical truth. We can then divide up a single octave into several smaller parts using that same division in each octave up and down the range of any instrument. This allows us to learn patterns in a single octave that can be repeated in each octave range.

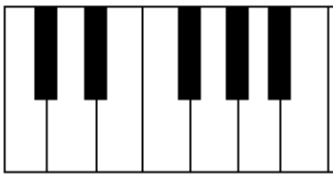
2.2

What about those Black Keys?

Maybe you've figured it out already, but those black keys are the sharps and flats. Hmmm, but there are only 5 black keys in each octave. Last week we learned that each letter name can be sharped or flatted. It seems that there should be 7 black keys, one for each sharp or flat. The explanation goes back to last week's discussion about the fact that the distance between each of the letter names is NOT the same. Let me show you again in table form. This table represents all of the letter names in a single octave (one full pattern on the keyboard). In keeping with tradition, the letter names start on C.

1	2	3	4	5	6	7	8	9	10	11	12
C	_	D	_	E	F	_	G	_	A	_	B

Notice that there is space between only 5 of the adjacent 7 letter names. This pattern is replicated on the keyboard. The letter names of the table equate to the white keys and the blanks equate to the black keys. Do you see the pattern? Of course the black keys have names.



Here is a table of all the notes names, similar to last week but this time starting on C. Can you find all of the letter names on the keyboard?

1	2	3	4	5	6	7	8	9	10	11	12
C	C#	D	D#	E	F	F#	G	G#	A	A#	B
B#	Db	_	Eb	Fb	E#	Gb	_	Ab	_	Bb	Cb

This link is to a keyboard diagram that you can print out for reference.

2.3

WHY 12 tones per octave?

This is a good question, I'm glad you asked. Unfortunately a good answer is beyond the scope of this course. Here's a short discussion on the topic. First I should assure you that this section (2.3) contains material that will NOT appear on any test so don't sweat it if you find it confusing.

Our 12 tone equal temperament system evolved over time. Since we don't have recordings of the music that was being made a century or two ago, we rely on surviving documents and historical accounts of the musical reality of the time. We do know that music notation DID NOT start with the 5 line staff system. First there

was a single line and melodies had a limited range. Then another line was added to the notation system but still providing only a limited pitch range. These are the characteristics of early melodic chants used for church services. Over time another line was added then another and so on, eventually evolving into the 5 line system we use today.

The issue of the 12 tone equal temperament is a little different. It is related to physics and our desire to overcome some of the characteristics of the nature of sound.

A single musical tone is made up of many different pitches sounding simultaneously. You might not be aware of it but that is just the way it is. When you play a note on a piano, for instance an octave below middle C (C3), that note also has a little bit of the next octave C (C4 – middle C). Not only that, the original C3 has a little bit of the next G (G4) and a little of C5, E5, G5, Bb5 and more. This is not a hoax. It is simply the nature of vibrating strings and air chambers and other physical ways of creating sound. I'm talking about acoustic instruments here, synthesizers are a different animal. Back to the piano example, the various ratios of volumes of the additional sounds (called overtones) to the original (called the fundamental) will determine the tone quality of the piano. Of course the quality of materials and construction play a large part in the instrument's tone quality. But usually a piano is recognizable as a piano and not confused with a clarinet, right? This is primarily because of the overtone content. The ratios of the overtones in the sound of a clarinet is different from the ratios of the overtones in the sound of a piano.

What does this have to do with 12 tones per octave?

Nothing, it's just background material, here comes the real discussion of the 12 tone equal temperament. Notice, that most of the overtones are not the same letter name as the fundamental note. In the example above the fundamental is C and the overtones include the notes C, G, E, Bb (and even more). Here was the problem before our 12 tone equal temperament system. When you tuned up the instrument so that the G key on the keyboard was "in–tune" with the overtone G (from the C fundamental) and the E Key was "in–tune" with overtone E (from the C fundamental) the key of C sounded great. So what is the problem? Well the problem occurred when you wanted to play in a different key. When you tuned the instrument for the key of C, the other keys sounded out–of–tune. If you wanted to play a piece in the key of A you had to tune up for the key of A instead of C. The bottom line is that the notes in one key were out–of–tune with the same letter named notes of a different key. Weird, huh? This is the result of a tuning system known as "pure" intonation. When using pure intonation, the choice was to either stay in a single key or retune for each different key. As composers started creating more complex compositions this tuning situation caused serious restrictions in the use of different tonalities within a single composition. As you shifted into a different tonality the music started sounding sour. In order to find a solution to this dilemma musicians started experimenting with new tuning systems that eventually lead to our 12 tone equal temperament system of tuning. In the equal temperament tuning system, most everything is slightly out–of–tune when compared to the overtone series (nature) but all keys sound sort of OK (to most people) and you don't have to retune for different keys.

That explains equal temperament, but what about 12 tones per Octave?

Well, some people say that dividing the octave into 12 parts will create the smallest interval that humans can recognize as a separate and distinct pitch. However earlier in this century a composer named Harry Patch was writing music that had 43 notes per octave!! He had to design and construct the instruments that were used to perform his music. Quite a task. Rumors are that Harry was a human ;–) So much for the "we can't hear more than 12 tones per octave" theory. As it turns out many musicians throughout history have used "quarter tones", the notes inbetween the half steps of the 12 tone system. The Harvard Dictionary of Music listing of "Microtones" cites several examples of using quarter tones some dating back centuries.

Additionally, some cultures have created music that uses only 5 notes per octave. Go figure.

So, it comes back to this: Why 12 notes per octave?

Gee, I don't know, ...why not? I suppose western music could have evolved differently, but it didn't. Sorry I took so much of your time with this tail chasing exercise.

In this class we will study the 12 tone system without any further questioning of the merits of the system. It's kind of like having faith in one's chosen religion, you may not have a complete understanding of "how and why", but you still believe none−the−less.

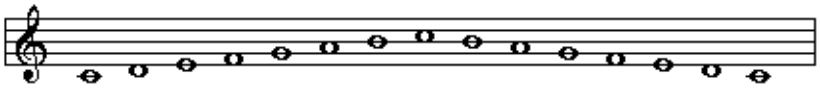
If you are interested in different viewpoints of music with regard to tuning systems, there is a considerable amount of information and many opinions on the subject. As a start you can look up the topics of "Intervals, calculation of", "Microtones" , and "Temperament" in the Harvard Dictionary of Music. There you can find a very technical and scientific discussion. It might even be interesting, no guarantees however. But as I stated at the beginning of this section, it is beyond the scope of this course.

2.4

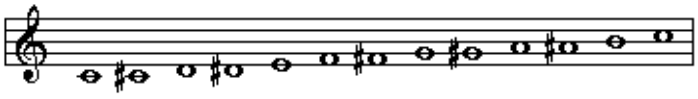
Let's listen to the notes.

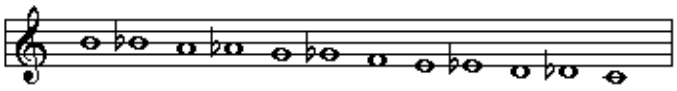
Open MIDI file

[C scale − uses the white keys only]

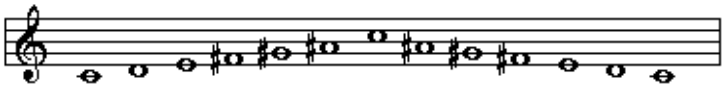


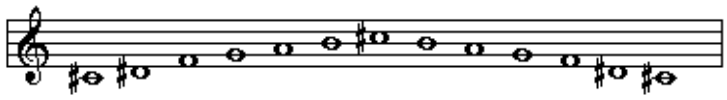
[Chromatic scale − uses all the white and black keys]



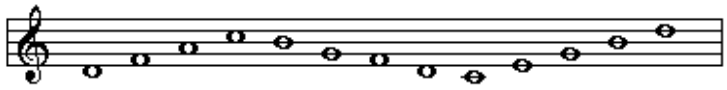


[Whole tone scales − two different whole tone scales,
each note is a whole step away from the next note of the scale.]





[II–V–I jazz pattern – this is a basic jazz pattern that outlines a common chord progression.]



Open quicktime presentation

2.5

Guitar

Half steps and the Fretboard

Each fret on the neck of the guitar is one half step in distance. The twelfth fret is one octave higher than the open string.

There are six strings on the guitar, numbered 1–6 counting from the highest sound string E. The letter names are shown below.

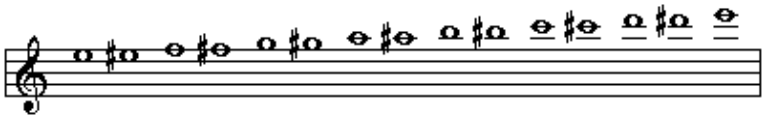
1 2 3 4 5 6
E B G D A E

An important concept in this type of instrument (all string instruments) is the overlapping ranges of the different strings.

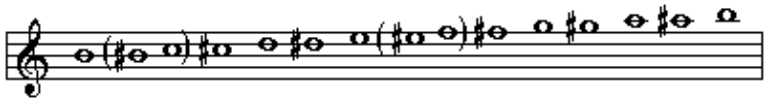
There are two or more versions of most of the pitches within the range of the guitar. As an example, consider the open first string, "E". That same note is found at the 5th fret of string two, the 9th fret of string three and the 14th fret of string four! These are not an octave higher or lower, all four "E"s are in the same octave, they are written at the same location on the staff (fourth space of the staff). These multiple versions of the same pitch create many interesting compositional possibilities that cannot be duplicated on a keyboard.

Shown below is one octave range on strings 1, 2, and 3. These strings are shown written as naturals and sharps. Each string has more range than an octave but even using this limited pitch range one can see the multiple versions of pitches available on the different strings. Notice that all three strings can play the notes of E5, F5, F#5, and G5. These are only some of the many possibilities.

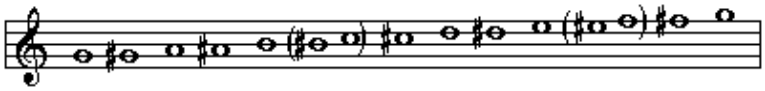
string 1



string 2



string 3



To see the written range of each string along with guitar tablature, use the following links to the text.

Naturals and Sharps on the Guitar
Naturals and Flats on the Guitar

2.6

Essential Differences between the Keyboard and the Fretboard

On a keyboard the sharps and flats are visually and tactually distinctive. It is fairly straight forward, with the trickiest part being the Fb, E#, Cb, B# letter names (all are white keys, seemingly of a different letter name!).

On the fretboard, visual and tactual characteristics for chromatics are not apparent. Each fret is one half step in distance and there is no distinguishing characteristic for sharps or flats. As an example, the sixth fret of string 1 is A#/Bb yet the sixth fret of string 2 is F. One fret higher at the seventh fret, string 1 is B yet the seventh fret of string 2 is F#/Gb. There is NO easy rule such as "all notes at the even numbered fret are chromatics" or whatever..., NO WAY, forget it. No black or white key to help you out. You just have to learn the names.

One of the essential differences between the keyboard and the fretboard is that a keyboard gives you one and only one choice of each note. You want to play middle C, there is ONE middle C on the keyboard. You want to play a C major scale starting on middle C? There is ONE place on the keyboard that you can play that scale. However, on the fretboard it is different. Since each string has a range that overlaps with the range of the adjacent strings, there are many possiblities for each note. It is common to have two, or more choices as to where on the fingerboard you will play a specific note or scale. The only exception being the extreme low or high range of the instrument.

The lack of black keys on the fretboard also illustrates another difference in the two instruments. It becomes apparent when you play music in a variety of keys. The keyboard fingering for a C major scale and a C# major scale would be quite different. However, there are several fingerings for C major on the guitar fretboard that you could simply move one fret higher and re−use for C#. The exact same fingering. Keyboard player are jealous. Do you hear them whining?

2.7

Another important difference.

A guitarist is generally a little more into the maintenance of the instrument. Certainly more involved in maintaining the tuning and restringing of the instrument. Most pianists hire a professional tuner to tune their instrument. These pianists are connected to their instrument on an artistic level but not on a "nut and bolts" level. I guess an analogy might be the people who do their own car's oil change vs. the people who go to the local Jiffy Lube. I don't change my own oil but I do change my guitar strings, it's sometimes dangerous work.

2.8

Keyboards players vs. Guitar Players

A note to guitarists: We guitarists are the butt of some jokes. Unfortunately it is true that many guitarists don't learn to read music very well. I've even read articles about respected guitarists who say "Fortunately, I don't read well enough to hurt my playing any." What a load of CRAP! Remaining ignornant of this important language of music notation is an unnecessary limitation on one's musical horizons. If the following joke describes you accurately and you don't do anything about it... well, SHAME ON YOU!

Q. How do you make a guitar player be quiet?
A. Put some written music in front of him.

Years ago one of my favorite Jazz instructors said to a Jazz combo class, " Most guitarists only know three chords, The E chord, the A chord and the cord that plugs into their amp."
PPPsssttttttt−−− Arrogant Sax player. But he sure could play (and read!). And unfortunately there was some truth to what he said. Let's prove him wrong.

2.9

Links

I'm having problems with this section of this file. The last line should be the address of the page, but frequently the last few lines are not shown in the browser. I haven't been able to track down the problem, if you don't get the address to the quizzes for this week (there are two), PLEASE EMAIL ME, mikesult@guitarland.com

Here are the links to this week's reading from the text. Note that the chapter is spread out over two files. You can link to part two from part one using the 'next' link found in these files.

- Chapter 2 – Keyboard
- Chapter 3 (pt 1) – Guitar

Here are the links to this week's online Tests (NoJS) – These are required!!

- Test 1 – Note Names on the Staff (NoJS)
- Test 2 – Ledger Lines (NoJS)
- Test 3 – Chromatic Notes (NoJS)

JavaScript quizzes (For Mac Users using Netscape) – These are optional!!

- Quiz 2 – Practice the Note Names on the Keyboard
- Quiz 3 – Practice the Chromatic Notes on the Keyboard

If the JavaScript quizzes don't work with your browser, here are the alternate assignments. Print out the worksheets and complete them by hand.

- Keyboard Worksheet no. 1
- Keyboard Worksheet no. 2
- Keyboard Worksheet no. 3
- Keyboard Worksheet no. 4
- Keyboard Worksheet no. 5
- Keyboard Worksheet no. 6

If you are using the JavaScript quizzes, I suggest you practice until you are in the 90% range before

submitting a quiz for a grade. Don't bother submitting your low scores, keep practicing until you are an expert (or until you're too bored to continue). To clear the quiz score you must leave the page (the 'reload' button in netscape doesn't clear the score) and then relink to the quiz (don't use the 'back' button to get to the quiz again, that won't clear the score in netscape).

Here's how you reset the score.

Use the back button to get to this page and then use the link above to get back to the quiz. No, I didn't just contradict myself. You can use the back button to get back here, but you can't use the back button (or the forward button) to get back to the quiz (assuming you want to reset the score).

Once you are ready, clear the score and start a fresh quiz to submit for a grade.

This quiz doesn't work on Windows 95 but works on Macs, WindowsNT (depending on the browser) and some flavors of UNIX. These problems are the reason that these quizzes are not required. Good Luck

---

The Required Tests – An explanation

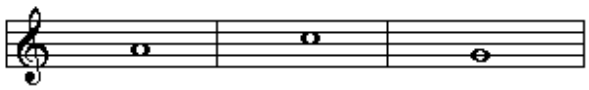
Below are some samples from the tests for this week. These ARE NOT the actual tests but instead a short example from the tests so that you can get an explanation of how to take them and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 1 – Note Names

Click on the answer menu (currently set to "select") and select the correct choice
to answer the following questions.

How it works

Assuming you've studied the chapter on pitch and lecture 1, you simply identify the letter name of the given note by its line space location. Since the first note is on the second space, it is letter "A" (spaces spell FACE, bottom to top). You click and hold down the mouse button on the word "select" then drag the mouse down (still holding down the mouse button) to the appropriate menu choice. When you are at the desired menu choice, let go of the mouse button. Try it out, select the letter "A" from the first menu. The second note is on the third space, letter C. The third example shows the correct answer (G) selected from the menu. This is how question number 3 should look before you submit the test.

section one		
		
Answer the following questions with regard to the above music notation.		
question 1 What is the name of the note in measure 1	question 2 What is the name of the note in measure 2	question 3 This menu is set to the correct answer

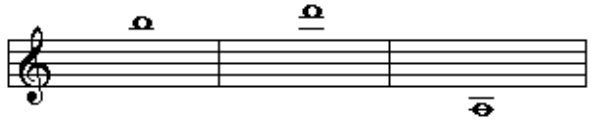
---

Test 2 – Ledger Lines

Click on the answer menu (currently set to "select") and select the correct choice
to answer the following questions.

How it works

Same as test one yet with ledger lines. In the example below question one is a "B", question 2 is a "D" and the question 3 menu is set to the correct answer, "A".

section one

Answer the following questions with regard to the above music notation.

question 1 What is the name of the note in measure 1	question 2 What is the name of the note in measure 2	question 3 This menu is set to the correct answer

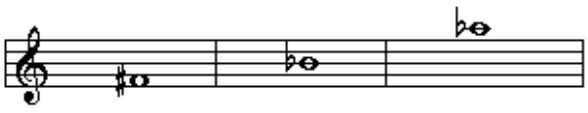
Test 3 – Chromatic Notes

Click on the answer menu (currently set to "select") and select the correct choice
to answer the following questions.

How it works

Same as test 1 and 2 with the addition of sharps and flats. The correct answers for this example are:

1. F#
2. Bb
3. Ab

section one

Answer the following questions with regard to the above music notation.

question 1 What is the name of the	question 2 What is the name of the	question 3 This menu is set to the

note in measure 1	note in measure 2	correct answer

end of Lecture 2

Lecture 3
Major Scales

Open MIDI file

3.1

First let's listen. Click on the Midi File link above.

Jesu, joy of man's desiring, Ode to Joy, Prelude in E, Whiter Shade of Pale.

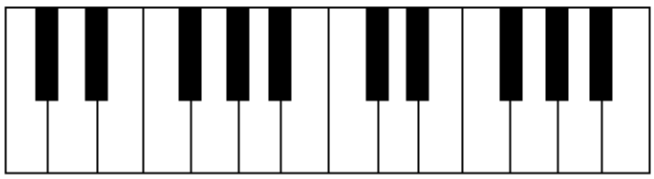
What do all of these tunes have in common?

3.2

Construction of the Major scale

1	2	3	4	5	6	7	8
	W	W	H	W	W	W	H

Notice that when starting on "C" on the keyboard, the white keys are arranged in the correct Whole Step/Half step pattern so as to create a "C" major scale. How convenient. This fact is why music theory generally begins the discussion of major scales with the key of "C" (and not "A").



We will discover that the "C" major scale is the ONLY major scale that does not use at least one black key. All of the other major scales use one or more black keys. It is useful to memorize the structure of the major scale. Say it aloud:

"Whole step, Whole step , Half step, Whole step, Whole step, Whole step, Half step."

Memorize this mantra.

It is also useful to think in terms of numbers with the number 1 representing a Half step (i.e. 1 unit of musical distance within the 12 tone system) and the number "2" representing a Whole step (i.e. 2 Half Steps = Whole Step).

The mantra now becomes:

"2, 2, 1, 2, 2, 2, 1"

This formula (using either numbers or words, which ever is easiest for you to remember) will be used to create a major scale on ANY pitch in our 12 tone system.

3.3

Other Major Scales

Pick a note, any note, any of the 21 names in our notation system. Take Eb for instance, or maybe F#, or A or perhaps A#. Can we build a major on any of these notes? At the end of section 3.2, I said you could build a major scale on any of the 12 tones of our system. So I guess any of the 21 names should be fair game as starting notes, don't you think? Well actually some of the names present unnecessary complications. Let me explain why.

One of the characteristics of a major scale is that it will use all of the letter names of the musical alphabet. Sometimes a scale might use a sharp or flat version of a letter, but all of the letters will be used in one way or another. This is ALWAYS true for major scales. We never "spell" a scale using two different forms of the same letter (i.e. No major scale should use both a "F" and a "F#"). This is where enharmonics are so important (remember them?). By showing a few examples, this alphabetical ordering of major scales will become clear. Using the suggested starting notes stated above (Eb, F#, A, and A#) let's try to create major scales that adhere to these two requirements.

1) the scale uses the correct formula:

whole,	whole,	half,	whole,	whole,	whole,	half
2,	2,	1,	2,	2,	2,	1

2) the scale uses all of the letter names and none of them twice.

> **sidebar**: Its is useful to work out the formula of intervals on a keyboard. Here is a link to a keyboard diagram that you can print out for reference (same one as last week). You should memorize the patterns of white and black keys within an octave. Close your eyes, can you see the pattern? If not, stare at the keyboard page until the pattern is burned into your brain. You truly do need to see the keyboard in your mind. Until then, you should have a printout of the keyboard for reference while reading the rest of this section.

Ok, let's try to create these major scales

First let's try Eb major:

The FIRST note is Eb.

The SECOND note must be a whole step higher (to the right) (F).

The THIRD note is another whole step higher (G),

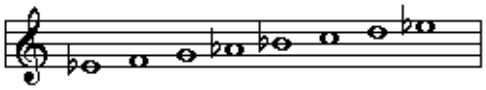
then the FOURTH note is a half step higher. Now we encouter the first enharmonic dilemma. Should this note be "G#" or "Ab"? Well, according to rule 2 above we shouldn't use the same letter twice. We have already used "G" so "G#" is out, it must be "Ab" instead. This is the correct enharmonic choice. Although "G#" sounds the same, it is not the correct name for this note in the context of the Eb major scale. Are you still with me?

The FIFTH note is a whole step above "Ab". It is called either "A#" or "Bb". You know which is correct, don't you? Yes, that note should be named "Bb"..

The SIXTH note is a whole step higher, it is "C".

The SEVENTH note is a whole step higher, it is "D". Finally, the eighth note is a half step higher, what should we call it? We have already used both the letters Eb and D.

The EIGHTH note is actually the First note played one octave higher and should always have the same letter name as the first note. In this case the name is Eb (not "D#"!!) There are actually only seven different letter names used in major scales. The eighth note of the scale actually "connects" us to the next octave. From there the pattern can start over in a higher pitch range. The entire scale is correctly spelled as "Eb, F, G, Ab, Bb, C, D, Eb" No sharp names are used in this scale. In fact, if properly constructed, any single major scale should never mix sharps and flats.



Now let's try F# as the starting note.

The FIRST note is F#

The SECOND note is a whole step higher. Should that note be called "G#" or "Ab"? We haven't used either letter yet, but we'd better not skip the letter G because it will cause a problem in the correct spelling of this scale. The correct enharmonic choice is "G#". Now wait a minute, this is significant. Remember in the Eb major scale when we needed this same note we called it "Ab" but in the F# major scale it is WRONG to call it "Ab", it is CORRECT to call this note "G#".

> **sidebar**: Trained musicians are picky about this sort of thing. It is important that you learn when it is appropriate to call a pitch one name as opposed to another. In the context of a specific major scale, it is always the case that one name is correct and the other is wrong. In other musical contexts (non−major scale music, there's lots of it around), sometimes it is ambiguous and either name will do.

Let's continue with the F# major scale.

The THIRD note is a whole step higher. The correct enharmonic choice is "A#" (not "Bb", do you see why?)

The FOURTH note is a half step higher to letter "B".

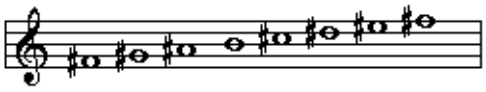
The FIFTH note is a whole step higher. The correct enharmonic choice is "C#" (not "Db").

The SIXTH note is a whole step higher. The correct enharmonic choice is "D#" (not "Eb").

The SEVENTH note is a whole step higher. The correct enharmonic choice is "E#" (not "F"!!!!). Yikes!, this is a situation when the white key should be called a sharp name. THIS IS CORRECT. We have already used the letter F on the first note (F#) and we haven't yet used a letter E of any type. The correct enharmonic choice is "E#". This enharmonic choice frequently trips up students because they sometimes think that the sharps and flats are always black keys (not so!) and this is obviously a white key. However, in accordance to the rules for

creating major scales, the correct name for this white key in this context of F# major is "E#" (calling the note 'F' is wrong!).

The EIGHTH note is F#, the same letter that we started with yet one octave higher.



Do you have a headache yet? The next one is easier.

Starting with the letter "A".

The FIRST note is "A"

The SECOND note is a whole step higher, letter "B"

The THIRD note is a whole step higher. The correct enharmonic choice is "C#" (not "Db", do you see why?)

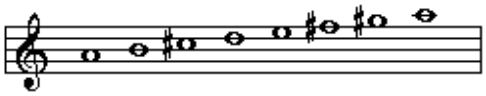
The FOURTH note is a half step higher to letter "D".

The FIFTH note is a half step higher to letter "E".

The SIXTH note is a whole step higher. The correct enharmonic choice is "F#" (not "Gb").

The SEVENTH note is a whole step higher. The correct enharmonic choice is "G#" (not "Ab").

The EIGHTH note is "A", the same letter that we started with yet one octave higher.



That wasn't so bad.

So, it seems that if we always adhere to the two rules noted above, we can create a major scale starting on any starting letter. Well, there are unnecessary problems when starting on some letter names. The next example will illustrate the problem.

When starting on the letter "A#", every note will be a half step higher than the key of "A"

The FIRST note is "A#"

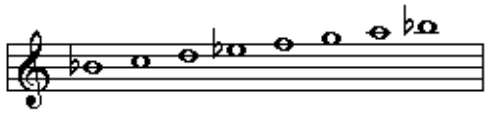
The SECOND note is a whole step higher, letter "B#", this is a white key but that's OK

The THIRD note is a whole step higher. Uh Ooh, that takes us to the "D" on the keyboard but it's supposed to be a "C" letter of some type. What do we do? We can call it "C double−sharp" but what a headache. By−the−Way the concept of double−sharp DOES exist. We could continue on with this scale and we would

have additional double−sharps at the sixth and seventh scale degrees, but why bother? If you want the sound of "A#" major then simply spell the scale as "Bb" major (they'll sound the same, right?, they are enharmonic scales).

Here is Bb major

1	2	3	4	5	6	7	8
Bb	C	D	Eb	F	G	A	Bb



It's pretty easy, and it sounds the same as would A# major.

So, to eliminate major scales with double−sharps or double−flats, our system uses only 15 of the 21 names as starting notes for major scales. We refer to the letter names as KEYS, as in the phrase "we are in the key of Bb major". To eliminate the problem we've been discussing regarding double−chromatics we do not use the major keys of A#. D#, E#, G#, or Fb. The remaining 15 letter names are used as legitimate major keys:

Ab, A, Bb, B, Cb, C, C#, Db, D, Eb, E, F, F#, Gb and G.

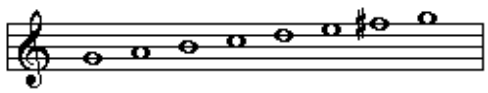
Instead of examining them in this mutated alphabetical order, we will take a different approach.

3.4

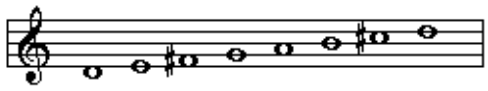
Major scale using Sharps

Do you have your keyboard reference at hand or in you mind? Check out these keys that use sharps, each uses the correct formula and all of the 7 letter names.

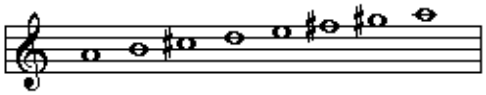
G major needs only one sharp, F#.



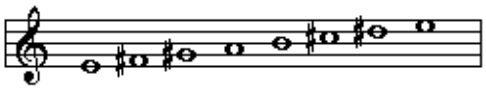
D major requires two sharps, F# and C#.



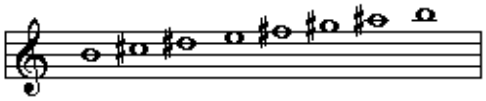
A major has three sharps, F#, C# and G#.



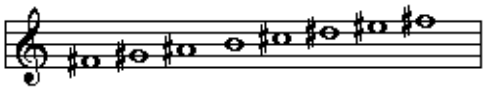
E major needs four sharps to stay within the formula, F#, C#, G# and D#.



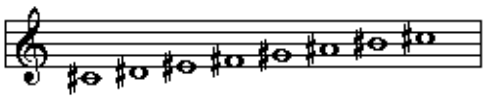
B major needs five sharps, F#, C#, G#, D# and A#.



F# major has six sharps, F#, C#, G#, D#, A# and E#, one is a white key (E#).



C# major, everything is sharped, F#, C#, G#, D#, A#, E# and B#, five black keys and two white keys with sharp names (E#, B#)

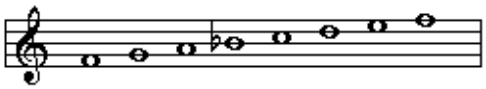


3.5

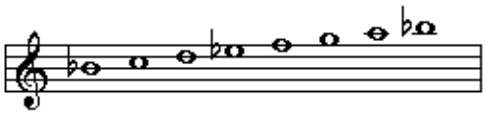
Major scale using Flats

Here are the keys that use flats. Once again each scale uses the correct formula and all of the 7 letter names.

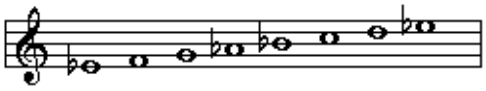
F major needs only one flat, Bb.



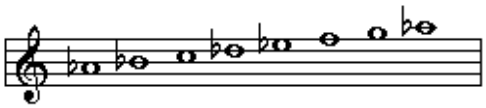
Bb major requires two flats, Bb and Eb.



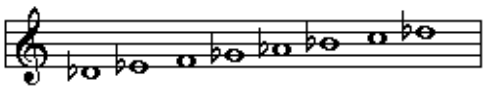
Eb major has three flats, Bb, Eb and Ab.



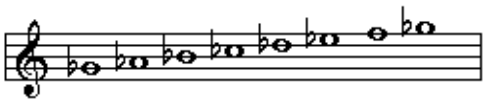
Ab major needs four flats to stay within the formula, Bb, Eb, Ab and Db.



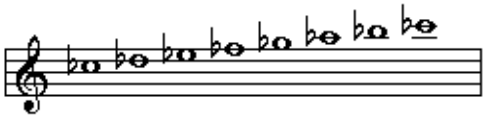
Db major needs five flats, Bb, Eb, Ab, Db and Gb. It sounds the same as C# major but is spelled entirely different. It is an enharmonic key to C# major.



Gb major has six flats, Bb, Eb, Ab, Db, Gb, and Cb, one is a white key (Cb). Gb major sounds the same as F# major but is spelled different. It is an enharmonic key to F# major.



Cb major, everything is flatted, Bb, Eb, Ab, Db, Gb, Cb and Fb. There are five black keys and two white keys with flat names (Cb, Fb). Cb major is an enharmonic key to B major.



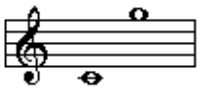
3.6

Why so many?

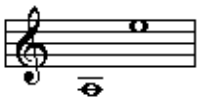
Many people feel that all keys possess an unique color and that the key of C has a different quality from Eb (aside from the obvious different range). Keys of E and F# are often cited as being "bright" whereas the key of Db is "dark". Although I don't discount these possiblities, I've never been able to make those distinctions between keys. Consequentially, I have never used a key solely for its color properties.

Matching melody range to vocal range

I do find the variety of key choices very useful however, especially with regard to matching a melody to a singer's vocal range. Each melody has a specific range within the context of the scale that is used. Using the "Star Spangled Banner" as an example, the lowest note is the tonic of the key and the highest note is the 5th of the scale (but it is the 5th note in the second octave of the scale!) This song has a very wide range and it is important to pick the key that has both the high note and the low note within the range of the singer. In the key of C, the notes would be C4 to G5 (soprano range) or C3 to G4 (tenor range).



For both men and women it is pretty high, perhaps too high for the singer (the G is too high for me to sing without embarassment). If you lower the song to the key of A, the range becomes A2 to E4 or A3 to E5. Assuming the low notes are still within the singers low range this may be a better key than C.



What if now the low notes are too low? The Star Spangled Banner has a wide range, if by lowering the high note you make the low note too low, you've gone down too far. If you can't seem to find a key that works for both the high note and the low note... sing a different song;–) Have you ever seen a singer start this song too high and struggle with the high notes at the end? This song has given singers trouble for decades. It is also a song that allows great singers to truly shine. The wide range of the song is one of the reasons that some people have suggested we change the national anthem to something else. If you've ever heard Ray Charles sing "America, the Beautiful" you know why that song (and Ray's rendition) has received consideration as a replacement. The melodic range of 'America, the Beautiful' is the interval of a 9th whereas the range of "Star Spangled Banner" is a 12th. (Intervals are discussed in a later chapter)

An important point is that each song's melodic range is unique and must be considered on its own without

regard to the appropriate key of other songs. In other words, just because you have determined that the Key of A is appropriate for the Star Spangled Banner, it doesn't mean that the Key of A is appropriate for all songs you sing. A song such as "Merrily We Roll Along" has a very narrow melodic range. This melody in just about any key will still be within the range of most singers. When I hear a singer say "My voice is in the key of [whatever]", I know that they don't really understand the process of picking a key to match a vocalist's range. Although it may be that a certain key seems to work consistently for your voice, that is still the result of the range of the melody in that key being within your vocal range. I've worked with singers who were very picky about which key they wanted to sing a song in, and I've worked with others who didn't care much (these singers have a very wide range and feel confident with any key). In my experience it is more common for the singer to choose the key (or at least veto certain keys).

Instruments are designed around specific keys

Most instruments are designed around the use of certain notes. Stringed instruments such as guitar and violin have open strings that are tuned to certain notes. This means that certain keys can utilize those open strings while other keys have no use for those notes. On the guitar, the lowest sounding string is E. A low E string played through a electric guitar turned up to "eleven", is a very powerful sound. Music played in the key of E on the guitar can take advantage of open strings that are not always available in other keys. The major keys of A, B, C, D, E and G allow for the use of certain open strings that are not available in other keys. This means that a composition played in one of these keys may use an instrumental technique available only in that key. The piece may not "work" in other keys without retuning the instrument. Of course by retuning the instrument one can achieve countless open string possibilities. The fancy italian name for retuning a stringed instrument is "scordatura". Since the retuning often results in the open strings being tuned to a simple chord, it is commonly referred to as an "open tuning".

The Keyboard with its arrangement of white and black keys has its unique qualities that make the fingering in some keys easier than the fingering of other keys. Legend has it that the composer Irving Berlin (he wrote "White Christmas" and a ton of other popular songs) had a special piano made that allowed him to play in any key while using the white keys (C major). Irving could use the fingering for C major and still change the key (by flipping a level?). He never had to learn the fingerings for other keys. I used to think that was 'cheating' but guitarist often use a capo and it's the same concept yet much easier to implement on guitar than piano. Most guitarist have a capo but Berlin's piano was a rarity and I'm sure cost a little more. It illustrates the fact that some keys are considered more difficult than others. By the way, any modern day synthesizer is capable of this type of transposition of keys. Irving would have loved them.

Wind Instruments are tuned to specific keys. Although all of the notes are available, specific notes have an 'open' fingering and certain scales are much easier to play than others. Common 'keys' for wind instruments are C (recorder, picolo, flute, oboe), Bb (soprano and tenor saxophone, trumpet, clarinet), Eb (alto and baritone saxophone), A (clarinet), F (french horn, english horn, alto recorder), D (picolo trumpet). If you have the money, you could have an instrument constructed in any key. If Irving Berlin played sax, would he have 12 of them? Each one custom made in a different key? Just wondering.

Showing Off

It is common for beginning and intermediate level jazz players (and even some advanced level players!) to learn a tune in one key and avoid the other keys. More accomplished players will play the tune in several keys, and many players take pride in being able to do so.

3.7

What can you do with them?

tongue−in−cheek

Unscientific data reveal that the major scale is one of the most commonly used scales on the planet earth. Many, many, familiar melodies use the major scale. It is widely believed that there is even more use of the major scale in unfamiliar melodies. And while this may be surprising, absolutely obscure melodies almost always use the major scale. The major scale is especially popular with the amateur musician who wants to write the next great love ballad.

Jewel uses it.

So did Lennon and McCartney

Bach, Mozart, Beethoven, all those guys too

pretty versatile scale

This following example makes use of a repeating bass note pattern, and other repeating patterns. A short repeating pattern is called an 'Ostinato'.

Open MIDI file

Below is a quiction presentation of the same MIDI file with accompanying commentary. You'll notice the difference in the synthesizer sounds between the different plugins.

Open quicktime presentation

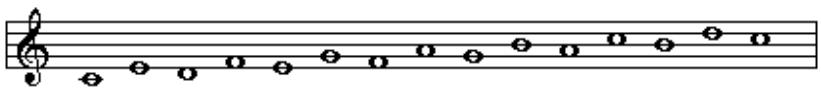
3.8

Eartraining Exercises

Open MIDI file

Here are some common melodic patterns used by musicians as exercises and warmup routines. These are shown in the key of C but they could and should be practiced in other keys as well.

broken thirds up



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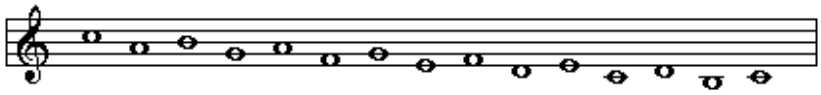
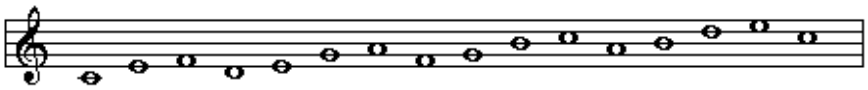
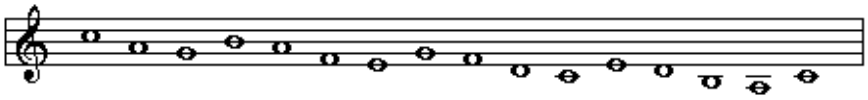
broken thirds down



combination of broken thirds up



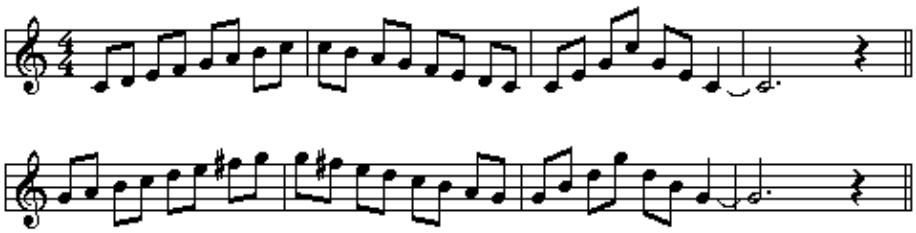
combination of broken thirds down



Classical scale/chord exercise

Open MIDI file

We haven't covered rhythmic notation yet, however the pitch element of this exercise should be understandable. This exercise should be memorized and practiced daily. Shown below is the exercise in both C and G major. The MIDI file goes through 12 different keys (only one version of each of the enharmonic scales F#/Gb, Cb/B, and C#/Db is used). The order of the keys is as follows: C, G, D, A, E, B, F#, Db, Ab, Eb, Bb, and F.



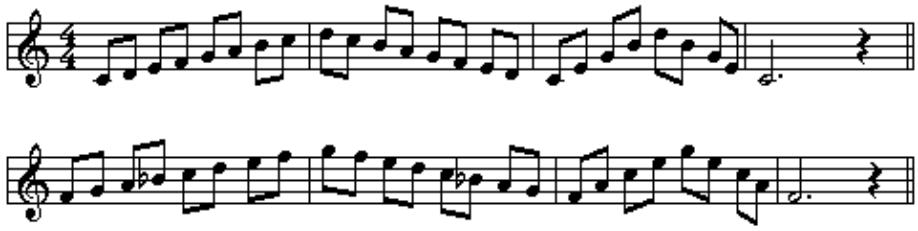
below is the exercise packaged in quicktime.

Open quicktime presentation

Jazz scale/chord exercise

Open MIDI file

This is a similar exercise that is more suited for the jazz style. Memorize this exercise and sing it everyday. Shown below is the exercise written in both C and F major. The MIDI file goes through 12 different keys in the following order. C, F, Bb, Eb, Ab, Db, Gb, B, E, A, D, and G. Just think how good you will feel knowing you have sung in all 12 keys today.



below is a jazz exercise packaged in quicktime.

Open quicktime presentation

below is a simple example showing how to combine to different music lines.

Open quicktime presentation

3.9

Links

Here are the links to this week's reading from the text.

- Chapter 4 – Major Scale, Keyboard
- Chapter 5 (pt 1) – Major Scale, Guitar

Here is the link to this week's online Test (NoJS) – This one is required!!

- Test 4 (NoJS) – Major Scales.

––

The one below is not required, but maybe useful.
For Mac users. Here is a JavaScript quiz. Windows 95 users beware, you'll get bogus results. When sufficiently annoyed feel free to email me and tell how it ruined your day:–(

- JavaScript Quiz 4 – Practice constructing Major Scales

Remember you are not required to submit a JavaScript quiz. The only required test this week is Test 4 (NoJS).

The Required Test – An explanation

Below is a samples from the test for this week. This IS NOT the actual test but instead a short example from the test so that you can get an explanation of how to take it and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 4 – Major Scales

Examine the following scales, they are either major scales that are spelled correctly or they contain one wrong note. Click on the answer menu (currently set to "select") and select the choice that is appropriate for each scale.

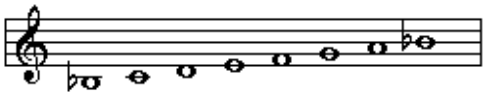
How it works

You need to compare the scale shown with a major scale that has the same starting note. In the example below the first note is Bb, so we compare the scale shown with a Bb major scale. It will either be a perfect match or there will be one wrong note. Here is a comparison of the Bb major scale with the scale that is shown:

All of the correct spelling for major scales are shown in lecture 3 (sections 3.4 and 3.5). You should use those scales (from memory) to compare against the ones shown on test4.

```
Bb major:          Bb C D Eb F G A Bb
Scale from page :  Bb C D E  F G A Bb
```

The fourth note is wrong.



Examine the above scale and select the appropriate menu choice.

end of Lecture 3

Lecture 4 – Rhythm

4.1

The Rhythm of speech

Tell me what you want, what you really really want (Spice Girls – "Wanabee")
sock–it–to–me, sock–it–to–me, sock–it–to–me, sock–it–to–me
(Aretha Franklin's backup singers on "Respect")
Yeah, That's the Ticket (Jon Lovitz's "liar" character from "Saturday Night Live")

Can you hear any of these phrases in your mind? I'm hoping that at least one of them is familiar to you. Each of them has a certain rhythm to it. The first two are from popular songs and the rhythm can be notated using standard notation. The third phrase from above isn't from a song, yet it needs a specific rhythmic delivery in order to be effective. Those of you who were watching Saturday Night Live during Jon Lovitz's run on the show know how the "Yeah, That's the Ticket" phrase should go.

All together now: " Yeaaaahhhhh, that's the ticket!"

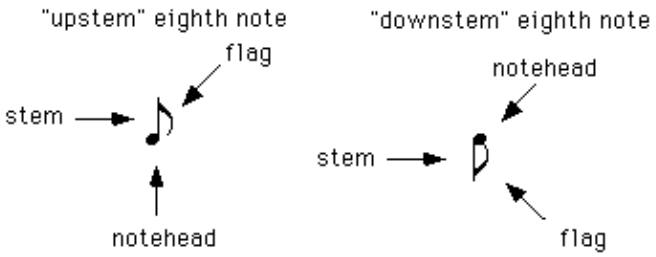
Say these phrases aloud. Listen to the rhythm of the words

The Tennessee Valley Authority
Sacramento State University

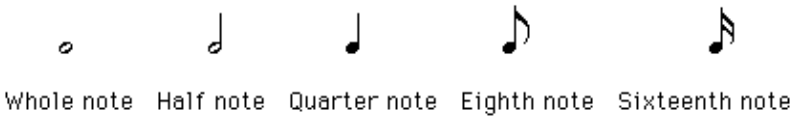
If I was to tell you the city I live in, I would say "I live in Santa Clara". Say it out loud.. Again. . . Say it over and over several times until it becomes a repetitive rhythmic phrase. These rhythmic patterns in speech can be used to help understand rhythmic notation. We will revisit some of these phrases later on in this lecture.

Note Values in standard notation

In order to incorporate rhythm into the notation system we must change the look of the note on the page to reflect its duration. Until now, the notes possessed only a notehead. There are more elements to the rhythmic portion of the notation system. Some notes have addtional attachments called stems, dots, flags and/or beams. This new stuff tells us the duration of the note (we already know the pitch of the note). Take a look at the different elements shown below.

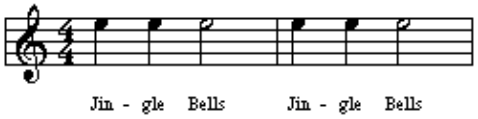


Not all notes have these attachments, some are just the way we've been using them in the first few chapters. You will notice that we have been using "whole notes" in most of our examples. Here is a list of several more note values.

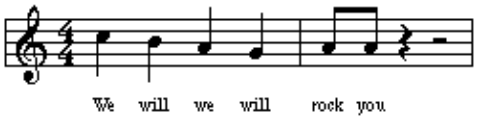


The notes are related to one another with regard to duration. Notice that the names of the notes tell us the proportional relationship with regard to the whole note. A half note is half the duration of a whole note. It takes four quarter notes in a row to last the time that a single whole note lasts. Do you see how this works? All of the different note durations are related to the others in some set proportion. The eighth note is twice the duration of a sixteenth note but only half as long as a quarter note. Notice that note values are relational and not tied to any set length of time. In other words a quarter note is not required to have any specific length of time. However once you decide on the duration of a quarter note, an eighth note will always be half of that duration. A half note will be twice the duration of the quarter note. Here are a couple of short examples.

Here's the beginning of the tune 'Jingle Bells'.

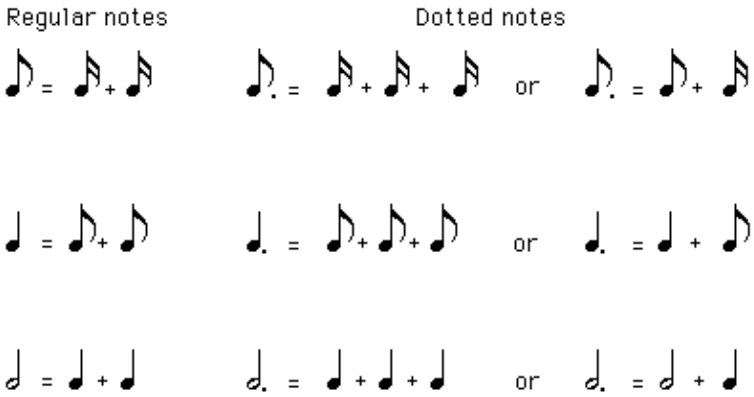


How about this Rock Anthem by the group Queen.



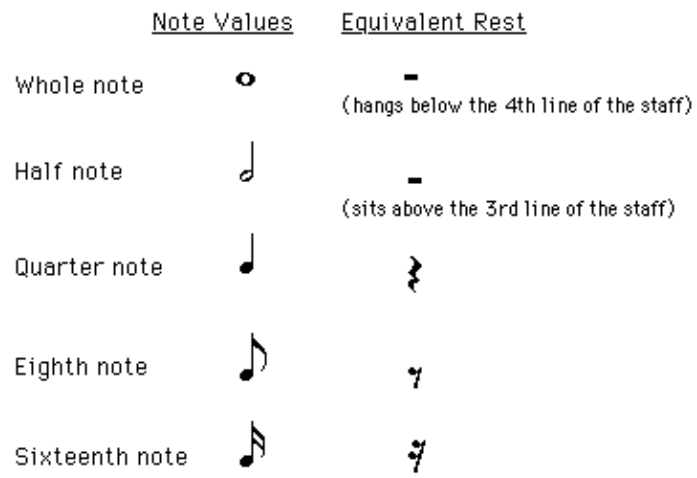
More Note Values

Each note value can be modified by adding a dot after the note. The dot adds 50% more duration to that note. As an example, since a half note has the duration of two quarter notes, a DOTTED half note has the duration of three quarter notes. The dot is very useful in expanding the rhythmic possibilities of our notation system.



Although it is not nearly as common as a (single) dotted note value, a second dot can be added to a note, that second dot will add 25% of the original (undotted) value to the note. With 2 dots a note will increase its duration by 75%.

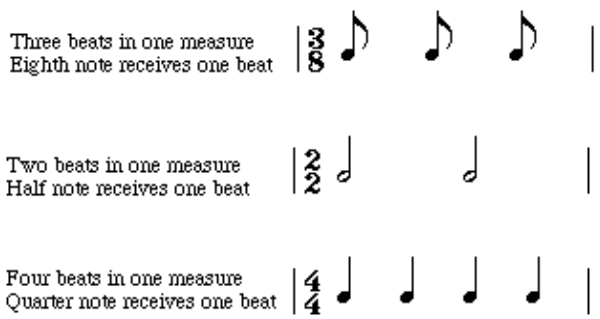
Each note value has a corresponding "rest" which is the music notation for a duration of silence.



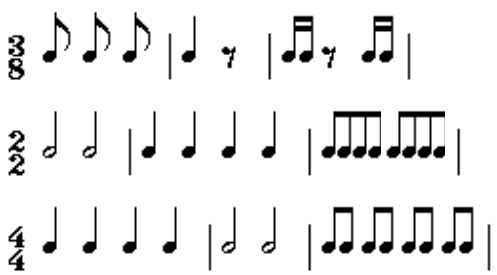
The dot (and double dots) can also be used with rests. The dot has the same effect with rests as with notes; it lengthens the duration of the silence.

With these different note values and rests we can create countless different rhythms. By stringing together several different note values and rests we can notate the rhythmic element of music.

However, in order to help make all of this a little easier to read there is another part to rhythmic notation. It is called "Meter", and it is used to further organize rhythms in music. We use a "Time Signature" to indicate the meter. A time signature consists of two numbers, one above the other. The top number indicates the amount of counts in one measure. The bottom number indicates the type of note value that will receive one count. Vertical lines, called barlines, are drawn in the music to separate the note values into measures.



Here are a few examples of time signatures and simple rhythms.



4.2

METER

Most music is set within a rhythmic framework. We refer to this rhythmic framework as the Meter of a piece of music. The concept of meter allows us to organize the rhythmic element of music. Music can be subcatagorized with regard to its meter. For instance a Waltz is a 3 beat meter, most Marches are a 2 beat meter, and much of Rock &Roll is in a 4 beat meter. When you listen to music you can usually hear a steady pulse that might not necessarily be played explicitly, but it is definitely perceptable. Maybe you tap your foot, or bob your head to that pulse. Dancers react to the pulse with their moves.

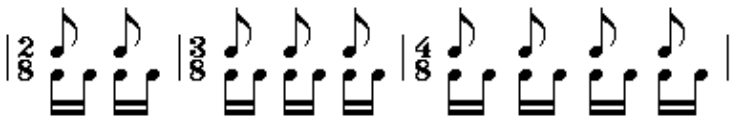
4.3

Simple Meter

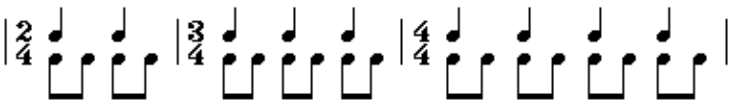
Not only is there a pulse to most music, there are notes of a variety of durations, short notes, long notes, etc. If we subdivide the pulse into two equal parts we are, by definition, in a simple meter. It doesn't matter how many counts are in the meter, if the pulse is divided into two equal parts to create faster rhythms then it is a simple meter. It isn't necessarily a simple rhythm, quite the contrary, a simple meter can be used to create very complicated rhythms. The term 'simple meter' refers to the two part subdivision and it is in contrast to compound meter discussed below.

Here are a few simple meters:

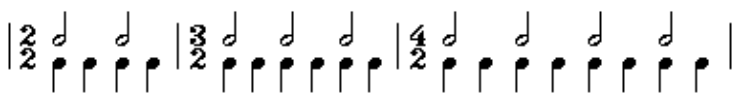
If the eighth note is the beat then the sixteenth note will be a 2−part subdivision of the beat.



If the quarter note is the beat then the eighth note will be a 2−part subdivision of the beat.



If the half note is the beat then the quarter note will be a 2−part subdivision of the beat.



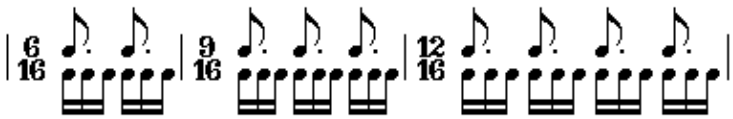
4.4

Compound meter

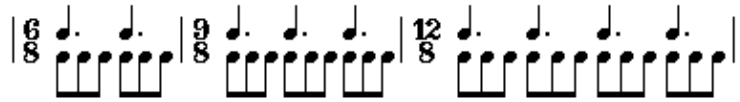
Often the pulse is subdivided into three parts instead of two parts. When this three part subdivision occurs, it creates a rhythmic feel we refer to as Compound Meter. Many popular songs use a compound meter. Here are just a few songs in compound meter that you might recognize: Three Blind Mice, Row, Row, Row Your Boat, Tarantella, Blueberry Hill (Fats Domino), Heartbreak Hotel (Elvis), Color My World (Chicago), You've Got To Hide Your Love Away (Beatles), Everybody Wants to Rule the World (Tears for Fears) and Minute by Minute (Doobie Brothers). Compound meter has a distinctively different rhythmic feel than Simple meter. A song could be arranged in either meter. An example is the song "I Can't Help Falling in Love". Elvis' version of "I Can't Help Falling in Love" is in compound meter whereas the UB40 remake of that song is in a simple meter. If you are familiar with those two versions you can hear the contrast in the rhythm.

In a compound meter, a dotted note is used for the pulse and then the next faster note value becomes the three part subdivision.

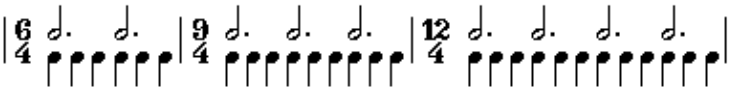
The following meters use the dotted eighth note as the beat and the sixteenth note as the 3−part subdivision.



The following meters use the dotted quarter note as the beat and the eighth note as the 3−part subdivision.



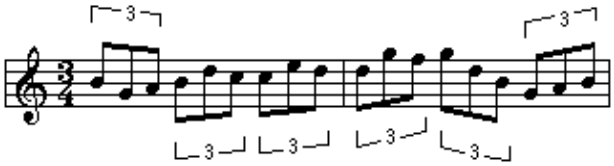
The following meters use the dotted half note as the beat and the quarter note as the 3−part subdivision.



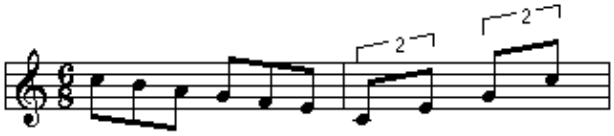
4.5

Mixing Simple, Compound

Sometimes a musical idea will use both simple and compound meter concepts. Regardless of the meter you are writing in, you can notate both simple and compound meter "feels". While writing in simple meter such as 3/4 you can always get the compound feeling (three part subdivision to the beat) by notating an eighth note 'triplet'. J.S.Bach's 'Jesu, Joy of Man's Desiring' is an example of a piece written in a simple meter, yet it has a three part subdivision throughout. An eighth note triplet is used to create the compound style subdivision.



If you are in a compound meter such as 6/8, you can create a two part subdivision by notating a doublet.



4.6

Performance style.

Often certain styles of music are rhythmically modified during performance. If you hand a piece of music in simple meter (containing eighth notes) to a group of classically trained violinists and ask each of them to play it, you will probably hear a noticeable difference in their interpretation but undoubtedly it will still have a simple meter 'feel'. A jazz musician performing the same piece of music might produce a dramatic difference in the rhythmic 'feel'. In swing style, the rhythmic feeling is closer to a compound meter feel with a purposeful distortion of the written notation of eighth notes. A jazz player's individual style is partly determined by how much he changes an even series of eighth notes into a series of notes of unequal duration. Additionally a jazz player will sometimes change written rhythms that are mostly on the beat to become more syncopated. I'm talking about players who are expert music readers, this is not due to ignorance.

4.7

Eartraining exercises

Although rhythm and pitch work together to create melody, it is useful to isolate the rhythmic element for eartraining purposes. Below is a list of rhythms that you should try to understand and memorize. By studying these basic rhythms you will improve your ability to read any music notation. These rhythms are found at the following links. Listen to the associated MIDI files as you look at them.

Open MIDI file

---

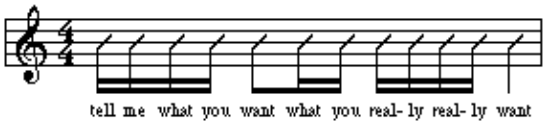
simple meter

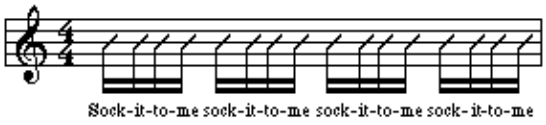
- 1 Beat Rhythms
- 2 Beat Rhythms
- 3 Beat Rhythms
- 4 Beat Rhythms

Open MIDI file

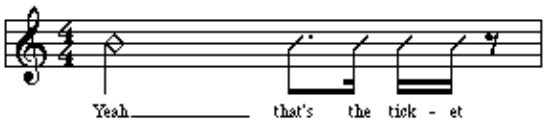
4.8

Here's how some of the phrases from the beginning of the lecture can be notated.





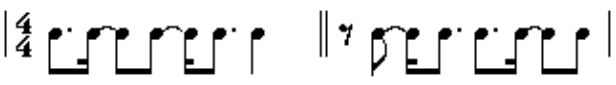
Since the next phrase is not set to a pulse, it could be interpreted differently than shown below. This is only one of several ways of notating the phrase.



4.9

Repetitive Rhythms

This last example uses the last rhythm of the 4 beat simple meter rhythms (number 109 from the four beat simple meter page). This rhythmic figure plus a variation on that rhythm is used repeatedly throughout this example. The variation of the rhythm takes the original rhythm and shifts it an eighth note to the right. Both of these rhythms are frequently 'off the beat' and could be referred to as 'syncopated'. These rhythms (played in the keyboard and bass parts) are set against an 'on the beat' drum part. The use of the variation rhythm occurs only near the end (before the final string line). The basic syncopated rhythms are shown below



Open MIDI file

Q. What note value is used throughout the final string line of the MIDI example?

A. Sixteenth notes, a long string of sixteenth notes.

Links

Links to other Reading:

- Chapter 6 from the Textbook
- Chapter 7 from the Textbook
- Chapter 8 from the Textbook

Links to this week's Tests.

- Test 5 – Note Values (NoJS)
- Test 6 – Meter (NoJS)

Links to worksheets

- Barline worksheet no.1
- Barline worksheet no.2
- Beaming worksheet

The Required Tests – An explanation

Below are some samples from the tests for this week. These ARE NOT the actual tests but instead a short example from the tests so that you can get an explanation of how to take them and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 5 – Note Values

Below are several time signatures followed by a single note value or rest. Determine the number of counts that note value or rest will received within the context of the given time signature. Use the answer menu (currently set to "select") to select the correct answer.

How it works

The test requires you analyze the BOTTOM number of the time signature. The top number is irrelevant. The bottom number will tell you the type of note that received ONE count. Use the note value relationships (a half note is half the duration of a whole note, etc.) and the type of note receiving one count to determine the duration of the note value shown. In the first example the bottom number is a "4". That means that a quarter note receives ONE count. The note shown is an eighth note (which always is half the duration of a quarter note). Since a quarter note receives one count in this time signature, in 3/4 an **eighth note will receive a half of a count**.

In the second example the bottom number is a "2". In time signatures with a number 2 on the bottom the half note receive ONE count. The shown note is a half note. In 2/2 a **half note receives one count**.

In the third example the bottom number is a "8". An eighth note is the duration that receives ONE count. The duration shown is a quarter note (which always received twice the duration of an eighth note). Since an eighth note receives one count in this time signature, in 3/8 a **quarter note will receive two counts**. (The third menu is set to the correct answer)

There is potential confusion because of the terminology. We have a quarter note but it can receive severals different amounts of counts depending on the bottom number of the time signature. (one count, one half of a count, or two counts, respectively in the three examples shown below.)

		
How many counts does the note value above receive?	How many counts does the note value above receive?	This menu is set to the correct answer

Test 6 – Meter

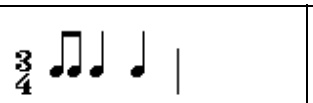
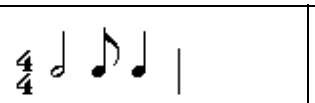
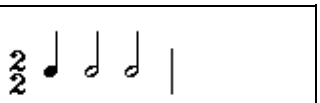
Below are several time signatures followed by one measure. Examine the measure to determine if it is a complete measure within the context of the given time signature. Use the answer menu (currently set to "select") to select the correct answer.

How it works

In this test both the TOP and BOTTOM numbers are relevant. First use the bottom number to determine what type of note value receives ONE count. Next add up the total number of counts within the measure. Finally compare that total with the top number of the time signature. In the 1st example shown below the bottom number of the time signature is a "4" (a quarter note receives ONE count). Adding up the two eighth notes and 2 quarter notes yields a total of 3 counts, the same as the top number. Bingo, the measure is correct.

The 2nd example shown also has a "4" as the bottom number (a quarter note receives ONE count). Adding up the half note , quarter note and eighth note yields a total of 3 and a half counts, less than the top number of "4". The correct answer is "Not enough counts".

The 3rd example shown also has a "2" as the bottom number (a half note receives ONE count). Adding up the quarter note and two half note, yields a total of 2 and a half counts, more than the top number of "2". The correct answer is "Too many counts". The third menu is set to the correct answer.

		
Is the measure above correct?	Is the measure above correct?	This menu is set to the correct answer

Lecture 5 – Key Signatures

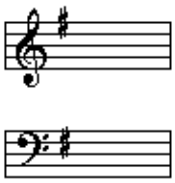
5.1

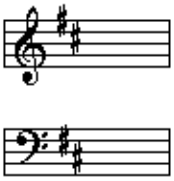
Remember, I Told You that already . . ..

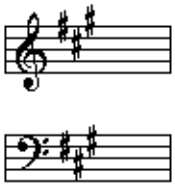
Were you ever in a situation where you made a mistake about something because you didn't know some important information? It's especially embarassing if someone says "you should have known, it was written down in the instructions!" Music notation provides a way to embed important information regarding sharps and flats. We call this a KEY SIGNATURE. A key signature will provide information at the beginning of each line regarding the use of sharps or flats (some jazz scores provide this information at the beginning of the very first line only). The key signature will instruct the performer as to whether certain letter names are sharped or flatted throughout a composition. For instance with a key signature of 2 sharps (F# and C#) the performer will see a note "C" on the staff (without a sharp) however, because of the key signature, the performer should play a C#. It is not easy for a beginner to remember the key signature. It is quite common for an inexperienced musician to forget about this important instruction. ALWAYS look for a key signature as one of the first things to notice about a musical score.

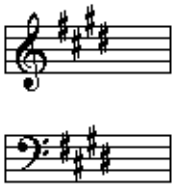
5.2

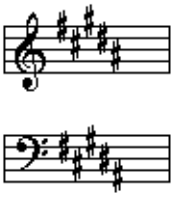
Major Key Signatures using Sharps

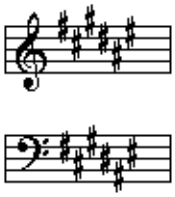
G Major 

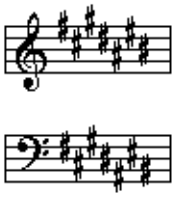
D Major 

A Major 

E Major 

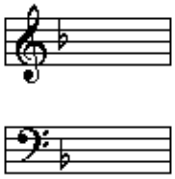
B Major 

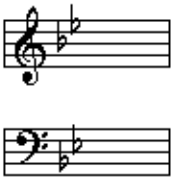
F# Major 

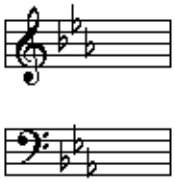
C# Major 

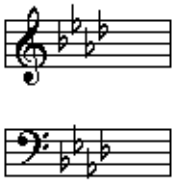
5.3

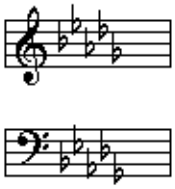
Major Key Signatures using Flats

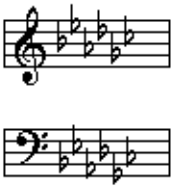
F Major 

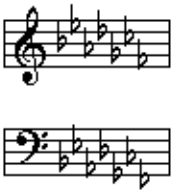
Bb Major 

Eb Major 

Ab Major 

Db Major 

Gb Major 

Cb Major 

5.4

Memorizing the locations of the sharps

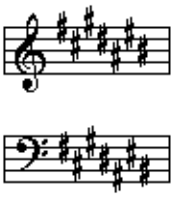
If you have difficulty remembering the order of the sharps in the Key signatures memorize the following phrase (or make up your own).

Fat Cats Go Down Alleys Eating Bagels

(Think of Garfield the cat sauntering down an alley with a big bagel.)

The first letter of each word in the phrase is also the correct order of the sharps in key signatures: F C G D A E B.

Learn the location of the sharps for the key of C# major. It includes all of the sharps.

C# Major 

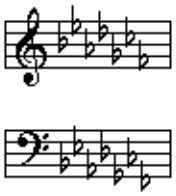
5.5

Memorizing the location of the flats

Here is a phrase to help remember the order of flats used in key signatures. (in keeping with the "cat and bagel" motif)

Bagel Eating Ants Destroy Good Cat Food

Learn the location of the flats for the key of Cb major. It includes all of the flats.

Cb Major 

5.6

Notice the order of the sharps and the order of the flats.

First lets look at the order of the sharps. The first sharp is F#, the second sharp is C#. Remember, the sharps of the key signature affect all octaves of that letter name. If you count the distance from F# UP to the next C# you will count 7 half steps. Go ahead, count the half steps yourself. There are even less half steps to count from F# DOWN to the next C#. There are 5 half steps from F# down to C#. Let's keep those two distances in mind, 7 half steps up or 5 half steps down. We will learn later that these distances have a name: a Perfect 5th (7 half steps) and a Perfect 4th (5 half steps). It isn't necessary that you understand why these are the names right now. All will be revealed in the chapter on intervals.

Now, what is the distance from C# (the second sharp) to the G# (the third sharp). Counting the half steps from C# up to G#, well what do you know, it's 7 half steps. Also it's 5 half steps from C# down to G# (of course). Using a different terminology, a G# is a Perfect 5th above a C#, and also a G# is a Perfect 4th below a C#.

This pattern continues...

A# (the fifth sharp) is a Perfect 5th above (or a Perfect 4th below) a D# (the fourth sharp)

E# (the sixth sharp) is a Perfect 5th above (or a Perfect 4th below) an A# (the fifth sharp)

B# (the seventh sharp) is a Perfect 5th above (or a Perfect 4th below) an E# (the sixth sharp)

If you can't (or don't) memorize the order you can always use the following knowledge. Start on F#, and then the next sharp is a Perfect 5th (7 half steps) ABOVE or a Perfect 4th (5 half steps) BELOW the current sharp. Keep going until you have seven sharps (the last two sharps are white keys!), these are all the Major Key Signatures with sharps.

With flats, it's just the opposite. The next flat is always a Perfect 5th BELOW or a Perfect 4th ABOVE the current flat. Think about it, the first flat is Bb the second flat is Eb (5 half steps higher than Bb).

This pattern continues also ...

Eb (the second flat) is a Perfect 4th above (or a Perfect 5th below) an Ab (the third flat)

Ab (the third flat) is a Perfect 4th above (or a Perfect 5th below) a Db (the fourth flat)

Db (the fourth flat) is a Perfect 4th above (or a Perfect 5th below) a Gb (the fifth flat)

Gb (the fifth flat) is a Perfect 4th above (or a Perfect 5th below) a Cb (the sixth flat)

Cb (the sixth flat) is a Perfect 4th above (or a Perfect 5th below) a Fb (the seventh flat)

Once again, if you don't memorize the order of the flats used in key signatures, you can recreate the order by using this new found knowledge. Start on Bb, and then the next flat is a Perfect 4th (5 half steps) ABOVE or a Perfect 5th (7 half steps) BELOW the current flat. Keep going until you have seven flats (the last two flats are white keys!). There they are, all the Major Key Signatures with flats.

Did you notice that the key names for these key signatures are related in the same way? As an example, the key of one sharp is G major, whereas the key of two sharps is D major (D is a Perfect 5th above or a Perfect 4th below G).

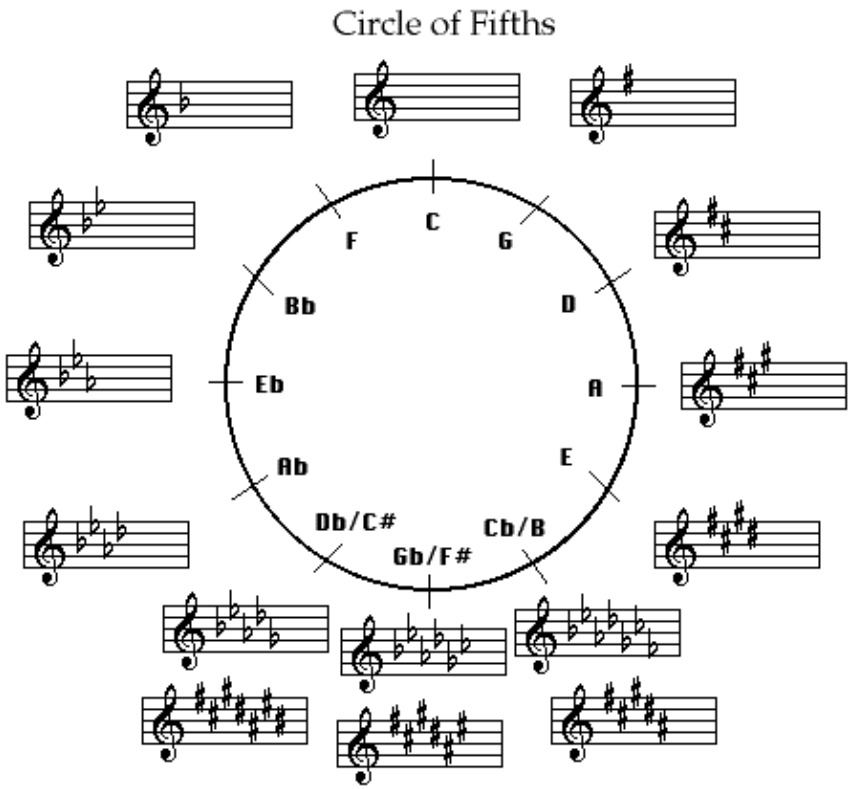
So, it seems that these intervals of a Perfect 5th and a Perfect 4th must be pretty important.

Yup.

5.7

Circle of Fifths

A traditional layout for all of the key signatures is shown below. Notice the three enharmonic key signatures at the bottom of the circle.



5.8

Cool Hand Signals

While playing some local jazz gigs here in the San Francisco Bay Area, I became acquainted with a hand signal method of declaring the key signatures. It is a very simple method, point two fingers UP (like the peace sign from the 60's) and it declares the key of two SHARPS (D major), point three fingers DOWN and it declares the key of three FLATS (Eb major).

Point UP to declare sharps, the number of fingers represents the amount of sharps (both hands are needed to declare either 6 or 7 sharps)

Point DOWN to declare flats, the number of fingers represents the amount of flats (both hands are needed to declare either 6 or 7 flats)

It's sort of like knowing the secret hand shake.

Of course you have to know which keys contain the various sharps and flats. For those who have a Java enabled browser here is an applet to test your knowledge and speed of matching sharps or flats with key signatures. You might have to click in the applet area below to start it. If you need more time to figure out the answer, click in the applet area the instant you see the question. The Java applet should pause, the next click will start it again.

5.9

Links

Open MIDI file

The above MIDI file is Invention no.1 by J.S.Bach. This piece was originally written for keyboard in the key of C major. This arrangement (unlike the original) changes orchestration throughout the composition.

Open MIDI file

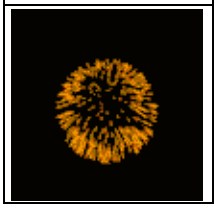
The above MIDI link is to the 'Air' for the Suite in D by Bach. It uses a key signature of two sharps (D major). This piece and Invention no.1 both use accidentals in addition to the key signature to modulate into additional keys beyond the original key. The details of modulation are beyond the scope of this course however one should be aware that many pieces written in a key signature will use accidentals of either sharps or flats to effectively change the key. The key signature indicates the key in which the composition begins and ends. During the body of the compositon Bach likes to wander off to other keys.

Incidentally the Air is an example of a MIDI file that sounds very different when played with Yamaha's MIDPLUG compared to being played with Quicktime. The Quicktime performance warbles noticeably whereas the MIDPLUG performance sounds more musical.

Links to Key Signature Worksheets

- Key Signature Worksheet 1

- Key Signature Worksheet 2

An explosion of MIDI files


Here are links to Charles Kelly's MIDI files page and Laura's MIDI Heaven page. They contain links to thousands of MIDI files that you may be interested in hearing. Well, not all of them of course. In fact you don't have to listen to any of them if you don't want to. "Who are Charles Kelly and Laura?" you ask. Well, I don't know who they are but I like their MIDI links. The animated graphic is from Laura's MIDI Heaven site and it is much more effective at her site. Check out these sites (after you've done your homework of course)

Charles Kelly's MIDI files page
Laura's MIDI Heaven

The Required Test – An explanation

Below is a sample from the test for this week. This IS NOT the actual test but instead a short example from the test so that you can get an explanation of how to take it and the "look and feel". To take the real test you must use the link provided above or on the "Music 10 BackDoor" document.

Required Test:

- Test 7 – Major Key Signatures (NoJS)

Test 7 – Major Key Signatures

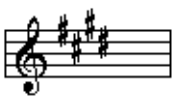
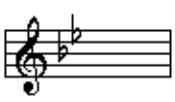
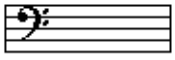
Below are the major key signatures in random order. Use the answer menu (currently set to "select") to select the correct letter name for each key signature.

How it works

Each key signature represents a major key. The menu lists all of the standard major keys. The examples shown are the following keys:

1. E major
2. Bb major
3. C major

The third menu is set to the correct answer.

What is the name of the above Key Signature?	What is the name of the above Key Signature?	This menu is set to the correct answer

Lecture 6 – Minor Scales

6.1

Minor Scales

We have studied the construction of the major scale but that scale is only one of many commonly used scales in music. Another commonly used scale is the MINOR SCALE. Actually, the minor scale comes in three varieties, NATURAL MINOR, HARMONIC MINOR, and MELODIC MINOR. The difference between these three forms of the minor scale is only one or two notes. These differences will be examined in this week's lesson.

Open MIDI file

Black Orpheus by the Brazilian composer Luiz Bonfa is a bossa nova classic in a minor key. It uses both the natural minor and harmonic minor forms.

6.2

Natural minor

First we start with the natural minor scale.

Just as there is a major scale that uses nothing but the white keys of the keyboard, there is a natural minor scale that uses only the white keys. The beginning note of this natural minor scale is "A". The "A" natural minor scale uses only the white keys: A, B, C, D, E, F, and G. The interval formula for a natural minor scale is as follows:

A	B	C	D	E	F	G	A
1	2	3	4	5	6	7	8
	W	H	W	W	H	W	W

The natural minor scale has a constant relationship with a specific major scale and that relationship will be studied in detail next week.

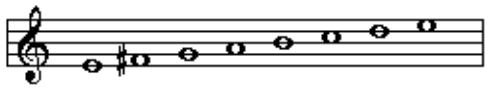
Many melodies use the natural minor scale and one well known tune is "God Rest Ye Merry Gentleman".

Open MIDI file

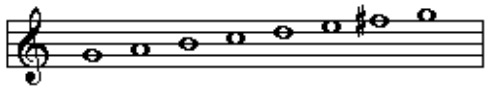
The natural minor scale can be created on any of the twelve pitches (using 15 different letter names). There is always a constant relationship between a natural minor scale and a major scale that contains the same amount of sharps or flats. The A natural minor scale is related to the C major scale because both scales use natural notes (white keys) only. There is a minor scale similarly related to the scale of G major (which has one sharp, F#). That scale is E natural minor. When starting on the note E and adhering to the natural minor interval formula, the scale will have one sharp, F#.

The E natural minor scale uses the same interval formula as A natural minor W–H–W–W–H–W–W. If you are using numbers (i.e. W=2, H=1) then the pattern is 2–1–2–2–1–2–2.

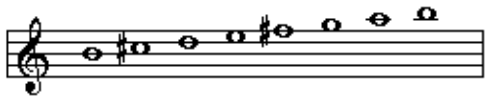
E natural minor



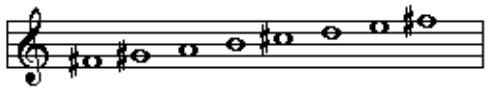
G major



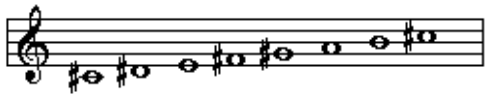
When starting on the note B, the pattern yields the notes shown below. This is the B natural minor scale.



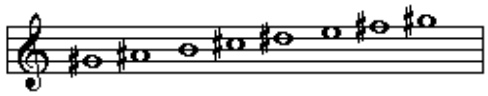
The natural minor scale that uses 3 sharps is named F# natural minor.



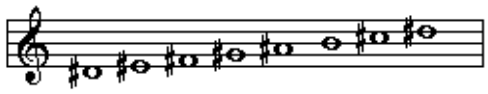
Start on C# and you get the following notes. C# natural minor has 4 sharps.



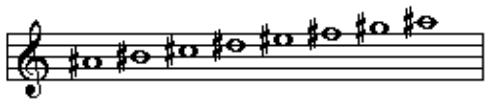
The natural minor scale that uses 5 sharps is named G# natural minor.



The natural minor scale that uses 6 sharps starts on D#.

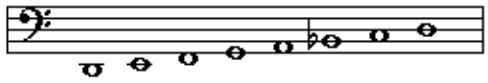


The natural minor scale that uses all 7 sharps is A# natural minor.

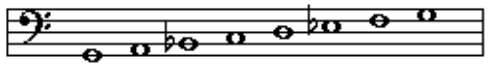


The same situation works for the natural minor scales using flats. There is a natural minor scale using 1 flat, 2 flats, 3 flats, 4 flats, 5 flats, 6 flats and 7 flats. Check out the list of scales shown below. For variety, I'll use Bass clef.

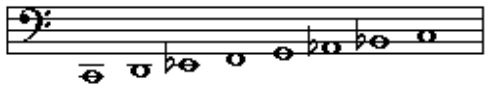
If you start on the note D and adhere to the formula of 2−1−2−2−1−2−2 you get the D natural minor scale shown below.



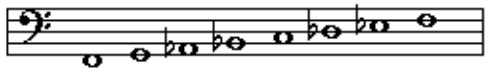
When starting on the note G, the pattern yields the notes shown below. This is the G natural minor scale.



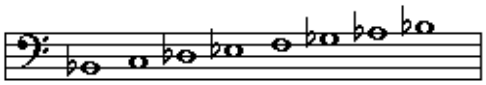
The natural minor scale that uses 3 flats is named C natural minor.



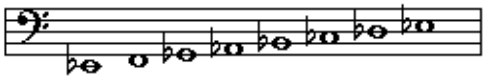
Start on F and you get the notes shown below. F natural minor has 4 flats.



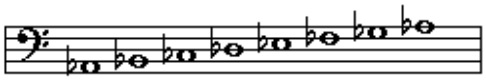
There is a natural minor scale that uses 5 flats, it is named Bb natural minor.



The natural minor scale has 6 flats starts on Eb.



The natural minor scale that uses all 7 flats is Ab natural minor.



6.3

Harmonic minor

Another form of the minor scale that is commonly used is called the Harmonic Minor scale. It is similar to natural minor except that the seventh scale degree is raised by a half step. For example, in the key of A minor, the natural form is spelled A B C D E F G A. To create the harmonic form, you raise the seventh scale degree a half step. In this key the seventh note G is changed to G#. In the key of A minor the harmonic minor scale is spelled A B C D E F G# A. Notice that the scale has one sharp, G#. This is not the same sharp that is used in major or natural minor scales with one sharp (F#). This constitutes a significant difference in scale construction. Using the number system, the interval construction is 2−1−2−2−1−3−1. Notice that this is the first scale we have studied that has an interval larger than 2 half steps. The interval between the sixth and seventh scale degree is 3 half steps and creates a characteristic sound. It is also a scale that has 3 different half step intervals. The raising of the seventh scale degree creates what is called a 'leading tone'. A leading tone is a note one half step below the tonic (the first note of the scale) and it is a useful melodic note that naturally resolves upward to the tonic. The natural minor scale does not have a leading tone because the seventh scale degree is 2 half steps below the tonic. It was the composers' desire to have a leading tone that brought about the creation of the harmonic minor scale.

half steps between scale degrees	2	1	2	2	1	3	1
scale degree	1	2	3	4	5	6	7	8

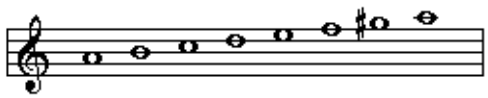
The tune Hava Nagila uses the harmonic minor scale and is an example of the sound of the sixth and seventh scale degree used in a melodic passage. This melody begins on the fifth note of the scale.

Open MIDI file

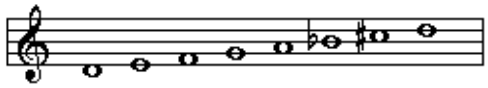
Here is a list of the harmonic minor scales. Notice the use of a new accidental that occurs in three of the scales that use sharps. The G#, D# and A# harmonic minor scales each use one double−sharp. The 'x' symbol is used

to indicate a double sharp. The double−sharps used in these scales are all white keys, and they are needed so that all of the letter names of the musical alphabet will be used and no letter names are used twice.

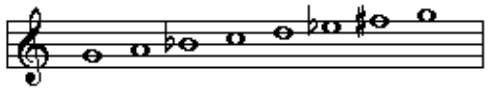
A harmonic minor scale



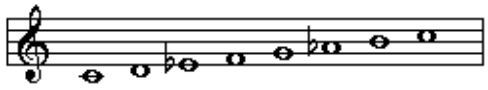
D harmonic minor
Wow! a scale that uses both a sharp and a flat! That doesn't happen in major or natural minor scales.



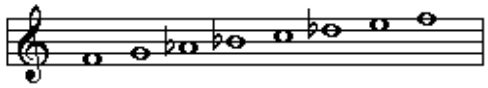
G harmonic minor Look! Another scale that uses both a sharp and flats.
All courtesy of the harmonic scale. ... You're Welcome.



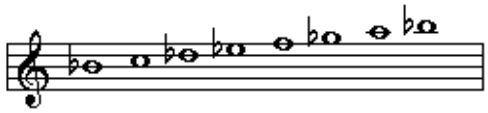
C harmonic minor



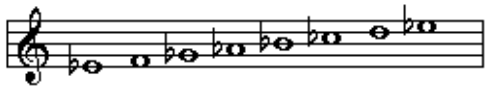
F harmonic minor



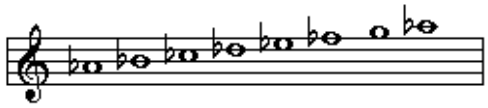
Bb harmonic minor



Eb harmonic minor

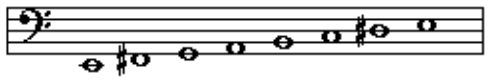


Ab harmonic minor

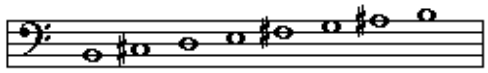


Here are the harmonic minor scales that use sharps. I'll use Bass clef for variety.

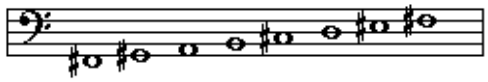
E harmonic minor



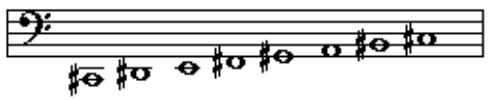
B harmonic minor



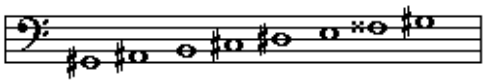
F# harmonic minor



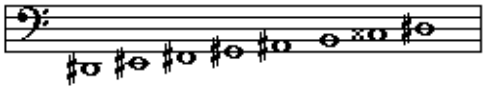
C# harmonic minor



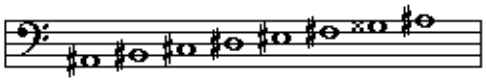
G# harmonic minor This scale uses Fx (F double−sharp) to create the raised seventh scale degree.



D# harmonic minor This scale uses Cx (C double−sharp) to create the raised seventh scale degree.



A# harmonic minor This scale uses Gx (G double−sharp) to create the raised seventh scale degree.



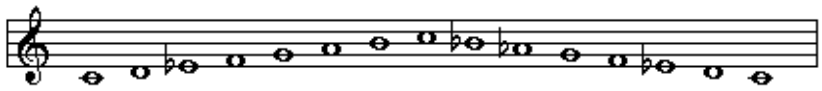
6.4

Melodic minor

By raising the seventh, the harmonic minor scale satisfied a composer's desire to use a "leading tone" in a minor key. This alteration however created an extra large interval between the 6th and 7th scale degrees (3 half steps!). Hava Nagila is an example of the wide interval between the sixth and seventh scale degree in the harmonic minor scale. This wide interval is a very easily recognizable and interesting sound but not every composer liked the melodic effect of this interval.

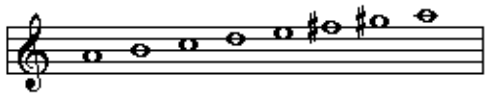
To the rescue comes the Melodic Minor scale. The melodic minor scale is similar to a natural minor scale except both the 6th and 7th are raised by a half step. This scale is created by whole steps and half steps, there are no 3 half step intervals in this scale. Also notice how close this scale is to the major scale of the same letter name (i.e. A melodic minor is almost the same as A major). The melodic minor scale has an unique quality of containing 4 whole steps in a row. Its use was extremely common during the Baroque and Classical eras and the melodic minor scale is also extremely useful in comtemporary jazz.

There is some inconsistency as to how the melodic minor scale is used. Traditionally the scale is taught using what is called the ascending and descending forms. Ascending form is the formula discussed in this section. The descending form of the melodic minor scale is exactly the same as the natural minor. Below is shown the ascending/descending version of the scale rooted on C. Notice that this scale has an A and B when ascending and an Ab and Bb when descending. In classical music one can find examples of this ascending/descending usage of the melodic minor scale as well as the ascending form only. In jazz it is more common to use the "ascending" form only. I prefer to call only the ascending form by the name "melodic minor" while I refer to the descending form by the name we have already given that scale: natural minor. Why confuse the issue by giving two different names to a single scale structure? If you read about the melodic minor scale in other music theory texts you will undoubtedly encounter the terms 'ascending' and 'descending' melodic minor.

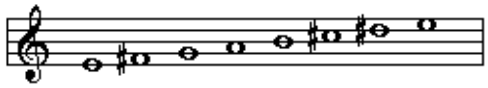


Here is a list of the melodic minor scales. I will not show the ascending/descending versions in this list. Notice that some of the scales use double−sharps.

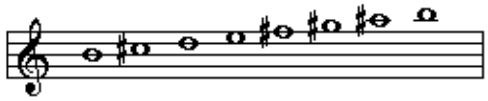
A Melodic Minor



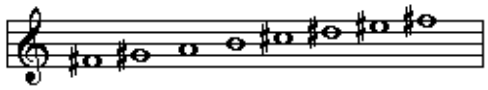
E Melodic Minor



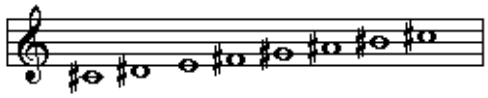
B Melodic Minor



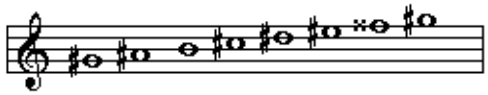
F# Melodic Minor



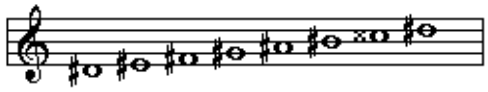
C# Melodic Minor



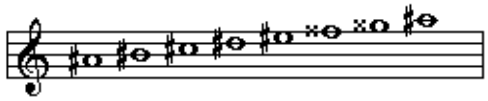
G# Melodic Minor



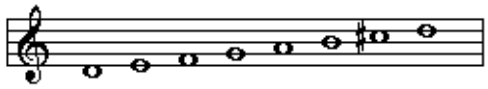
D# Melodic Minor



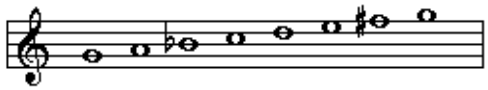
A# Melodic Minor



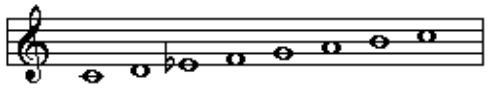
D Melodic Minor



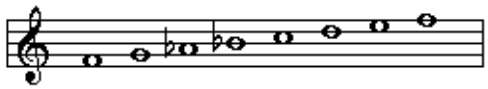
G Melodic Minor



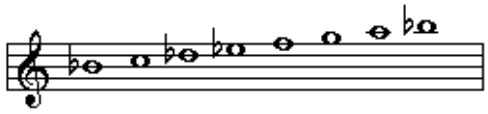
C Melodic Minor



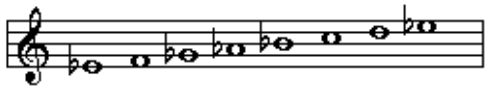
F Melodic Minor



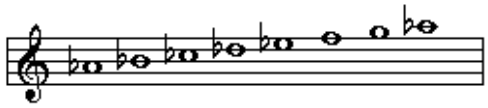
Bb Melodic Minor



Eb Melodic Minor



Ab Melodic Minor



The following example is of the Melodic minor scale, first using the traditional classical 'ascending/descending' forms then the jazz 'ascending only' form. The opening phrase of a Bourree by Bach and 'The Autumn Leaves' by Kosma/Mercer are included. In the Bourree the ascending/descending form is used. The Autumn Leaves begins with four ascending melodic lines but uses the melodic form on the fourth line only (the natural minor scale is used on the first three lines).

Open MIDI file

6.5

So which one do I use?

One of the things that has attracted me to the minor keys is the variety of scale and chord choices. The fact that the scale has three forms creates an inherent variety. Some compositions use one form throughout as has been demonstrated with God Rest Ye Merry Gentlemen (natural minor) or Hava Nagila (harmonic minor). Many other compositions in minor use two or all three forms. Some compositions use both the raised and natural 6th and 7th scale degrees. Some popular tunes that use these scale degrees in a descending bassline include My Funny Valentine, This Masquerade, Stairway to Heaven, and Michelle.

Composers will choose the form of the minor scale that best creates the musical effect that they desire. If that means changing forms in mid−phrase so−be−it. Mozart's 40th symphony changes from the natural minor form

in the first phase to the harmonic minor form (used melodically) in the second phrase. And of course, it sounds perfect. It's Mozart.

6.6

Eartraining Exercises

These eartraining exercises move through all of the minor keys. The exercise consists of a scale played up and down followed by the triad (1st 3rd 5th and 8th notes of the scale). The order of the keys is as follows: Am, Em, Bm, F#m, C#m, G#m/Abm, D#m/Ebm, A#m/Bbm, Fm, Cm, Gm, Dm.

Natural Minor exercise

Open MIDI file

Harmonic Minor exercise

Open MIDI file

Melodic Minor exercise

This exercise uses the ascending/descending form of the melodic minor scale. The descending form is the same as natural minor.

Open MIDI file

Melodic Minor jazz exercise

In the jazz style it is more common to use the same form both ascending and descending. Also in jazz it is common to use more complicated harmony than a simple triad so an arpeggiated 9th chord is used instead. (see chapter on triads for more info on chords) For variety the order of the keys is changed to the following: Am, Dm, Gm, Cm, Fm, Bbm/A#m, Ebm/D#m, Abm/G#m, C#m, F#m, Bm, Em.

Open MIDI file

6.7

Why Study These Scales?

What exactly is the purpose of studying all of these scales? Are we restricted to using notes only in the major, natural minor, harmonic minor or melodic minor scales? Are the other notes wrong?

The answer to the last two questions is "NO!".

The value of studying all of the scales lies in the fact that many people thoughout history have used these scales. (Imitation is the highest form of flattery.) These scales are used in music the world knows and loves. If you like classical, pop, rock, or jazz music you have probably enjoyed music that uses the scales we have studied. There are many other important scales to learn, but the four scales we have focused our study on are certainly among the Top Ten. These scales are in our musical psyche and many musicians who have no formal training use these scales without knowing the names of the scales they are playing.

But if these scales are almost intuitive, why take the effort to study them? If I already hear the scale in my mind, why do I have to study a bunch of rules on how to write the scales?

My answer: I believe in studying music on several levels. I hear it in my mind, I know how it feels on an instrument (for me that would be keyboard or guitar) and I understand the scales and chords and their relationship to the key as I play them. If I'm playing a written piece from memory, I can "see" the sheet music in my mind. If I'm improvising, I forego any mental notation processing (I don't see music notation in my mind when I'm improvising, others might, I don't know). In my view, hearing the music in your mind is the most important component but certainly not the only component to the process of creating and performing music.

I'm in favor of a systematic approach to learning how great composers create the beautiful sounds they do. And although learning these scales is only a start to learning how music is created, it is an important foundation on which to build.

6.8

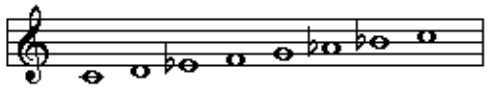
Other Minorish Stuff

The minor key is a good environment in which to play the blues and pentatonic scales. These scales are of a different construction from the scales studied in this lecture, yet they are of interest to me and I assume others. They will not be a requirement for testing purposes, if you were wondering. In other words I won't test you on the material in section 6.8.

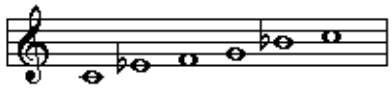
Minor Pentatonic

This five note scale is created by starting with the natural minor form and omitting the second and sixth note. So it is really the same scale you already know except you skip two of the notes. By continuously omitting the 2nd and 6th scale degree a different musical effect is created.

C natural minor



C minor pentatonic

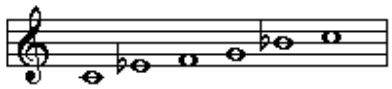


There is some ambiguity regarding the terms used for scale degrees in this scale. The second note of the scale is often referred to as the third of the scale because it matches the third note of the natural minor scale of the same letter name. Remember, the second note is omitted, therefore often the term "second scale degree" is omitted also. The same situation holds true regarding the sixth scale degree. Therefore it is common to refer to the tonic (first or key note), 3rd, 4th, 5th and 7th scale degrees in a minor pentatonic scale even though there are only 5 notes, not 7.

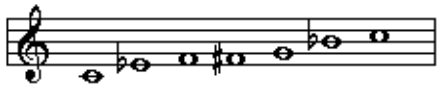
This is the first scale that many beginning guitarists learn from their more experienced guitar playing friends. In the hands of an expert player this scale can be quite flashy.

The Minor Blues scale is similar to the minor pentatonic scale with the addition of another note. The new note is the note in between the fourth and fifth scale degree. This creates a short chromatic section of three half steps in a row. That's different. It's a cool sound. It's not exactly a traditional minor sound, but it definitely has a minor quality. I call it minorish.

C minor pentatonic



C minor blues scale



Open MIDI file

6.9

Rearranging a Classic

The following MIDI file is from the Classical MIDI archives site on the Internet (I found it using the Charles Kelly link from last week's lecture). It is a performance of the Rondo from Beethoven's Pathetique Piano Sonata. The first section (which is repeated several times, standard procedure for a Rondo) uses the Harmonic minor scale extensively.

Open MIDI file

I thought it might be fun to rearrange parts of the Rondo as a Mambo. The second MIDI file is that arrangement. I changed the rhythm in many places to transform it into a quasi–Mambo, but in the sections that I used, I didn't change many notes of the melody. Do you hear someone spinning? Sorry Ludwig, my apologies.

Open MIDI file

Links

Reading:

- Chapter 10 from the Textbook
- Lecture 6

Worksheets:

- Minor Scale worksheet no. 1
- Minor Scale worksheet no. 2
- Minor Scale worksheet no. 3
- Minor Scale worksheet no. 4
- Minor Scale worksheet no. 5
- Minor Scale worksheet no. 6
- Minor Scale worksheet no. 7
- Minor Scale worksheet no. 8

Required Test:

- Test 8 – Minor Scales (NoJS)

(Optional) Danger!, THOSE JavaScript quizzes.

- Practice Natural Minor ScalesPractice Harmonic Minor ScalesPractice Melodic Minor Scales

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The Required Test – An explanation

Below is a sample from the test for this week. This IS NOT the actual test but instead a short example from the test so that you can get an explanation of how to take them and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 8 – Minor Scales

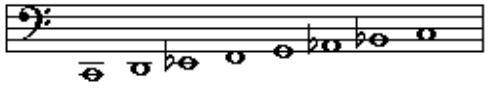
Examine the following scales, they are either natural minor, harmonic minor or melodic minor scales that are spelled correctly or they are incorrectly spelled (in this case choose "None of the above". Click on the answer menu (currently set to "select") and select the choice that is appropriate for each scale.

How it works

Examine the scale shown, compare it against the three forms of minor that begin on the first note of the scale shown. The scale shown below begins on C. It should be compared to the C minor scales.

```
Scale from test    C D Eb F G Ab Bb C
C natural minor    C D Eb F G Ab Bb C
C harmonic minor   C D Eb F G Ab B  C
C melodic minor    C D Eb F G A  B  C
```

The scale shown is a match with the natural minor scale.



Examine the above scale and select the appropriate menu choice.

−−−−− end of Lecture 6 −−−−−

Lecture 7
Major and Minor Relationships

In this week's lecture there are no new scales but we will expand the meaning of key signatures and discuss relationships between major and minor scales.

7.1

Relative relationships

As mentioned briefly last week, each natural minor scale shares the same notes with a major scale of a different letter name. As you recall the A natural minor scale does not use any sharps or flats, just like the C major scale. The A natural minor scale is the relative minor scale of C major because they both have the same notes. Notice that the sixth note of C major is letter A. Also notice that the third note of A natural minor is letter C. These relationships are consistent throughout all of the major scales and their relative minor scales. As in real life, these relationships work both ways. We can refer to a major scale and its relative minor, and/or a minor scale and its relative major. As an example, C major's relative minor is A minor (always the natural minor form). Here's an example from the other perspective: E minor's relative major is G major because both of those scales use one sharp (F#). It is implied that the natural minor form is used when comparing major and minor scales.

Just as we can use a key signature to indicate a major key, we can use a key signature to indicate a minor key. We don't need to create any new key signatures, we'll simply re–use the ones we already have. Each key signature will now have two possible interpretations, a major key or the relative minor key.

How do you know which interpretation is the correct one? We will examine some strategies for making the correct decision in this lecture.

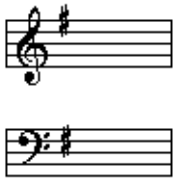
7.2

Minor Key Signatures

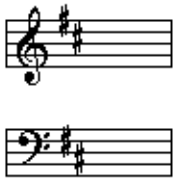
Before listing all of the Minor key signatures, I want to restate the fact that the sixth note of a major scale is the starting note of its relative minor. For each key signature, think of the major key that signature represents. The sixth note of that scale is the letter name of the minor scale also represented by that key signature. This is true in every case. The key signature of one sharp represents G major and the sixth note of G major is E. Therefore the key signature of one sharp also represents E minor. Here's another example: The key signature of two sharps represents D major. The sixth note of D major is B, so the key signature of two sharps also represents B minor.

Minor Key Signatures using Sharps

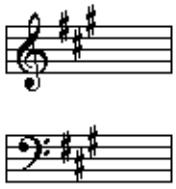
E minor
(G major's sixth note is E)



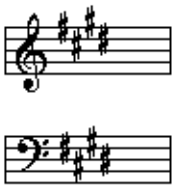
B minor
(D Major's sixth note is B)



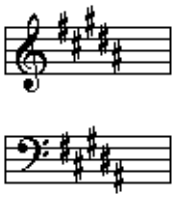
F# minor
(A Major's sixth note is F#)



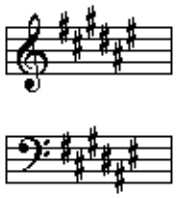
C# minor
(E Major's sixth note is C#)



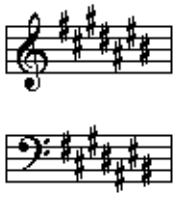
G# minor
(B Major's sixth note is G#)



D# minor
(F# Major's sixth note is D#)



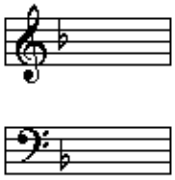
A# minor
(C# Major's sixth note is A#)



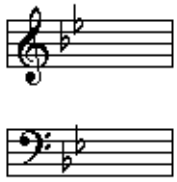
7.3

Minor Key Signatures using Flats

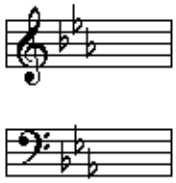
D minor
(F Major's sixth note is D)



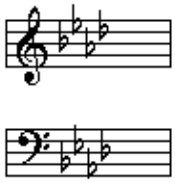
G minor
(Bb Major's sixth note is G)



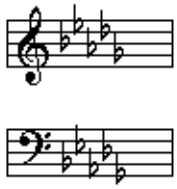
C minor
(Eb Major's sixth note is C)



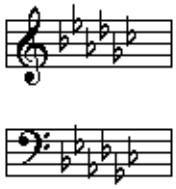
F minor
(Ab Major's sixth note is F)



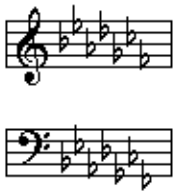
Bb minor
(Db Major's sixth note is Bb)



Eb minor
(Gb Major's sixth note is Eb)



Ab minor
(Cb Major's sixth note is Ab)

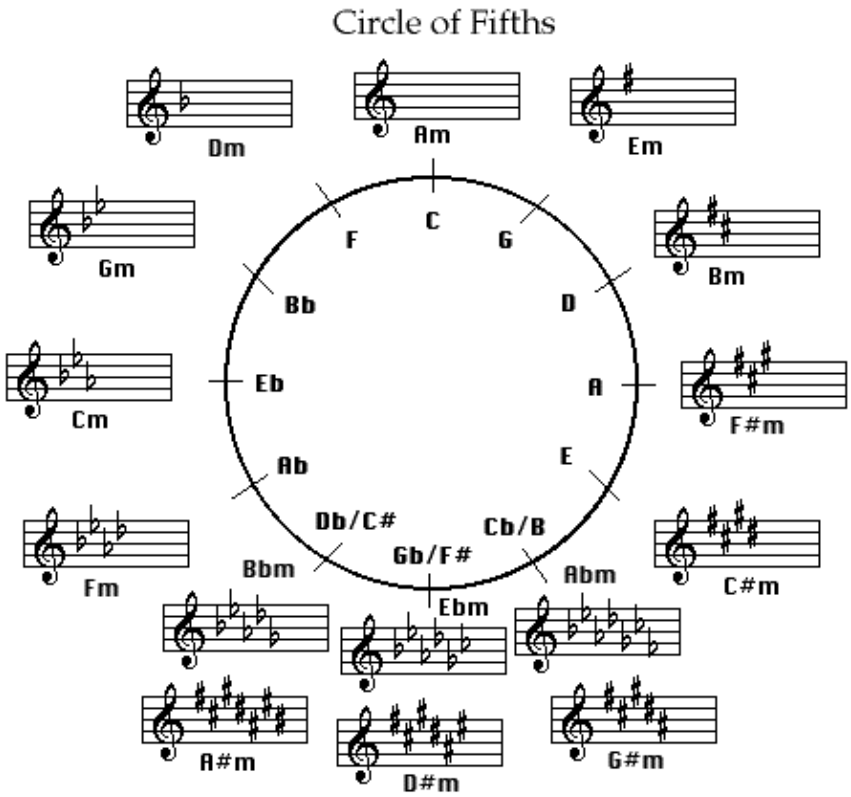


Here is an applet to test your knowledge of relative major and minor scale. A major (or minor) key is given, see if you can think of the relative minor (or major) key before it is shown on the screen. If you need more time to figure out the answer, click in the applet area the instant you see the question. The Java applet should pause, the next click will start it again.

7.4

Circle of Fifths Revisited

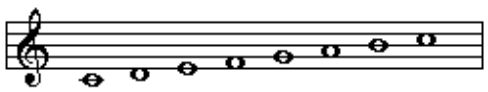
Here is the traditional layout for key signatures now updated to include the minor key signature designations.

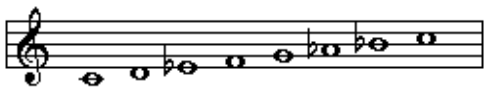


7.5

Parallel relationship

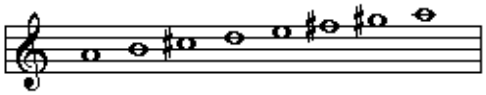
There is another common comparison used between major and minor scales. The relationship between major and minor scales with the same starting note is known as a PARALLEL relationship. C major's 'parallel minor' is C minor and conversely C minor's 'parallel major' is C major. They share the same starting notes and a few other notes but they have different key signatures. When comparing C major and C natural minor you will notice that there are three different notes. So that the different notes will be more obvious, I won't use a key signature for the examples in this section.

C major 

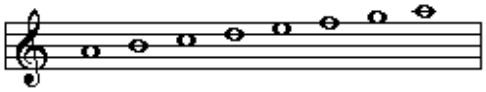
C natural minor 

Notice the comparison between A major and A natural minor. There are three different notes in this key also. All major scales and their parallel natural minor scales will have three different notes. The 3rd, 6th and 7th scale degrees will always be different when comparing a major scale and its parallel minor (natural minor form).

A major

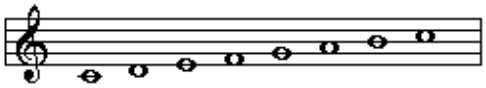


A natural minor

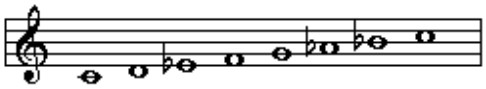


The changes made to create the harmonic and melodic forms are moving those scales closer to the parallel major scale. Let's look at the C major scale and the three forms of the parallel minor, C natural minor, C harmonic minor and C melodic minor.

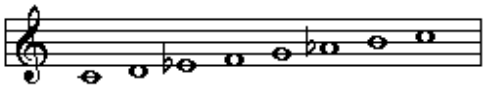
C major



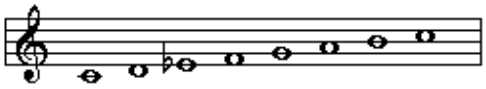
C natural minor



C harmonic minor



C melodic minor



As it turns out, throughout musical history composers have used both the relative and parallel relationships between major and minor keys. For example if Beethoven was writing an extended composition in the key of F minor, it was common for him to use the relative major key (Ab major) or the parallel major key (F major) depending on the desired musical effect. In fact, additional, closely related keys were commonly used.

So, what is a closely related key?

Using the circle of fifths as a reference, a closely related key is a major or minor key that is at an adjacent location in the circle to the current key. Expanding this definition just a little, one could include the parallel major/minor relationships. As an example, the closely related keys of Am would include C major, D minor, F

major (one notch counterclockwise) , E minor and G major (one notch clockwise). With the expanded definition one also includes the parallel major, A major.

Are we saying that a composer might start a composition in one key and then change to another key somewhere in the middle of the composition?

Yes, a complete examination of this process is beyond the scope of this course, but it is common for some compositions to change keys in the middle then return to the original before the end.

7.6

Some MIDI examples

The first example is the C major scale followed its relative minor, A minor. The order of the scales in this example is C major, A natural minor, C major, A harmonic minor, C major, A melodic minor (ascending/descending), C major, A melodic minor.

Open MIDI file

The second example is C major and its parallel minor, C minor. The order of the scales is C major, C natural minor, C harmonic minor, C melodic minor (ascending/descending), C melodic minor.

Open MIDI file

7.7

How do you know whether a key signature represents a major or minor key?

There are several clues one can look for in a composition to determine whether a key signature is used as a major key signature or a minor key signature. The first thing one can look for is the last bass note of a composition. Most compositions end with the key note in the bass, so if you see a key signature of 2 sharps (D major or B minor) and the last bass note is B, the composition is most likely in B minor. Conversely, if the last note is a D then one would assume that the key signature represents D major.

Additional clues are given when the harmonic minor or melodic minor forms are used. Traditionally, a minor key signature represents the natural minor form. If composers want to use the harmonic or melodic forms (as is common) they will have to add an accidental sharp or natural sign to create these forms. If the key signature is one sharp (E minor or G major) and there is an additional D# accidental used, this is a clue that the E harmonic minor form is being used. Why? Because D# is needed to create the harmonic minor form when a key signature of one sharp is being used. In this case, one should conclude that the key signature of one sharp represents E minor. A similar situation exists if you were to see both accidentals C# and D# within the key signature of one sharp. These notes are needed to create E melodic minor. However, since a composition might 'modulate' to another key in the middle, these clues are not always accurate.

7.8

Beethoven loved minor

Ludwig von Beethoven (1770–1827) wrote many great pieces of music in minor keys. One of his most famous piano pieces is the Adagio from the 'Moonlight' piano sonata. This piece is in the key of C# minor but it modulates to several other keys in the middle section before returning to C# minor. Do you know what key signature is used to indicate C# minor? Yes, four sharps. Additional accidentals are needed throughout this piece, it does not stay strictly within the context of four sharps for very long. This MIDI file is from the classical MIDI files archives.

Open MIDI file

7.9

Chopin loved minor

Frederic Chopin (1810–1849) also wrote many great pieces in minor keys. Here is his prelude in C minor for piano. What key signature would you expect to see for C minor? If you said three flats, you get ice cream. This piece has been the inspiration for a few pop ballads over the years. As in the Beethoven piece, there are several notes outside of the key signature that require accidentals. This MIDI file is also from the Classical MIDI files archive.

Open MIDI file

Links

Reading:

- Chapter 11 from the Textbook

Required Test:

- Test 9 – Minor Key Signatures (NoJS)

(Optional) Danger!, one of THOSE JavaScript quizzes.

- Practice Minor Key Signatures

The Required Test – An explanation

Below is a sample from the test for this week. This IS NOT the actual test but instead a short example from the test so that you can get an explanation of how to take them and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 9 – Minor Key Signatures

Below are the MINOR key signatures in random order. Use the answer menu (currently set to

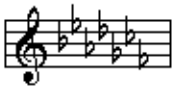
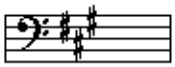
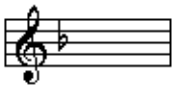
"select") to select the correct letter name for each key signature.

How it works

Each key signature represents a minor key. The menu lists all of the standard minor keys. The examples shown are the following minor keys:

1. Ab minor
2. F# minor
3. D minor

The third menu is set to the correct answer.

		
What is the name of the above Key Signature?	What is the name of the above Key Signature?	This menu is set to the correct answer

End of lecture 7

Lecture 8
Intervals

8.1

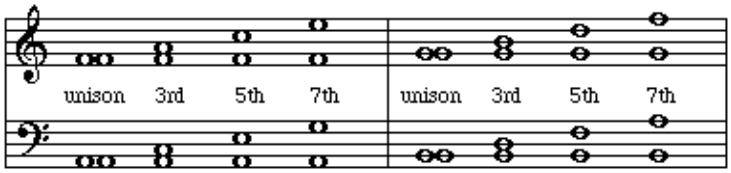
Measuring the distance between notes.

Simply put, an interval is the distance between two notes. We have already been dealing with intervals in a limited way when we built the scales in the previous weeks. We have used intervals of one, two or three half steps to create the scales and thus we have been using three different sized intervals between adjacent notes of the scales.

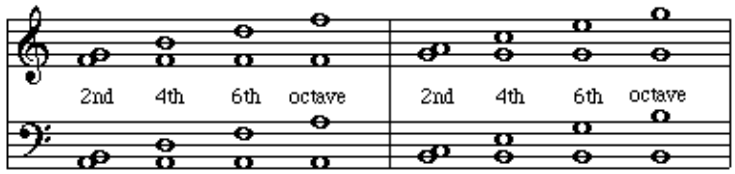
We use the half step as the smallest unit in our measuring system of musical intervals much the same way that inches or centimeters might be used to measure the length or width of an object. Although an interval is measured in half steps, the name we assign to an interval is related to the context of the notation of the two notes on the staff.

One of the elements we use to name an interval is the line/space distance between the notes on the staff. This distance in line/space positions between two notes is known as the INTERVAL NUMBER. Notes that are on adjacent line/space positions on the staff are said to be a 'second' apart regardless of the amount of half steps between the notes. The notes E and F are a second apart as are the notes F and G. Here are some more seconds, C−D, G−Ab and Db−E. When you measure the intervals in half steps, you will find that some of the seconds are one half step whereas others are two half steps while some are three half steps. Yes, there are different types of seconds each of a different size. This is true of all interval numbers. The interval number alone does not provide all of the information to completely identify an interval. As an analogy, the interval number can be thought of as organizing intervals into catagories or families just as my last name (Sult) identifies my family but doesn't specify which Sult. I have two brothers and two sisters, if you want to distinguish between us, more information is needed such as a first name. When identifying intervals, the 'first name' is called the INTERVAL PREFIX. We use the terms MAJOR, MINOR, AUGMENTED and DIMINISHED for interval prefixes and their meaning will be explained in this lecture. The interval prefix is sometimes referred to as the 'quality' of an interval.

Before dealing with the interval prefix, be sure you are confident in your understanding of the interval number. The interval number is most relevant when looking at music notation. The most obvious characteristic of interval numbers is that odd numbered intervals (unisons, 3rds, 5ths, 7ths) are on similar staff positions, either both notes are on a line or both notes on a space.



Conversely, even numbered intervals (2nds, 4ths, 6ths, octaves) are on different staff positions, if one note is on a line the other is on a space. This is the first step to naming intervals in music notation.



The measuring of half steps is irrelevant at this point and is used only to specify the interval prefix (discussed later).

8.2

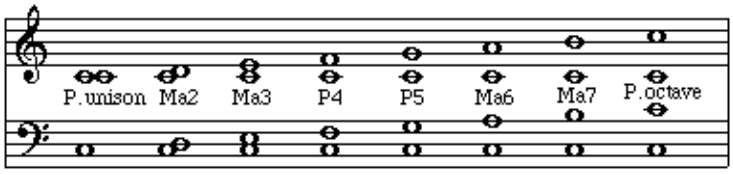
Perfect and major intervals

We return to the major scale for our initial study of intervals. When measuring from the first note (tonic) of the scale, one can create an interval for each scale degree. The interval number of the distance from the first scale degree to the second is a SECOND. The interval number from the tonic to the third scale degree is a THIRD, from the tonic to the fourth scale degree is a FOURTH and so on.

We use the term PERFECT as the interval prefix for four of the intervals measured from the first note of the major scale. If the first note of the scale is used twice (such as two vocalists singing the same note) we call that interval a PERFECT UNISON. There are zero half steps in a PERFECT UNISON. The interval from the first note of the major scale to the fourth note is called a PERFECT FOURTH. There are five half steps in a PERFECT FOURTH. A PERFECT FIFTH is the name of the interval from the first note to the fifth note of the major scale. There are seven half steps in a PERFECT FIFTH. The interval from the first note of the scale to the eighth note (which is the same letter name as the first) is called a PERFECT OCTAVE. There are twelve half steps in a PERFECT OCTAVE.

THE INTERVALS OF 2nds, 3rds, 6ths and 7ths ARE NEVER CALLED PERFECT. The remaining intervals, measured from the first note of the scale, are called MAJOR intervals The interval from the first note to the second note is called a MAJOR SECOND. There are two half steps in a MAJOR SECOND. The interval from the first note to the third note is called a MAJOR THIRD. There are four half steps in a MAJOR THIRD. From the first note to the sixth note is a MAJOR SIXTH. There are nine half steps in a MAJOR SIXTH. And finally, the first note to the seventh note is a MAJOR SEVENTH. There are eleven half steps in a MAJOR SEVENTH.

THE INTERVALS OF unisons, 4ths, 5ths and octaves ARE NEVER CALLED MAJOR.

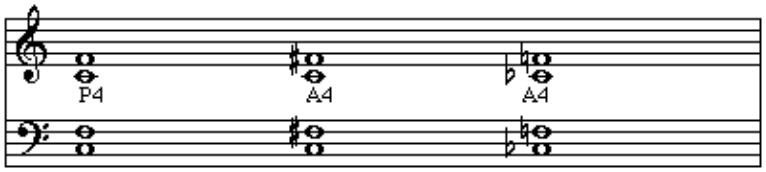


It is important to clearly understand that all of these intervals are from the FIRST NOTE of a major scale to the other scale degrees. When starting from other scale degrees you can create additional intervals that might be of a different quality.

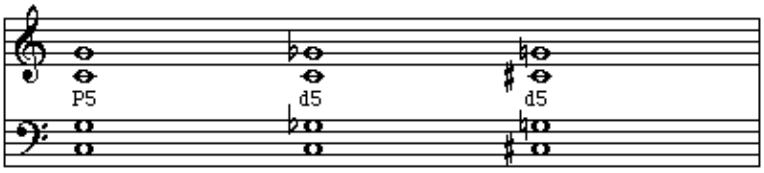
8.3

Perfect, Augmented and Diminished

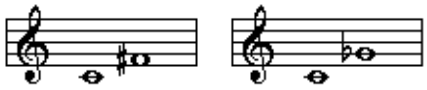
As mentioned previously, there are several types of each interval number. Any perfect interval made larger by one half step becomes AUGMENTED.



Any perfect interval made smaller by one half step becomes DIMINISHED.



When these additional prefixes are included the possibility for enharmonic intervals occurs. Enharmonic intervals are two intervals that have the same number of half steps yet have a different name. A common example is the interval of six half steps which is sometimes called a Diminished Fifth and other times called an Augmented Fourth. This particular interval is known by another name also: the Tritone. The term Tritone refers to the fact that this interval spans 3 whole steps (6 half steps).

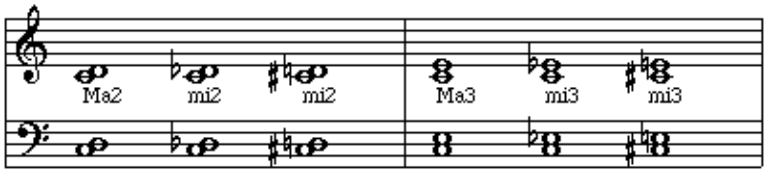


Augmented 4th Diminished 5th

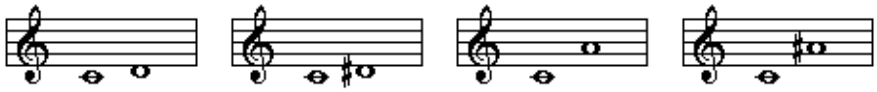
8.4

Major, Minor, Augmented, and Diminished.

To complete the prefix names we must add the term MINOR and expand the use of the terms AUGMENTED and DIMINISHED. Any major interval made smaller by one half step becomes MINOR.

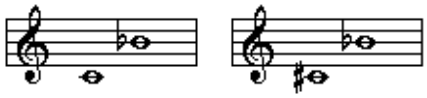


Any major interval made larger by one half step becomes AUGMENTED. This occurs most often in music with Augmented 2nds and Augmented 6ths.



Major 2nd Augmented 2nd Major 6th Augmented 6th

Any minor interval made smaller by one half step becomes DIMINISHED. The most common occurrence in music is the Diminished 7th



Minor 7th Diminished 7th

A diminished 7th interval can be created in every harmonic minor scale, which harmonic minor scale is this diminished 7th interval from? If you said "D harmonic minor" you are correct and get an A for the day. If you said "How would I know", give it some thought, hmmm, both a C# and a Bb. Go back and look at D harmonic minor.

Here is a table that lists the interval name and the amount of half steps in that interval. The following appreviations are used:

- Ma = Major
- Mi = Minor
- A = Augmented
- D = Diminished

Num. of half steps	0	1	2	3	4	5	6	7	8	9	10	11	12
Interval Names	P1	Mi2	Ma2	Mi3	Ma3	P4	A4	P5	Mi6	Ma6	Mi7	Ma7	P8
Enharmonic Names	D2*	A1	D3	A2	D4	A3*	D5	D6*	A5	D7	A6	D8	A7*

* the written intervals marked with the "*" are extremely rare. Composer who use notation that contain these intervals usually end up in a mental institution.

I'm serious.

8.5

Eartraining Routine

The following eartraining routine is quite difficult to sing. It contains all of the intervals, ascending and descending, within one octave. The tone center is G and the overall range is two octaves. Try singing along with this exercise. It's a challenge.

Just for a little variety the exercise is written in 7/4. The basic structure is a three note group consisting of 1) the tone center (G), 2) the next note to create the interval then 3) back to the tone center. Each note is a half note with a chance for a quick breath at the end of each measure (tempo of the file is quarter note = 120, but on the internet tempo is kind of 'iffy'). By the way, it would be appropriate to call the tone center the 'tonic' of this exercise. The order of intervals is as follows:

- ascending mi2, ma2, descending mi2, ma2,
- ascending mi3, ma3, descending mi3, ma3,
- ascending p4, a4, descending p4, a4,
- ascending p5, d5, descending p5, d5, (note: the only one where the second interval is smaller than the first.)
- ascending mi6, ma6, descending mi6, ma6,
- ascending mi7, ma7, descending mi7, ma7,
- ascending p8, descending p8

The reason I have included the d5 (instead of the a5) along with the p5 is that the d5 sound is very common and I wanted to relate that sound to both the p4 and p5. You did know that an a4 sounds the same as a d5 didn't you? Good. Do you remember the name we use for two different named intervals that have the same sound? Yes, enharmonic is used again this time as in "an augmented 4th and a diminished fifth are enharmonic equivalents" or if you are in a hurry just say "they're enharmonics", we musicians know what that means.

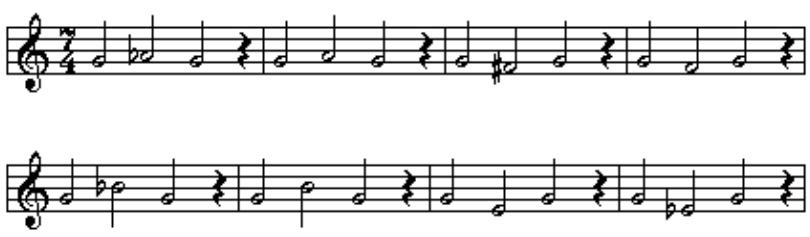
Although this exercise uses all of the intervals, ascending and descending, within an octave, the notation does not have all of the possible ways of writing those sounds. Many of the intervals could be written as enharmonics. For instance, the interval of an augmented 2nd is not written. An augmented 2nd has the same amount of half steps as a minor third. The augmented second, although not common, is not a rare interval either as it occurs in every harmonic minor scale. I've decided to limit the enharmonic combinations in the notation to only one: augmented 4th / diminished 5th.

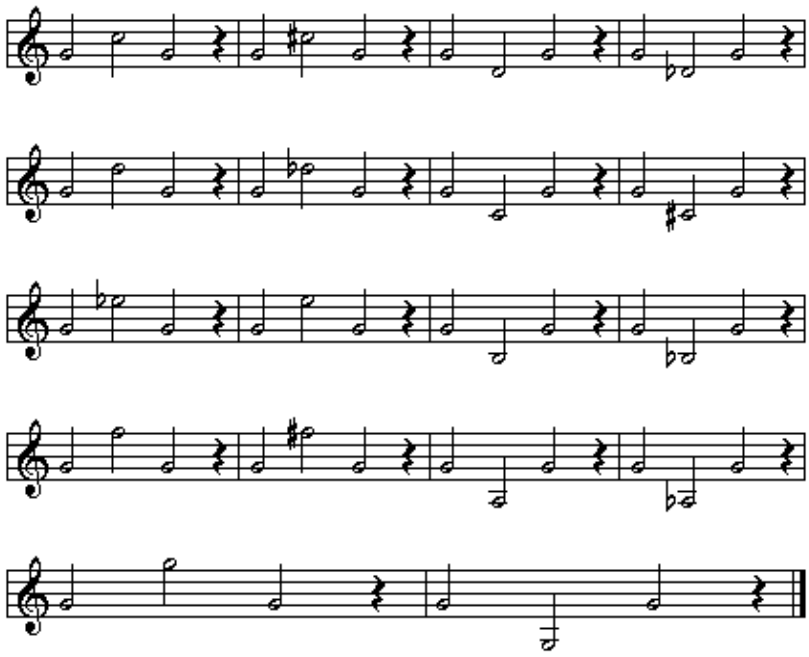
Here is a partial list of enharmonic intervals, they have the same amount of half steps but often their context makes them sound different. strange.

The augmented 2nd and minor 3rd are enharmonics.
The augmented 5th and minor 6th are enharmonics.
The diminished 7th and major 6th are enharmonics.
The augmented 6th and minor 7th are enharmonics.

The other enharmonics are too rare to mention at this time.

Open MIDI file





8.6

Songs and Intervals

Often it is helpful to have a song that you can associate with a specific interval. This section contains some MIDI files that demonstrate some interval in the context of some songs.

Seconds

- (1 beep)Minor Second – Jaws
- (2 beeps)Hernando's Hideaway
  The context of this minor 2nd (the first two notes) is the 5th and 6th scale degrees from a harmonic minor scale.
- (3 beeps)Major Second – Silent Night
  The context of this major 2nd is the 5th and 6th scale degrees from a major scale.
- (4 beeps)You Really Got Me
  The context of this major 2nd is the root and 7th scale degree of mixolydian (next week we discuss mixolydian).

Open MIDI file

Thirds

- (1 beep)Minor Third – Spoonful
  The context of this minor 3rd is the root and 3rd scale degrees from a minor scale
- (2 beeps)Brahms' Lullaby
  The context of this minor 3rd is the 3rd and 5th scale degrees from a major scale

- (3 beeps)Major Third – Beethoven's Fifth Symphony (4th Mvt.)
  The context of this major 3rd is the root and 3rd scale degrees from a major scale
- (4 beeps)Swing Low, Sweet Chariot
  The context of this major 3rd is the root and 3rd scale degrees from a major scale
- (5 beeps)Beethoven's Fifth Symphony (1st Mvt.)
  The context of this major 3rd is the 5th and 3rd scale degrees from a minor scale, then a minor 3rd (from the 4th and 2nd scale degrees in minor)

Open MIDI file

Fourths and Fifths

- (1 beep)Perfect Fourth – Bridal March
  The context of this perfect 4th is the 5th and tonic scale degrees from a major scale
- (2 beeps)A Little Night Music
- (3 beeps)Augmented Fourth – Maria (West Side Story)
  The context of this Augmented 4th is the root and raised 4th scale degrees from a major scale
- (4 beeps)Purple Haze
- (5 beeps)Cool (West Side Story)
- (6 beeps)Perfect Fifth – Scarboro Faire
  The context of this perfect 5th is the root and 5th scale degrees from a Dorian scale (next week we discuss Dorian)
- (7 beeps)Bugle Fanfare (Imperial Margarine)
  The context of this perfect 5th is the root and 5th scale degrees from a major scale

Open MIDI file

Sixths, Sevenths and the Octave

- (1 beep)Minor Sixth – Black Orpheus
  The context of this minor 6th is the 5th and 3rd scale degrees from a major scale
- (2 beeps)(Ending of) Take the A Train
- (3 beeps)Major Sixth – NBC musical logo
- (4 beeps)Minor Seventh – Somewhere (West Side Story)
- (5 beeps)Major Seventh – Bali Hai
- (6 beeps)Perfect Octave – Somewhere Over the Rainbow

Open MIDI file

8.7

Some Observations

The major scale has only perfect and major intervals when measured from the tonic of the scale. The minor scale has perfect, major and minor intervals when measured from the tonic of the scale. When starting from scale degrees other than the tonic, one can create intervals of perfect, major, minor, augmented, and

diminished quality. I don't mean to imply that one can create any of these intervals at any scale degree, what I mean is that when using all of the possible combinations of scales and intervals you can find at least one of each prefix although not all prefixes at each interval number.

For a complete listing of all possible intervals within the context of the four scale forms we have studied in this course, see the second part of the chapter on intervals from the text. If you haven't already looked at it, please check all of the intervals within the scales, from the text.

8.8

Birdland

The composition 'Birdland' by Joe Zawinul is an interesting example of how context can determine the perception of consonance and dissonance. The synth bassline that opens the piece has the notes B,C,D then B,C,D,G. The melody played on top of the bassline starts on the note Bb. One might expect (well I would expect) the B bass against the Bb melody to have a clashing discordant sound but it sounds very natural to me. In fact this type of combination of tones is commonly used in jazz, blues and rock &roll. It is not very common in classical music until you get near this century and harmony began using upper extensions of 9th, 11th and 13ths. In other words Mozart and Beethoven didn't get this funky (maybe at the after hours party, who knows), although I think that J.S.Bach was so far ahead of his time he might have come up with this combination of notes. Chopin implied this on occasion, especially the little phrase in the middle of his E minor prelude.

This MIDI file doesn't do the tune justice. If you want to hear the definitive version, you can't beat the original by Weather Report on the 'Heavy Weather' CD. Jaco Pastorius plays a beautiful fretless bass passage that knocks me out every time I hear it. Manhattan Transfer also did a vocal arrangement that is pretty fun.

Open MIDI file

8.9

Beat the Interval Brainiac

Here is a Java applet to test your knowledge of interval names and their corresponding size. A question about an interval name is displayed, see if you can think of the number of half steps in that interval before it is shown on the screen. If you need more time to figure out the answer, click in the applet area the instant you see the question. The Java applet should pause, the next click will start it again. If you can consistently think of the correct answer before the Java Applet displays the answer you have a good understanding of intervals. If you can't keep up, well ye all come on back someday, ye hear! We're open 24 hours, you can practice all you want.

Links

Other Reading:

- Chapter 12 – part 1 from the Textbook
- Chapter 12 – part 2 from the Textbook

Required Tests:

- Test 10 – Interval Numbers (NoJS)
- Test 11 – Interval Names (NoJS)

The Required Tests – An explanation

Below are some samples from the tests for this week. These ARE NOT the actual tests but instead a short example from the tests so that you can get an explanation of how to take them and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 10 – Interval Numbers

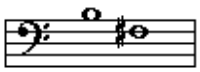
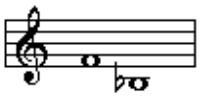
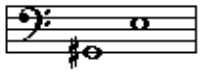
Below are several intervals. Examine the locations of the notes on the staff and determine the interval number for each one. It is not important to analyze the half step distances on this test, only the interval number. Use the answer menu (currently set to "select") to select the correct interval number for each interval.

How it works

Measure the line/space difference between the two notes. In the first example shown below the first note is on the space above the staff. Count the line/space difference between the space above the staff and the fourth line. Counting down from the space above the staff (1), to the top line (2), to the fourth space (3) to the fourth line (4). The interval is a fourth.

In the second example the first note is on the first space and the second note is on the space below the first ledger line below the staff. Counting from the first space (1), to the first line (2), to the space below the staff (3), to the first ledger line below the staff (4) to the space below the first ledger line below the staff (5). The interval is a fifth.

In the third example the first note is on the first line and the second note is on the third space. Counting from the first line (1), to the first space (2), to the second line (3), to the second space (4) to the third line (5) to the third space (6). The interval is a sixth. The third menu is set to the correct answer.

		
What is the number of the above interval?	What is the number of the above interval?	This menu is set to the correct answer

Test 11 – Interval Names

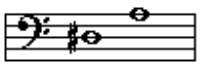
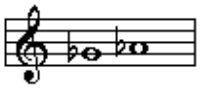
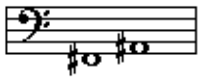
Below are several intervals. Examine the locations of the notes on the staff and taking into account the distance between the notes, determine the interval name for each one. Use the answer menu (currently set to "select") to select the correct interval name for each interval.

How it works

You have to get both the interval number (as in test 10) and also determine the interval prefix. The interval prefix is determined by count the total half step distance between the two notes. In the 1st example shown below the interval from D# to A is a 5th with a total distance of 6 half steps. The correct answer is Diminished 5th.

In the 2nd example shown below the interval from Gb to Ab is a 2nd with a total distance of 2 half steps. The correct answer is Major 2nd.

In the 3rd example shown below the interval from F# to A# is a 3rd with a total distance of 4 half steps. The correct answer is Major 3rd. The third menu is set to the correct answer.

		
What is the name of the above interval?	What is the name of the above interval?	This menu is set to the correct answer

Lecture 9
Triads

Triads are the basic harmonic structure in most musical styles. A triad is simply three different letter names played at the same time. Although there are many different possible combinations of notes to create triads, traditionally the study of triads is limited to four different structures. This lecture will discuss these four triadic structures plus a couple of others whose use have become quite common. Before getting into the lecture just a short mention about some terminology. The term 'chord' is often used in the discussion of harmony and sometimes this term is used interchangeably with the term triad. The term 'chord' is a more general term meaning two or more notes played as a harmonic structure. A triad is specifically a three note chord. All triads are chords yet due to the specific nature of triads, not all chords are triads. Although a chord is often a more complicated structure than a triad, it is common to refer to a triad using the term 'chord'.

9.1

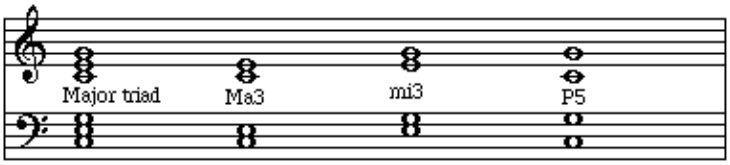
Simple enough for the Three Stooges, Sophisticated enough for Bach

Combining the first, third and fifth notes of a major scale creates the correct interval structure for a MAJOR TRIAD. Let's examine the intervals found in a major triad. Notice that the triad is created by stacking up the interval of a third upon another third. The stacking of thirds is basic to constructing triads. The lowest note of the triad is called the ROOT The other notes have logical names: The middle note is called the THIRD and the highest note is called the FIFTH.

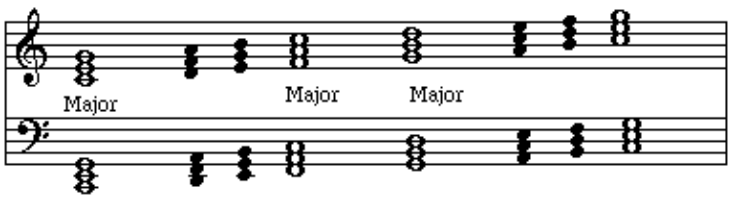
Notice the interval structure of the triad:

- The interval from the Root to the Third is a Major 3rd.
- The interval from the Third to the Fifth is a Minor 3rd.
- The interval of the Root to the Fifth is a Perfect 5th.

All major triads have this structure. It is the "formula" for a major triad.



When starting on the fourth scale degree of a major scale and stacking up a couple of thirds you can create another major triad. The chord tones use the terms ROOT, THIRD and FIFTH as before, but in this case the root is F, the third is A, and the fifth is C. Another major triad can be created at the fifth scale degree of a major scale. The major scale contains three different major triads.



Hey, wait a minute what about the triads build on the other scale degrees, aren't they major triads also? This is the major scale isn't it?

No and Yes.

No, not all of the triads in a major scale are major triads but YES this is a major scale we are talking about. Let me repeat that idea: Not all of the triads in a major scale are major triads. Don't confuse a scale with a triad. A scale is a set of notes from which we can create several different triads. When using a major scale we can create 3 different major triads. This is important, let me say it once more. This time I'll use the word "chord" instead of "triad". Not all of the chords in a major scale are major chords. Of the seven different chords we can create from a major scale only three are major chords. These three major triads are built on the first scale degree, fourth scale degree, and fifth scale degree. You should MEMORIZE THIS. These are referred to as the 'Primary Chords' of the key. Often we use roman numerals to refer to chords. We refer to a chord built on the first scale degree as a "I chord". A chord built on the fourth scale degree is called a "IV chord", one built on the fifth scale degree is called a "V chord" and so on. (This type of naming system allows one to think in terms of chord progression formulas that can be applied to a variety of keys. This topic is introduced in our last lecture in this course.)

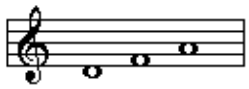
There are specific letter names also given to each chord but the roman numeral name reveals the chord's relationship to the key. Now, here is the same idea restated with roman numerals. In a major scale the I, IV, and V chords are major chords. This is true for every major scale on the planet earth. The I, IV and V chords in the key of C are C, F and G respectively. A capital letter is used to indicate a major triad (C = C major triad). Some systems use Cmajor, Cmaj or Cma. Sometimes CM. In the interest of brevity I prefer simply "C".

So if three of the triads are major, what are the other four? Now it gets good.

9.2

Minor, Augmented and Diminished triads

In addition to the major triad we will also examine the construction of the minor, augmented and diminished triads. First let's look at the triad built on the second scale degree, (the II chord in the key of C is rooted on D). This graphic, and several others in this lecture, show the notes spread across the page. This "broken chord" is called an arpeggio. It is common in music for a chord to be arpeggiated although it is usually a faster note value such as an eighth note or sixteenth note.



here is an analysis of the intervals:

- The interval from the Root to the Third is a Minor 3rd.
- The interval from the Third to the Fifth is a Major 3rd.
- The interval of the Root to the Fifth is a Perfect 5th.

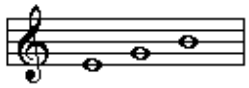
This is called a minor triad. The "II chord" in a major scale is a Minor triad. This is true for all major keys. Really.

Notice that a minor triad has a minor 3rd from the Root to the Third. Conversely, a major triad has a major 3rd from the Root to the Third. Both have a perfect Fifth from Root to Fifth. Think about this for a while, this is handy information: Major triads have major 3rds from the root. Minor triads have minor 3rds from the root. Both have perfect fifths from the root.

Also of interest (to me anyway) is that major triads embody the interval of a minor 3rd (from the third to the fifth) and conversely, a minor triad embodies the interval of a major 3rd (from the third to the fifth). Cool, you get both types of thirds with either triad. It may not be apparent why that is useful but it means that many melodies of a major scale could be harmonized with both major or minor chords each with its own unique emotional effect. You would learn about that sort of thing in a later theory course, it's beyond this course so I'll move on.

So, are the rest of the triads also minor triads?

Let's examine each one. Built on the third scale degree we have a triad that matches the minor formula (the III chord in the key of C is rooted on E).

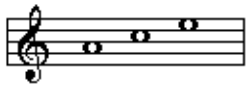


- The interval from the Root to the Third is a Minor 3rd.
- The interval from the Third to the Fifth is a Major 3rd.
- The interval of the Root to the Fifth is a Perfect 5th.

The III chord in a major key is a minor triad. In all of the major keys the III chord is minor.

We already covered the IV and V chords, they're both major.

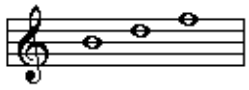
On to the VI chord (the VI chord in the key of C is rooted on A).



- The interval from the Root to the Third is a Minor 3rd.
- The interval from the Third to the Fifth is a Major 3rd.
- The interval of the Root to the Fifth is a Perfect 5th.

It checks out as a minor triad. The VI chord in every major key is a minor triad.

One more to go the VII chord (the VII chord in the key of C is rooted on B). Let's look carefully.

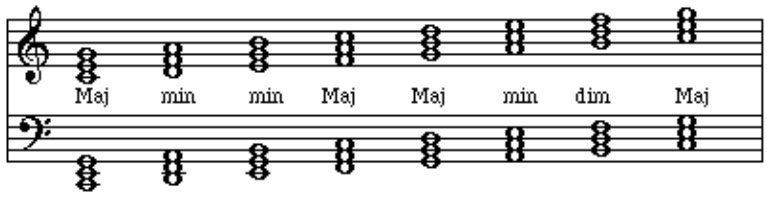


- The interval from the Root to the Third is a Minor 3rd.
- The interval from the Third to the Fifth is a Minor 3rd.
- The interval of the Root to the Fifth is a Diminished 5th.

Hmm, it's neither a minor triad nor a major triad. You can probably deduce that this one is the "Diminished triad". The VII chord of every major key is a diminished triad.

These are all the triads in a major scale. We call these the "diatonic chords" of the key. Notice the following pattern. Every major scale embodies these triads in this exact order. It is worth memorizing. I'll wait while you stare at this for a moment.

I	II	III	IV	V	VI	VII
Major	Minor	Minor	Major	Major	Minor	Diminished



Chant the mantra:
Major, Minor, Minor, Major, Major, Minor, Diminished.

When using roman numerals many people use upper case to indicate a major triad and lower case to indicate minor triads. Additionally, upper case with a '+' sign indicates an augmented triad and lower case with a 'o' indicates a diminished triad. Although I have not used this system, you should be aware of this system because many music theory books use it. Here is how the major scale triads would look using this system:

I	ii	iii	IV	V	vi	vii^{o}
Major	Minor	Minor	Major	Major	Minor	Diminished

In addition to using roman numerals, each scale degree has a name. If you want to fill your brain with more info, memorize this also. Even if your brain is full, at least memorize the names for the I, IV and V chords. The names tonic, subdominant and dominant are commonly used and you should become familiar with their meaning.

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Leading tone
I	II	III	IV	V	VI	VII
Major	Minor	Minor	Major	Major	Minor	Diminished

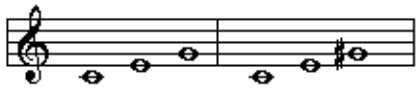
There is still one more basic triad: the "Augmented triad". It is not diatonic to a major scale but it is diatonic to both the harmonic and melodic minor scales as a III chord. Using the above mentioned system, the augmented triad would be indicated like this: III+, an upper case roman numeral with the '+' symbol. While this system is common, I generally do not use it for my own work. I won't use it in this lecture. Well actually, I guess I just did. Just keep it in mind, if and when you see this system somewhere else.

Here is the formula for the Augmented triad:

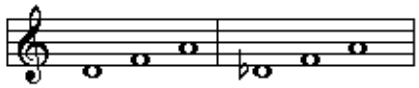
- The interval from the Root to the Third is a Major 3rd.
- The interval from the Third to the Fifth is a Major 3rd.

- The interval of the Root to the Fifth is a Augmented 5th.

It is easy to create an augmented triad by starting with a major triad and then raise the fifth one half step. The first measure below shows the notes of a C major triad, the second measure shows a C augmented triad.



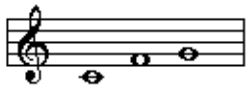
Another way of creating an augmented triad is to start with a minor chord and lower the root one half step. The first measure below shows the notes of a D minor triad, the second measure shows the Db augmented triad.



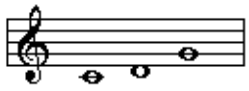
9.3

Additional triad structures

There are several other combinations of three different tones that could be (and are) used to create music. Two of the more common of these additional structures are called "sus chords". The sus4 chord replaces the third of the triad with a fourth. As an example, the Csus4 chord contains the notes C, F and G. It is used in Rock, Jazz, Classical, Pop, Country, Hi−Hop, pretty much anywhere good music is found. Keep in mind that although these triads have been shown in arpeggiated form, they can also be played as a block chord (all notes at the same time).



Another is the sus2 chord. The sus2 chord replaces the third with the second. A Csus2 chord contains the notes C, D and G. It is a common replacement for a major triad in some styles. U2 and The Police used it alot. Bruce Hornsby likes it. It is fairly common, it should be a part of every contemporary musician's harmonic vocabulary.

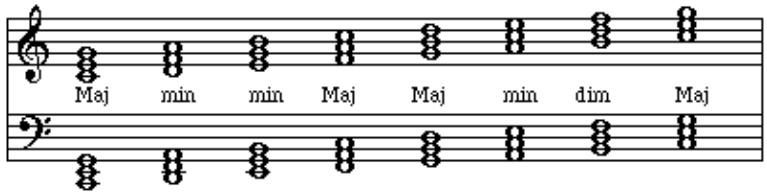


9.4

Triads within scale systems

We've already discussed the triads within a major scale. I'll show the diatonic triads in major again.

I	II	III	IV	V	VI	VII
Major	Minor	Minor	Major	Major	Minor	Diminished



Now let's examine the triads in the minor scales.

Natural Minor

For natural minor the diatonic chords are as follows:

I	II	III	IV	V	VI	VII
Minor	Diminished	Major	Minor	Minor	Major	Major

The order of the triads is different form the order in the major scale. You might notice however that there are 3 major triads, 3 minor triads and 1 diminished triad, just like in major. Upon closer examination you will see that the order is related to the order of the triads in major yet it starts at a different place. Let me explain. In major the order of triads is Major, Minor, Minor, Major, Major, Minor and Diminished. You can create the order of the minor triads by starting on the last Minor and continue to the Diminished then jump back to the beginning and finish it off in order.

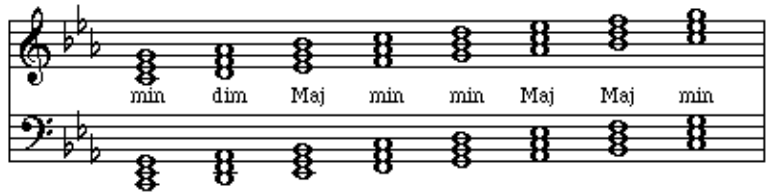
```
The order of triads in a major key:

major    minor    minor     major      major      minor    diminished
                                                  (start here
                                              to create the order
                                                for nat. minor)

the order of triads in natural minor

                       |----- the first five triads in major ------|
minor   diminished     major    minor    minor      major      major


pretty cool, huh?  we'll revisit this kind of idea next week with modes.
```

The scale degrees in minor also have names. The names are the same as the ones in major with the exception that in the natural minor scale the VII chord is referred to as the Subtonic chord (not the Leading Tone chord). In the harmonic and melodic forms the name Leading Tone is used instead of Subtonic because the 7th note is different in those forms compared to natural minor. So, what is the difference between subtonic and leading tone? A leading tone is one half step below the tonic, a subtonic is a whole step below the tonic. Now you

know, but do you care? One of the reasons I prefer using roman numerals instead of the names is that with roman numerals all of the forms refer to this chord as a VII chord. I like consistency. I'm well aware of the differences in the minor forms but l like keeping the same symbols for the chords of the different minor forms.

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Subtonic
I	II	III	IV	V	VI	VII
Minor	Diminished	Major	Minor	Minor	Major	Major

Here are the triads in C natural minor.

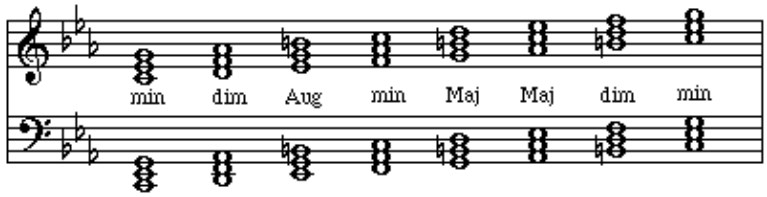


Harmonic Minor

For harmonic minor the diatonic chords are as follows:

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Leading tone
I	II	III	IV	V	VI	VII
Minor	Diminished	Augmented	Minor	Major	Major	Diminished

Here are the triads in C harmonic minor. A natural sign is needed to raise the 7th scale degree. Notice the III chord is augmented.

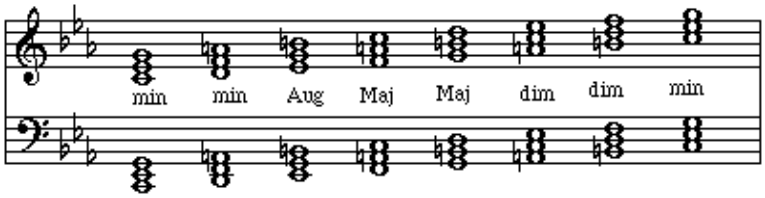


Melodic Minor

For melodic minor the diatonic chords are as follows:

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Leading tone
I	II	III	IV	V	VI	VII
Minor	Minor	Augmented	Major	Major	Diminished	Diminished

Here are the triads in C melodic minor. A natural sign is needed to raise both the 6th and the 7th scale degrees to create the melodic minor form. Once again the III chord is augmented.



Are you curious why we don't have harmonic and melodic minor key signatures? Me too. I've seen a piano piece by Bela Bartok that uses a harmonic minor key signature of Bb and C# to indicate D harmonic minor. Does that ring a bell? This is not common however. Generally the only minor key signatures used are the traditional natural minor signatures and any needed changes are made with accidentals. One reason may be that in minor keys it is common to use more than one of the forms in a composition so you would have to use accidentals regardless of what minor key signature was used.

9.5

Let's listen to these triads.

The first MIDI file plays the triads in ascending order up one full octave: I II III IV V VI VII I. This is the same as the Major scale graphic shown in the previous section. Then it plays the chords in descending order: I VII VI V IV III II I.

Open MIDI file

The second MIDI file uses the same pattern but this time the pattern is applied to the three forms of Minor: Natural Minor, Harmonic Minor, Melodic Minor. Use the graphics from the previous section to see the triads in ascending order.

A change in sound is made to each minor form so that it is easier to hear the different forms of minor. The natural minor triads are played using a string sound, the harmonic minor triads are played using an organ sound and the melodic minor triads are played using a voice sound.

Open MIDI file

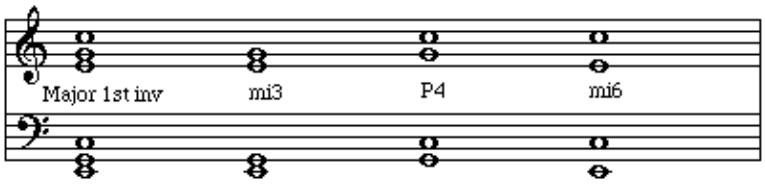
9.6

Inverting triads

So far we have seen and heard the chords in "Root Position". Root position refers to the Root being the lowest note of the chord. It is possible to use either the third or the fifth of the triad as the lowest note of a chord. These are called inversions.

First inversion

A "first inversion" triad has the third of the chord in the bass (the lowest note). Notice the spacing of the notes, there is an interval of a third on the bottom and an interval of a fourth on the top. The interval of a sixth spans the outside notes. Any of the triad types can be inverted.

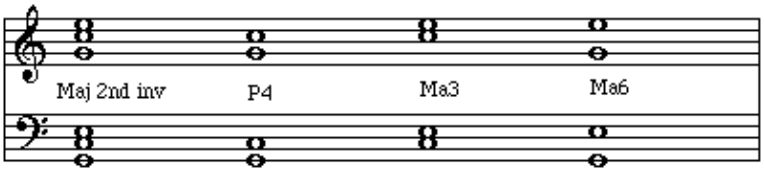


They're are two ways of indicating an inversion with symbols. The traditional way uses arabic numbers along with roman numerals. The numbers 6 and 3 represent the intervals of a sixth and a third which are found in a 1st inversion triad. As an abbreviation, the number 6 alone is used. When the number 6 is attached to a roman numeral it indicates that a specific chord within the scale system is in 1st inversion. Example, I6 and V6, indicate that the tonic chord is in 1st inversion and the dominant chord is in 1st inversion.

A second way to indicate the inversion is with Chord symbols. These letter names are sometimes called "Pop chord symbols" because this system of chord notation is included in sheet music of popular music. The letter name of the chord (described earlier) is followed by a slash then another letter indicating the name of the bass note. As an example, the symbol C/E indicates a C major chord (remember, a capital letter alone means major) with the note E in the bass. This notation does not tell if this is first inversion, it merely tells you that some note other than the root of the chord is in the bass. As it turns out the example "C/E" IS in first inversion but this same notation can be used for many different comibinations of chords and bass notes. I refer to this type of chord notation as the "Chord/Bass" symbol.

Second inversion

We can flip the chord around one more time to create the "second inversion". A second inversion triad has the Fifth of the chord in the bass. The spacing changes to a fourth on the bottom, and third on top and a sixth between the outside notes.



Using traditional classical notation the numbers 6 and 4 are used to indicate second inversion. This is because of the sixth and the fourth intervals measured for the bass note. These numbers are attached to roman numerals to indicate a chord in 2nd inversion. The 6 is usually placed above the 4 as shown below.

$$\mathrm{IV}\ {}^{6}_{4}$$

This symbol means the subdominant chord (the IV chord) is in 2nd inversion. Of course, the letter name of the chord will be different in each key. In the key of C this means the IV chord (F major) has its fifth (the note C) in the bass. In the Key of D the IV chord is G and its fifth (the note D) would be in the bass. The roman numeral system is not tied to any specific key, therefore, before you can discuss any specific chord letter names, you must first give a key context. The term "IV chord" begs the question "In what key?".

The traditional roman numeral system with a specific key context can always be translated into a Chord/Bass symbol. Here are some examples using both 1st and 2nd inversion.

I 6 In the Key of C this mean C/E – In the key of G this means G/B – In the key of F this means F/A

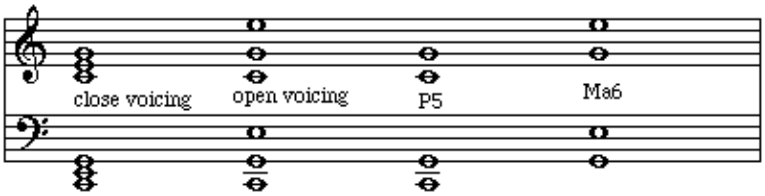
IV^{6}_{4} In the Key of C this mean F/C – In the key of G this means C/G – In the key of F this means Bb/F

9.7

Open and close voicing

The spacing of the notes of the chord is known as the "voicing". We have been examining close voicing chords but they can be spread out to create open voicings. The standard open voicing is created by moving the center note up one octave. This technique can be applied to any inversion.

This is shown in both treble and bass clefs.



Doubling chord tones

It is common to use a four voice texture when studying harmony. If the prevailing chord structure is a triad, then three of the voices take the Root, Third and Fifth and the remaining voice will double one of the chord tones. The most common note doubled is the Root, however doubling either the third or fifth is possible.

9.8

Inversions with Open and Close Voicings

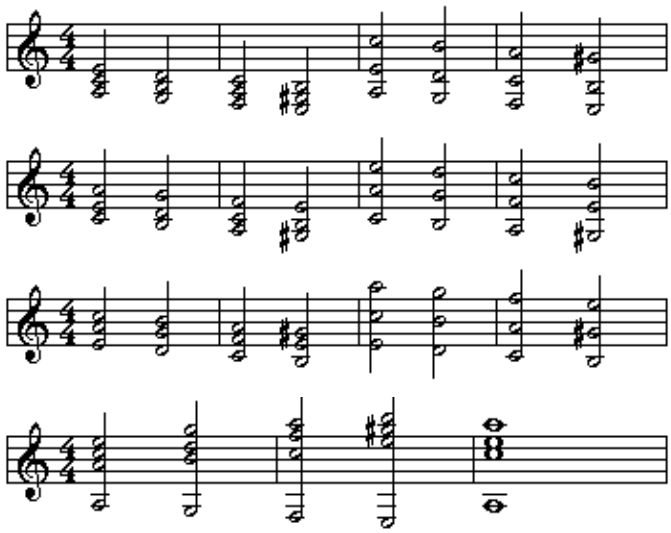
The following MIDI file uses a standard chord Progression using a minor scale. The first three chords are from natural minor, the fourth chord is from harmonic minor. This short harmonic idea is played using a variety of inversions and voicings. You probably have heard several songs that use this type of chord progression, its been around for centuries. The progression is played seven times through. The first time in root position/close voicing, the second time in root position/open voicing, the third and fourth time use 1st inversions both in close voicing and open voicing. The fifth and sixth are using 2nd inversion first with close voicing and then with open voicing. The last repetition is in a four voice texture with the bass doubling the root of each chord. Notice that the bass is moving in the opposite direction of the upper three voices. This type of voiceleading is known as "contrary motion" between the bass and the upper voices. Contrary motion is a common voiceleading practice.

Music education has some funny traditions. One such tradition is a type of indoctrination regarding parallel fifths. Parallel fifths occur when two voices which are a perfect fifth apart move in the same direction and the exact same distance. "Serious" music theory books from the last century tell you it is wrong and sounds bad. For reasons unknown to me, traditional music theory education has held on to that idea. What do you think, there are parallel fifths in 6 of the following 15 measures. Can you tell which ones? Do they sound bad compared to the other measures? The measures that contain parallel fifths are 1,2,3,4,7 and 8. I think the notion of parallel fifths being undesirable is silly. Of course I was brought up on Rock &Roll and that style has plenty of parallel fifths so I'm quite used to the sound.

The chord progression in roman numerals is I – VII – VI – V, the key is A minor (mixture of natural and

harmonic).

1. (measures 1–2) Am – G – F – E close voicing – Root Position
2. (measures 3–4) Am – G – F – E open voicing – Root Position
3. (measure 5–6) Am/C – G/B – F/A – E/G# close voicing – 1st inversion
4. (measure 7–8) Am/C – G/B – F/A – E/G# open voicing – 1st inversion
5. (measure 9–10) Am/E – G/D – F/C – E/B close voicing – 2nd inversion
6. (measure 11–12) Am/E – G/D – F/C – E/B open voicing – 2nd inversion
7. (measure 13–15) Am – G – F – E – Am : Contrary motion between bass and top three voices. The root of each chord is doubled in the bass.



Open MIDI file

9.9

Links

Other Reading:

- Chapter 13 from the Textbook

Required Tests:

- Test 12 – Triads (NoJS)
- Midterm 2 (NoJS)

The Required Test – An explanation

Below is a sample from the tests for this week. This IS NOT the actual test but instead a short example from the test so that you can get an explanation of how to take it and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 12 – Triads

Quality and Inversions

Triad Quality

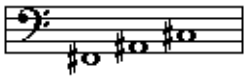
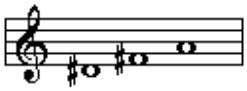
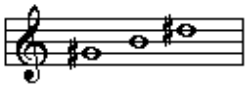
Below are several triads shown in arpeggiated form. Analyze the intervals of the triads and determine the quality (major, minor, augmented or diminished) of the triad. Use the answer menu (currently set to "select") to select the correct quality for each triad.

How it works

In the 1st example, the root (F#) to the 3rd (A#) is a Ma3. The root (F#) to the 5th (C#) is a P5. It is a major triad.

In the 2nd example, the root (D#) to the 3rd (F#) is a Mi3. The root (D#) to the 5th (A) is a d5. It is a diminished triad.

In the 3rd example, the root (G#) to the 3rd (B) is a Mi3. The root (G#) to the 5th (D#) is a P5. It is a minor triad. The third menu is set to the correct answer.

		
What is the quality of the above Triad?	What is the quality of the above Triad?	What is the quality of the above Triad?

Lecture 10
Modes

10.1

Getting the most out of what you already know

The concept of modes is very powerful. It will give us a variety of scales that are related to the Major scale. We already have studied one of these relationships, i.e. the major scale and its relative minor scale. As you should recall, when using the notes of a major scale, the sixth note can be used as the starting note for a different scale. The most basic example is using the notes of C major (all white keys on the keyboard) yet starting on the sixth note of that scale (letter "A") and creating the "A" natural minor scale (also all white keys).

Well, what about the other notes? Can we create scales by starting at other locations other than the sixth note? The answer is yes, yes, yes, we can, can, can. Not only can we do it, but the use of these additional scales are common and sometimes essential to certain styles of music. We will examine these scales this week. They are collectively referred to as "Modes" however I will use the term "Modes" and "Scales" interchangeably.

Often students find the study of modes confusing. We will study modes from two different view points:

1. Relative Modes
2. Parallel Modes

Some may find one approach easier to understand than the other. Your choice. I like both but favor the Parallel approach.

IONIAN

Ionian mode is the same interval formula as the major scale we have been studying in this course. It is a rose by another name and sounds just as sweet. We will use our knowledge of the major scale interval formula as a basis for creating the relative modes.

Here is a text representation of the relative approach. Shown below is the interval formula for a major scale (two octaves). When using that interval formula and starting at various locations one can create the interval formula for any of the modes.

```
            (major)
|-----------ionian-----------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H

    |-----------dorian-----------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H

        |----------phrygian----------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H

            |----------lydian------------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H

                |---------mixolydian---------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H
```

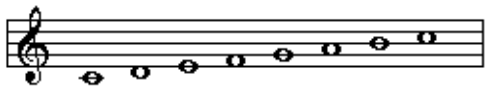
```
                    |----------aeolian-----------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H

                          |----------locrian-----------|
  W   W   H   W   W   W   H  | W   W   H   W   W   W   H
```

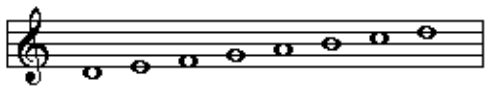
The most important point to grasp is that every major scale (whose modal name is "Ionian Mode") embodies one complete set of the modes. These modes are the "relative modes" of that major scale because they all come from the same key signature. One big happy family, how nice.

10.2

DORIAN

The Dorian mode is created by starting on the second note of a major scale and using that note as the tonic of a new scale. The interval structure for the Dorian mode is W–H–W–W–W–H–W.





```
|----------(major)-----------|
  W   W   H   W   W   W   H    W   W   H   W   W   W   H
    |-----------dorian-----------|
```

It has a minor triad built on the first scale degree and it is a commonly used scale in Rock, Jazz and some Folk styles.

As a personal note, when I first started playing guitar, I worked out this scale by ear without knowing it's name. I knew it had a minor quality and I assumed that it must be the natural minor scale that I had heard about (it sure seemed 'natural' to me). I was surprised to find out that the natural minor scale was a little different from this scale that I had figured out by ear. The reason the dorian scale seemed so natural to me is that I was listening to a lot of music at that time which used the dorian scale.

There are two ways to look at the modes and their relationship to the major scales we have already learned. The first relationship we examine well be the "relative modes". The other relationship is the "parallel modes", discussed later. As noted above, the dorian scale can be created by starting on the second note of a major scale and using the notes of that "parent" major scale to create this new scale called dorian. This is called the relative dorian. As a specific example consider the C major scale. The second note of the scale is D, this note is used as the starting point for a D dorian scale. D dorian uses only the natural notes (white keys only) just as C major does. D dorian is the "relative dorian" of C major. The term "parent major scale" is commonly used in jazz education and it is used in the context of relative scales

The dorian scale is commonly used in a number of styles. The song "Moondance" by Van Morrison is largely dorian, "Oye Como Va" by Santana (written by Tito Puente) is dorian, "Scarboro Faire" is dorian, "Walking

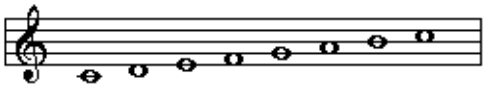
on the Sun" by Smash Mouth is mostly dorian. It has been a favorite sound in dance music for decades.

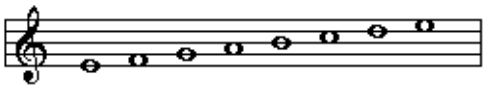
Open MIDI file

10.3

PHRYGIAN

The next mode is the Phrygian mode. The phrygian mode is created by starting on the third scale degree of a major scale. The resulting interval formula is H–W–W–W–H–W–W.





```
|----------(major)-----------|
  W   W   H   W   W   W   H    W   W   H   W   W   W   H
        |--------phrygian--------|
```

Using the C major scale as the parent major scale, the relative phrygian begins on the note E. E phrygian is the relative phrygian of C major.

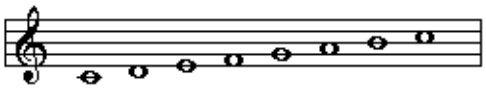
Phrygian is an important scale used in Spanish flamenco music. The half step between scale degrees one and two gives it a distinctive sound.

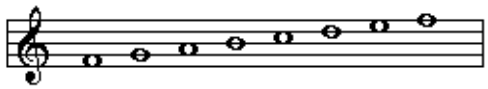
Open MIDI file

10.4

LYDIAN

The next mode is the Lydian mode. The lydian mode is created by starting on the fourth scale degree of a major scale. The resulting interval formula is W–W–W–H–W–W–H.





```
|----------(major)-----------|
  W   W   H   W   W   W   H    W   W   H   W   W   W   H
            |-----------lydian-----------|
```

Using the C major scale as the parent major scale, the relative lydian begins on the note F. F lydian is the relative lydian of C major.

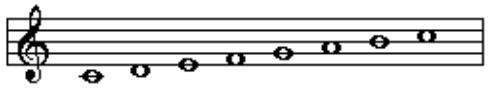
Lydian is commonly used in jazz as an alternative to the major scale. In situations where a major scale might be used many jazz improvisers will use lydian instead.

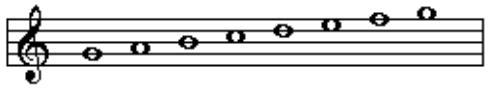
Open MIDI file

10.5

MIXOLYDIAN

The next mode is the Mixolydian mode. The mixolydian mode is created by starting on the fifth scale degree of a major scale. The resulting interval formula is W–W–H–W–W–H–W.





```
|----------(major)-----------|
  W   W   H   W   W   W   H    W   W   H   W   W   W   H
              |--------mixolydian----------|
```

Using the C major scale as the parent major scale, the relative mixolydian begins on the note G. G mixolydian is the relative mixolydian of C major.

Mixolydian is one of the commonly used scales in Rock &Roll, Boogie Woogie, Funk and Soul. In fact you couldn't create the sounds of those styles without using mixolydian. Don't even try. If you want to play in these styles start practicing mixolydian scales, you can start with G mixolydian. It's all white keys. How convenient.

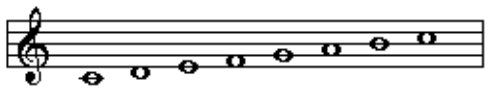
Open MIDI file

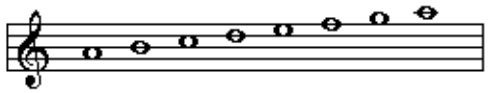
10.6

AEOLIAN

Been there, done that... sort of.

The next mode is the Aeolian mode. The aeolian mode is created by starting on the sixth scale degree of a major scale. The resulting interval formula is W–H–W–W–H–W–W.





```
|----------(major)-----------|
  W   W   H   W   W   W   H    W   W   H   W   W   W   H
                    |----------aeolian-----------|
```

Using the C major scale as the parent major scale, the relative aeolian begins on the note A. A aeolian is the relative aeolian of C major.

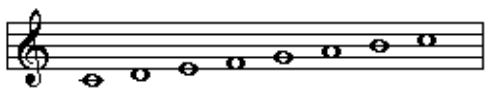
Aeolian is very common, do you recognize the formula? It is identical to natural minor. Aeolian and natural minor are the same scale. Another name for one of the scales we already know.

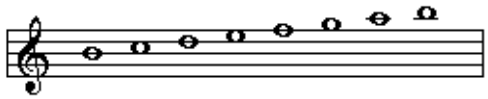
Open MIDI file

10.7

LOCRIAN

The next mode is the Locrian mode. The locrian mode is created by starting on the seventh scale degree of a major scale. The resulting interval formula is H–W–W–H–W–W–W.





```
|----------(major)-----------|
  W   W   H   W   W   W   H    W   W   H   W   W   W   H
                          |----------locrian-----------|
```

Using the C major scale as the parent major scale, the relative locrian begins on the note B. B locrian is the relative locrian of C major.

Probably the least commonly used of the modes, but it is used with the II chord in minor and the VII chord in major. A detailed discussion is beyond the mission of this course.

Open MIDI file

10.8

If Dora Play's Like Me All's Lost

The above phrase was suggested by a former student as a memory aid to remember the order of the names of the relative modes. The first letter of each word is the same first letter of the name of the modes

If	Dora	Play's	Like	Me	All's	Lost
Ionian	Dorian	Phrygian	Lydian	Mixolydian	Aeolian	Locrian

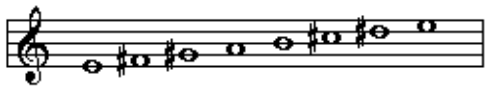
"What does it mean?", you ask. I dunno. But it's useful if you are having trouble remembering the names of the relative modes and their order.

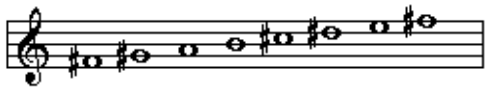
WORKING YOUR WAY BACKWARD

Sometimes students get confused with the relative approach because they forget if they are coming or going. By that I mean they sometimes apply the wrong logic to finding the notes of a specific mode. For example, if you want to know the notes of F# dorian, you can use the relative mode view point to arrive at the answer. The Dorian mode is created by starting on the second note of a major scale, right? YES. If you want to find F# dorian we can't start with a F# major scale, we instead have to find the major scale whose second note is F#! How do we do that? With intervals! We go the same interval DOWN from F# that occurs between the first and second scale degree of a major scale. (remember dorian is created from the second note of the major scale).

This one is easy, right?

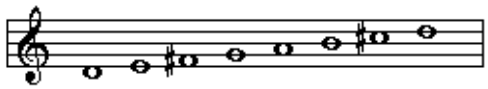
The interval from the first note to the second note of a major scale is a major second. So, if we go DOWN a major second from F# we will arrive at the tonic of a major scale that has the same notes as F# dorian. Do you see it on the keyboard in your mind? It is the note E. E major (which has 4 sharps) contains the same notes as F# dorian.

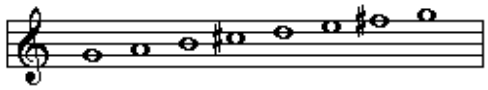




Let's do another one.

Let's say you heard that the lydian mode is used in jazz (psst – the lydian mode is frequently used in jazz) and you wanted to practice a lydian scale. Let's find the notes of G lydian. We have to use our knowledge of where lydian fits into the modal family (If(ionian) Dora(dorian) Plays(phrygian) Like(lydian)...that's the 4th word) OK, lydian can be created by starting on the 4th note of a major scale. Now we have to figure out what major scale has as its 4th note, the letter G. We do this by working our way back. The interval from the 1st note to the 4th note of a major scale is a perfect 4th. So we have to go DOWN a perfect 4th from G to find the tonic of the major scale that has the same notes as G lydian. A perfect 4th down from G is D. G lydian has the same notes as D major (but you start on G). G lydian is spelled G, A, B, C#, D, E, F#, G. It contains two sharps (F# and C#) just like D major.





With the addition of all of the modes we have vastly increased our scale choices but remember all of these modes are embedded within some major scale.

Hey, wait a minute, what about the harmonic and melodic scales? They didn't show up anywhere in the modal family. Yes, it is true they are not part of the traditional modal family.

Could we use harmonic or melodic minor as "parent scales" for a new modal system?

The answer is yes, jazz musicians do this all the time. But we won't do it in this class. It's a topic considered beyond the fundamentals. Many would say it's downright advanced.

10.9

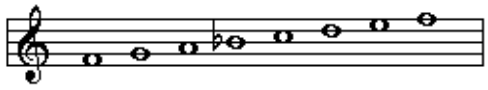
A Different View of the Modes.

In a previous week we compared a Minor scale to its Parallel major scale. We also can make a Parallel comparison between a major scale and any of the modes.

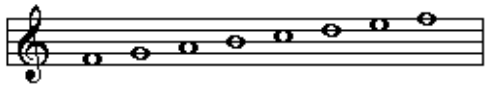
One system used in jazz education to describe the formula for modes is to make a parallel comparison with the major scale. We can compare any of the modes to a major scale and indicate with a sharp or a flat how the mode differs from the major scale. There is potential for some confusion with this system because the sharps or flats in the mode formulas may not result in a corresponding sharp or flat in a specific scale. An example will illustrate this idea. In this system a major scale is represented by the numbers 1 through 8. Remember the 8th note is really the tonic note (1st note) up one octave.

Major: 1 2 3 4 5 6 7 8

Let's look at a parallel comparison between lydian and major, rooted on F. We will compare F lydian and F major and see which notes are the same and which are different. From a previous section in this lecture you may recall that F lydian has the same notes as C major (all white keys, do you see it on the keyboard in your mind?) And of course everyone knows the notes of F major by now. It contains only one black key, Bb.



```
------ F major --------
F   G   A   Bb   C   D   E   F
F   G   A   B    C   D   E   F
------ F Lydian -------
```

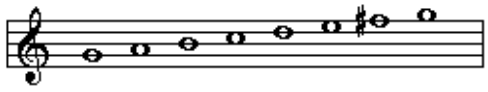


Only the 4th note is different. In lydian the note is one half step higher than in major (B vs. Bb) Using this jazz system we say that the 4th is raised or sharped, even though it is not literally a sharp (and instead a natural) In this system the lydian scale is represented as follows:

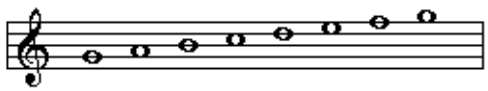
Lydian: 1 2 3 #4 5 6 7 8

It is like a major scale with a sharped 4th scale degree. In many keys, the raised fourth scale degree is truly a sharp in other keys it is a natural (which was a flat in the parallel major scale)

A similar situation exists with the flat used in the system. Here is an example. G major and G mixolydian. How do they compare?



```
------ G major --------
G   A   B   C   D   E   F#  G
G   A   B   C   D   E   F   G
---- G mixolydian -----
```



The 7th note of G mixolydian is one half step lower than the seventh note of G major. Using this system the formula for mixolydian is like this:

Mixolydian: 1 2 3 4 5 6 b7 8

Just like major except you "flat" the 7th. In G major the 7th is F# so when we lower that note one half step we are at the note F.

In this system the sharps and flats should be thought of as instructions to raise or lower by one half step a note (compared to the parallel major scale).

Here is the entire modal system using parallel comparisons:

```
Lydian        1   2   3  #4   5   6   7   8
Major(ionian) 1   2   3   4   5   6   7   8
Mixolydian    1   2   3   4   5   6  b7   8
Dorian        1   2  b3   4   5   6  b7   8
Aeolian       1   2  b3   4   5  b6  b7   8
Phrygian      1  b2  b3   4   5  b6  b7   8
Locrian       1  b2  b3   4  b5  b6  b7   8
```

Do you remember Dora ("If Dora Plays ...")? Well Dora has a friend named Lydian Major. Really.

Here's a gimmick to help you remember the order of the parallel modes:

```
Lydia  Major     Met     Dora     At   Phoenix   Lake

Lydian Major Mixolydian Dorian Aeolian Phrygian Locrian

 1#      0      1b        2b     3b       4b      5b
(-1b)          (-1#)    (-2#)  (-3#)    (-4#)   (-5#)
```

A little explanation is in order. Assuming you know your major scales well, you can compare a mode against its parallel major scale. If that scale has one more sharp (or one less flat in keys that use flats) then it is Lydian. If the scale has two more flats (or two less sharps in keys that use sharps) then it is Dorian.

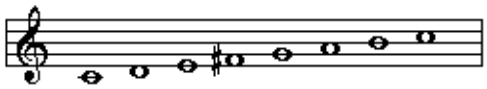
Here is an example. A scale rooted in C uses two flats (Bb and Eb), what mode is it? Well, first you need to know the key signature of the parallel major scale, C major. That's easy, no sharps or flats. The scale in question uses two flats, that's two more flats than the parallel major. Now using the gimmick phrase (starting on the word "major"), move two words to the right ("... Met Dora..."). It's C Dorian.

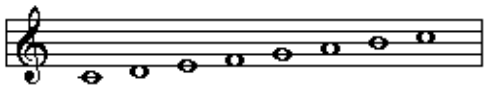
Another One. A scale rooted on G uses four flats (Bb, Eb, Ab, Db), what mode is it? The parallel major is G major, one sharp. The scale in question uses four flats. Hmmm, we seem to cross over from sharps to flats but that's OK. We just need to keep track of the total number of sharp and flat changes. In this case we remove the one sharp and add four flats. That is a total of five changes. Using the "Conspiracy at Phoenix Lake" phrase, simply move five words to the right starting from the word "Major" ("...Met Dora At Phoenix Lake."). It's G

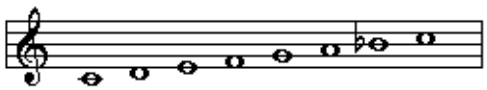
Open MIDI file

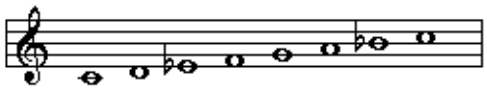
When these formulas are translated into whole−steps and half−steps they result in the exact same formulas as the relative method. Well of course they do, we are looking at the same scales, just from a different vantage point.

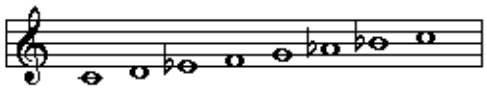
Notice that I have placed the lydian scale on the top. I have done this because this organizes the modes in a logical order. As you go down the list each new mode is created by making one change to the previous mode. Let me go through the whole list demonstrating this point.

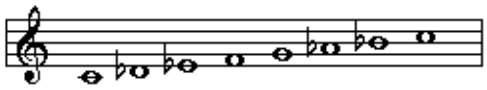
- 

  If you start with a lydian scale and lower the 4th it results in a major scale.
- 

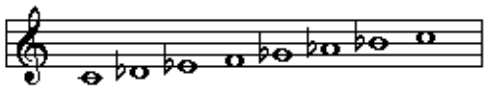
  If you start with a major scale and lower the 7th it results in a mixolydian scale.
- 

  If you start with a mixolydian scale and lower the 3rd it results in a dorian scale.
- 

  If you start with a dorian scale and lower the 6th it results in a aeolian (natural minor) scale.
- 

  If you start with a aeolian scale and lower the 2nd it results in a phrygian scale.
- 

  If you start with a phrygian scale and lower the 5th it results in a locrian scale.



I find this information invaluable, I don't leave home without it.

Incidently, when you organize the modes as shown above with the lydian scale at the top of the heap you can understand why Jazz composer and theorist George Russell wrote a Jazz Theory text using Lydian as the parent scale (not Major). His book is titled "The Lydian Chromatic Concept to Tonal Organization". It's a pretty tough read but it contains alot of valuable information.

I think it is useful to further organize the modes into two basic categories: Major types and Minor types

The tonic chord (I chord) is the criteria for separating the modes into the two categories. The three modes whose tonic triad is major are the "Major type" modes, the other four are the "Minor types". The tonic chord is made up of three notes: the 1st, 3rd and 5th of the scale. A major triad is represented by the numbers 1 3 5. The Major types of modes are Lydian, Major, Mixolydian. A minor triad is represented by the numbers 1 b3 5. The Minor types are Dorian, Aeolian, Phrygian, and Locrian. Notice that the locrian mode's tonic triad is 1 b3 b5. This represents a diminished triad yet it is lumped in with the minor types, gee you didn't want locrian to be all alone did you?

	Tonic Triad						
	|		|				
Major types							
Lydian	1	2	3	#4	5	6	7	8
Major(ionian)	1	2	3	4	5	6	7	8
Mixolydian	1	2	3	4	5	6	b7	8
Minor types								
Dorian	1	2	b3	4	5	6	b7	8
Aeolian	1	2	b3	4	5	b6	b7	8
Phrygian	1	b2	b3	4	5	b6	b7	8
Locrian	1	b2	b3	4	b5	b6	b7	8

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When playing in a major key an improviser might try either lydian or mixolydian instead of major. Likewise when playing in minor an improviser might play Dorian, Aeolian, Phrygian, or Locrian in addition to Harmonic and Melodic Minor (you always get more choices with minor). Where did Natural minor go? Do you see it. It's called Aeolian. Remember Natural minor and Aeolian are the same.

Does it seem that we keep learning new stuff that doesn't relate to the things we have already studied? There seems to be an endless stream of new things coming at you each week. Well, here is a chance to put some of your knowledge about key signatures to good use. You can use key signatures to help you find the notes of a mode. Think about the key of C major. No sharps or flats. To create C lydian we add one sharp, F#. This change of one sharp is true for all keys with a little twist. Lets say you want to know the notes for D lydian. D major is two sharps so you add one more. D lydian is three sharps. Easy, huh? It works for all of the modes if you know how much to change the key signature. If you have the circle of fifths handy it's a snap. Here's how it works:

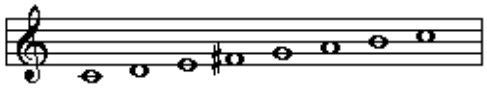
- To create lydian subtract one flat or add one sharp to the parallel major key signature. (move clockwise one position)
- To create mixolydian subtract one sharp or add one flat to the parallel major key signature. (move counterclockwise one position)
- To create dorian subtract two sharps or add two flats (or subtract one sharp and add one flat) to the parallel major key signature. (move counterclockwise two positions)
- To create aeolian subtract three sharps or add three flats (or a combination of three changes) to the parallel major key signature. (move counterclockwise three positions)
- To create phrygian subtract four sharps or add four flats (or a combination of four changes) to the parallel major key signature. (move counterclockwise four positions)
- To create locrian subtract five sharps or add five flats (or a combination of five changes) to the parallel major key signature. (move counterclockwise five positions)

Here are a couple of examples. If you want to know what the notes of G dorian are, you can start with the key signature of G major (one sharp, F#). The above instructions say to subtract two sharps but there is only one. What do we do? We subtract the one sharp and add one flat making a total of two changes. G dorian using one flat, Bb, the rest of the notes are natural.

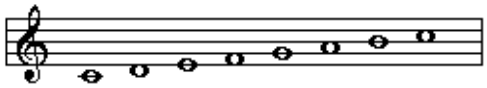
Another example, suppose you want to know the notes of D phrygian. According to the instructions we start with the key signature of D major (2 sharps) and move four positions counterclockwise in the circle of fifths. This effectively subtracts the two sharps and adds two flats. The D phrygian scale uses two flats, Bb and Eb, the rest of the notes are natural. If you have the circle of fifths in your mind it is very easy to use this method.

One more time, here are all of the modes rooted on C.

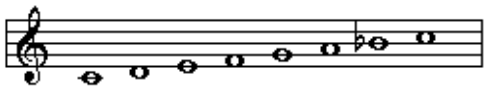
- C lydian – 1 sharp



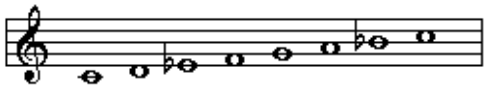
- C major – no sharps or flats



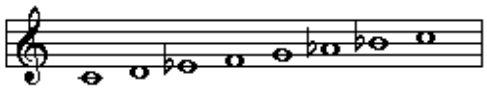
- C mixolydian – 1 flat



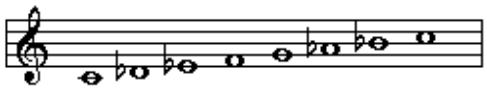
- C dorian – 2 flats



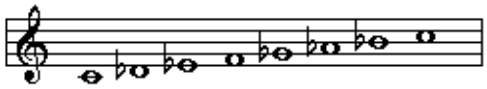
- C aeolian – 3 flats



- C phrygian – 4 flats



- C locrian – 5 flats

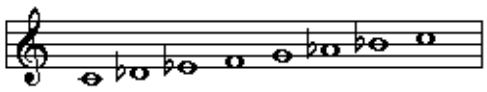


Strategies for the Test

The test for the Modes will show several correctly spelled Modes. You will select from the answer menu which of the modes is shown. You can use a relative or parallel approach. Let me give an example of both

- Relative method

  Consider the scale shown below.



  1. First find the Parent Major Scale.
     This scale contains four different flats. That is a relative mode of the clan of four flats. Do you know what major scale (or major key signature) has four flats? Yes, oh most diligent student, you are correct, it is Ab major. Ab major is the parent major scale, but this scale starts on C.
  2. Locate the starting note within the Parent Major Scale
     That's a snap, C is the third note of Ab major.
  3. Use your knowledge of relative modes (or Use the "If Dora Plays ..." gimmick) and the fact that C is the third note of the Parent Major Scale.

     ```
     1      2      3
     If     Dora   Plays
     Ionian Dorian Phrygian ...
     ```

     Bingo!, its phrygian from the family of four flats. The answer is Phrygian.
- Parallel method

  Consider the same scale from a parallel approach.

1. The Tonic is C, so we compare this scale to a C major scale.
2. There are four changes from the Parallel Major scale, Db, Eb, Ab, and Bb.
3. Use your knowledge of Parallel Modes and the fact that this one is four notes removed from the Parallel major.

```
      as you add flats the modes change like this:

  -1       0      1           2       3        4         5
 Lydia  Major     Met       Dora     At     Phoenix    Lake
Lydian  Major  Mixolydian  Dorian  Aeolian  Phrygian  Locrian
```

So with four changes, this one is Phrygian.

Either way you will arrive at the correct answer: Phrygian. As an analogy, if you're going to San Francisco from my house you can take 101 or 280. They're different, but both get you to where you want to go. It's you're choice as to which direction you want to go with regard to modes, relative or parallel. Just drive the road carefully and you will get to the correct answer.

Remember, when the RELATIVES arrive the modal mantra is "If Dora Plays Like Me All's Lost", but in a PARALLEL universe the modal mantra is "Lydia Major Met Dora At Phoenix Lake".

I Love Gimmicks
Dogs Love Trucks

Links

Other Reading:

- Chapter 14 from the Textbook

Required Test:

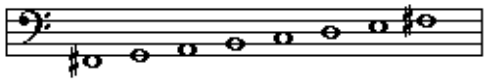
- Test 13 – Modes (NoJS)

The Required Test – An explanation

Below is a sample from the tests for this week. This IS NOT the actual test but instead a short example from the test so that you can get an explanation of how to take it and the "look and feel". To take the real test you must use the links provided above or on the "Music 10 BackDoor" document.

Test 13 – Modes

Examine the following scales, they are one of the following modes (in alphabetical order): Aeolian, Dorian, Ionian, Locrian, Lydian, Mixolydian, or Phrygian. Click on the answer menu (currently set to "select") and select the choice that is appropriate for each scale. Please note that the menu listing is in alphabetical order so as not to favor either a relative or parallel approach to arriving at the answers. Unfortunately it makes the menu order "unfriendly" to both. In other words the third mode is not the third menu choice, etc. All of the menus on this test are in alphabetical order.



Examine the above scale and select the appropriate menu choice.

Lecture 11
Chord Progressions

11.1

Connecting a series of different triads.

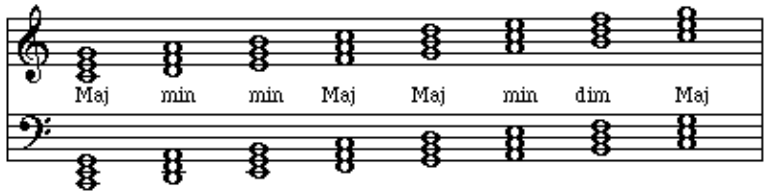
Two weeks ago we discussed triads. This week we will show some examples of how you can use the triads to create a CHORD PROGRESSION. A Chord Progression is simply a series of chords played in a composition. Any composition that contains two or more chords has a chord progression. In this lecture I will sometimes use the term "chord progression" to mean the change from one chord to another while at other times I will use the term "chord progression" to mean a series of chords. You're smart, you'll be able to figure out which one I mean.

11.2

Diatonic Harmony in Major

We've already seen the diatonic triads of the major scale two weeks ago. I'll repeat them again.

I	II	III	IV	V	VI	VII
Major	Minor	Minor	Major	Major	Minor	Diminished



These chords can be used to harmonize a melody created from the notes of the scale. If you create a melody using C major, then these chords can be used to harmonize that melody. They are not the only choices but they are the basic choices. Many popular songs have been written using only the diatonic chords. Here is an example in the key of A. The song "The Weight" by the Band uses a repeating progression in the verse of I – III – IV – I, each chord lasts for two counts. This translates to the chords A, C#m, D, A. These chords harmonize all of the melody notes of the verse. The same chords are used during the chorus but the harmonic rhythm is different. During the chorus the A and C#m chords last for one count each and the D lasts for two counts. This four beat pattern is repeated during the chorus.

Open MIDI file

11.3

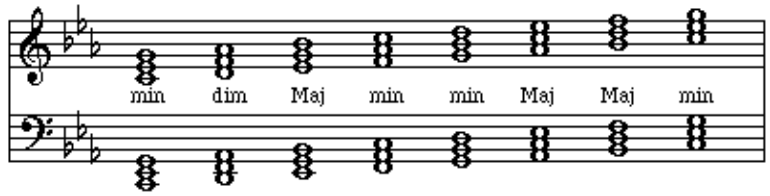
Diatonic Harmony in Minor

Here's a repeat of the triads in the three forms of Minor.

Natural Minor

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Subtonic
I	II	III	IV	V	VI	VII
Minor	Diminished	Major	Minor	Minor	Major	Major

Here are the triads in C natural minor:

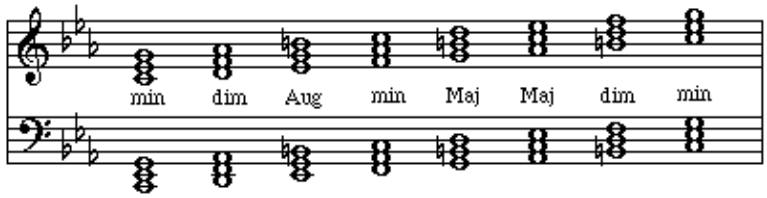


Harmonic Minor

For harmonic minor, the diatonic chords are as follows:

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Leading tone
I	II	III	IV	V	VI	VII
Minor	Diminished	Augmented	Minor	Major	Major	Diminished

Here are the triads in C harmonic minor. A natural sign is needed to raise the 7th scale degree. Notice that the III chord is augmented.

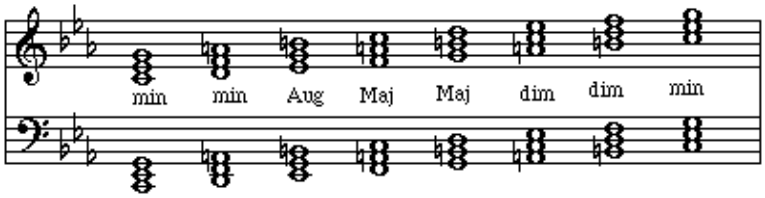


Melodic Minor

For melodic minor, the diatonic chords are as follows:

Tonic	Supertonic	Mediant	Subdominant	Dominant	Submediant	Leading tone
I	II	III	IV	V	VI	VII
Minor	Minor	Augmented	Major	Major	Diminished	Diminished

Here are the triads in C melodic minor. A natural sign is needed to raise both the 6th and the 7th scale degrees to create the melodic minor form. Once again the III chord is augmented.



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11.4

Cadences

The first chord progressions we will study are the traditional harmonic cadences. These progressions often occur at musical phrase endings. These cadences are often used in classical music and are quite common in other styles as well. In addition to being used at phrase endings, these progressions can be chained together to form longer chord progressions. Consider these cadences to be the first harmonic progressions you put in your "bag of harmonic tricks".

Authentic Cadence (V–I) (1 beep)

The authentic cadence provides a convincing harmonic conclusion to a musical phrase. It is sometimes referred to as a "Dominant to Tonic" progression. Most classical pieces end with an authentic cadence. Beethoven would sometimes go on for pages with authentic cadences. The authentic cadence is fundamental to what we call "functional harmony". The essence of function harmony is the expectation of the V chord moving to the I chord. The V chord doesn't always move to the I chord, but it is so common in classical music that when the V chord doesn't resolve to the I chord we call it a "deceptive cadence" (see below)

[insert graphic]

Plagal Cadence (IV–I) (2 beeps)

The plagal cadence occurs when a IV chord resolves to a I chord. This cadence is sometimes called a "Church Cadence" or "Amen Cadence" because many church hymns have a IV–I progression at the end as the choir is singing "Amen"

[insert graphic]

Deceptive Cadence (V–VI) (3 beeps)

As mentioned above the V chord (dominant) moving to the I chord (tonic) is so common that when the V chord goes elsewhere it is said to be "deceptive". The mindset is this: I heard the V chord, I expected to hear the I chord next but I heard something else and I've been deceived. But it's not a bad thing. It is my favorite cadence. The most common place other than the I chord for the V chord to move to, is the VI chord. Other "deceptive destinations" for the V chord include the IV chord or the II chord. Technically, a resolution to any chord but the I chord is considered a "deceptive resolution", but the most common deceptive cadence is to the VI chord. The deceptive cadence is a welcome relief from the much used authentic cadence.

[insert graphic]

Half Cadence (I–V) (4 beeps)

The half cadence is rarely the last cadence in a composition. It lands on the V chord and provides an unresolved harmonic feeling that begs for another phrase with a more convincing final cadence such as authentic or plagal. If you know the song "Jambalaya" by Hank Williams Sr. you have heard half cadences. That entire song is comprised of only two chords: the I chord and the V chord. The first phrase is a half cadence (I – V), the next phrase is an authentic cadence (V – I). Throughout the entire song each phrase alternates between a half cadence and an authentic cadence. I'm not sure if Hank Williams used these terms when thinking of his music but his harmonic intent was clear and can be discussed using these harmonic cadence names. The V chord can be preceeded by any chord (not just the I chord), the essential characteristic of the half cadence is that it ends on the V chord. The II–V progression is also commonly used for a half cadence.

[insert graphic]

The following MIDI files contain the basic harmonic cadences. First the tonic chord is played for reference, then the two chord cadence is played. The order is as listed above and the "beep" numbering system is used in the MIDI file. The first MIDI file is in major, the second is in minor.

Open MIDI file

Open MIDI file

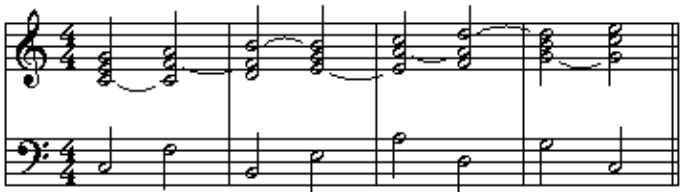
11.5

Root Movements

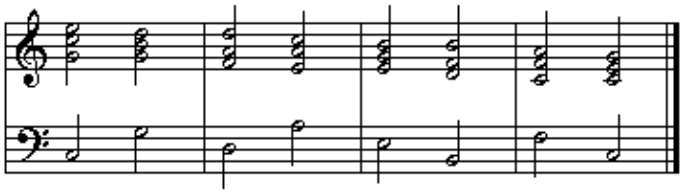
We can catagorize the movement of one chord to another with respect to the interval of the root movement. For example, if a C major chord moves to a D minor chord, the root movement is a 2nd (the interval between C and D is a 2nd). If the D minor chord then moves to a G major chord, the root movement of that progression is a 4th (the interval between D and G is a 4th). When using diatonic chords (the chords found within a single scale) we can draw some conclusions with regard to COMMON TONES between the chords. A common tone is a note that is common to both chords played in succession. Below the characteristics of the possible diatonic progressions are listed.

Fourths (cycle progressions)

The root movement of a 4th is very common in music. When the root movement is UP 4th it is sometimes called a cycle (or circle) progression because it generally follows the notes found in adjacent locations when moving counterclockwise in the circle of fifths. In the circle of 5ths, all of the adjacent locations are either a P4th higher or lower (depending on whether you are moving clockwise or counterclockwise). Why do I say that the intervals between adjacent locations of the circle of 5ths are actually 4ths? Hopefully you recall that the inversion of a P5th is a P4th. So if you move up a P5th you will arrive at the same letter name as you would if you move down a P4th. I prefer using 4ths instead of 5ths because it is a shorter distance to calculate. As an example, if you move UP a P4th from D you arrive at G, if you move DOWN a P5th from D you arrive at G. Either way you land on a G. The Authentic cadence is an example of a cycle progression

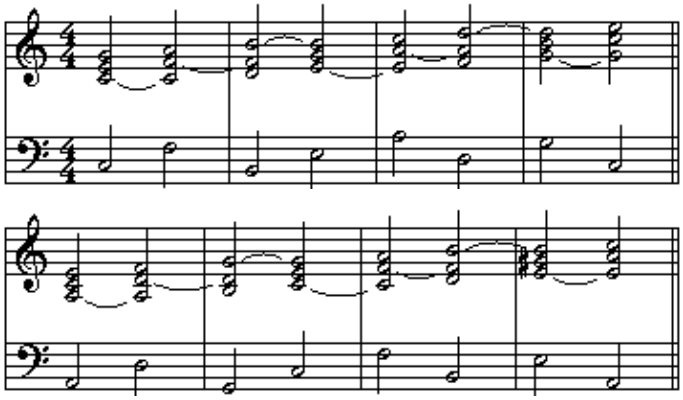


So, a root movement UP a 4th is sometimes called a "cycle progression". When the root movement is DOWN a 4th it is sometimes called a "backcycle progression". The Plagal cadence is an example of a backcycle progression.

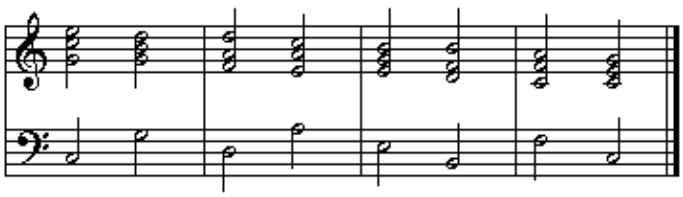


Now that we have some terminology out of the way, let's look at the common tone characteristics of progression of a 4th (Up or Down).

There is one common tone in diatonic chord progressions using root movement of a fourth . The other two chord tones of the triad must move one scale degree to become the correct chord tones for the second chord. Here is an example, consider the progression of C major to F major (the I to IV chords in the key of C major). The root movement is a P4th up (or if you prefer, a P5th down). According to the above statement there should be one common tone between these chords. The notes of the C major chord are C, E and G. The F major chord contains the notes F, A and C. The note C is common to both chords. So far, so good. Now the other chord tones of the C triad (E and G) should each move one scale degree to become chord tones of the F triad. The E moves up to F and the G moves up to A. It all works as advertised.



This next example doesn't use ties lines but the common tones are still there. Do you see them?



As it turns out this is true of all diatonic chord progressions whose root movement is up or down a 4th. I'm sure you remember that most of the 4ths in a major scale are perfect 4ths, except for one augmented 4th. The

single common tone principle is true for ALL of the root movements of 4ths regardless of whether it is a P4th or an A4th. The root movement of a 4th is extremely common in music. I could bet that it is the most commonly used progression without too much fear of losing my money.

Here is one fact about diatonic chord progressions:

Root movement of a 4th = One common tone.

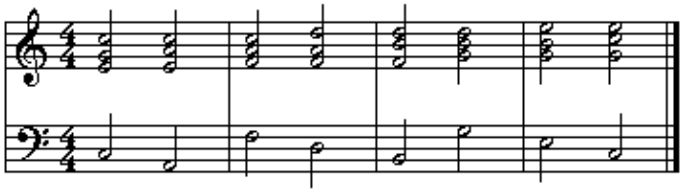
You should memorize this fact.

Open MIDI file

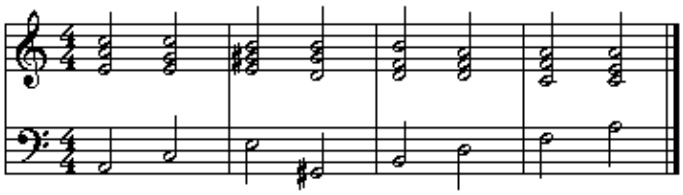
Thirds

What about root movement of a third (up or down)? We know that the major and minor scales contain both major and minor thirds (you knew that didn't you?) and it is common to move from one chord to another whose root is a 3rd away (maybe you didn't know this, that's why I'm telling you now). Let's examine the characteristics of that type of progression. Consider the progression from A minor to F major (the I chord to VI chord in A minor). It has a root movement of down a 3rd (specifically a Ma3). The notes of the A minor triad are A, C and E. The F major triad contains F, A and C. Wow, two common tones C and E. That means all we would have to do to change from an A minor triad to a F triad is change to note E (from the A minor triad) to the note F (it becomes the root of the F major triad). Pretty Slick. This type of common tone principle creates the smoothest possible voiceleading between chords. An exception to this might occur in a minor key when using a chord from one minor form followed by a chord from a different minor form. In these cases there will only be one common tone.

Root Movement down a 3rd in Major.



Root Movement Up a 3rd in Minor.



Here is another fact about diatonic chord progressions:

Root movement of a 3rd = Two common tones.

You should memorize this fact also.

It is not required that you always use this common tone principle but you should be aware of the possiblities. On occasion however you may want to ignore the common tone possibilities and simply move everything in parallel motion to the next chord. If you want to do something like the following, it is legal in the continental United States (maybe elsewhere too), although it is discouraged in most college music theory courses I've taken. It has to do with an objection to parallel fifths, I talked a little about it in the lecture on triads. This objection is a tired old concept of little merit as far as I'm concerned.

[MIDI file of root movement of 3rds]

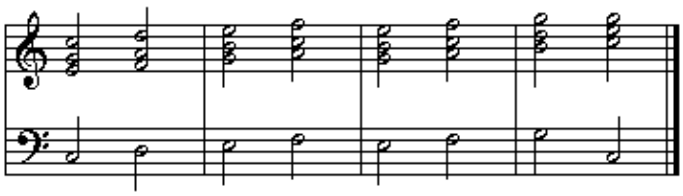
Open MIDI file

Seconds

The root movement of a second is simple. You just move up or down one scale degree. There are no common tones in progressions with a root movement of a 2nd. None. The most obvious voiceleading is to move all voices one scale degree in the same direction as the root movement. This creates a chord movement using "parallel motion". If the interval of a Perfect 5th is involved (as would be if the chords were in root position) then the potential for "parallel 5ths" is present. As mentioned previously, parallel 5ths have been considered undesirable within the context of traditional music theory voiceleading principles (go figure, it makes no sense to me). There are some strategies for avoiding parallel 5ths if that is your mission. Regardless of your voiceleading politics these "contrary motion" voiceleading principles are worth examining. Let's take an example of a F major chord moving to a G major chord (IV – V in C major). It is a root movement up a 2nd (specifically a Ma2). If the F chord is in root position and we move all three voices up one scale degree we arrive at the G major chord. It sounds fine to me. But it does contain a parallel fifth. The interval of F to C (in the F triad) is a Perfect 5th and both of those notes move in parallel motion to another perfect 5th, (G to D from the G triad). As I said, it never bothered me personally but I had to learn to avoid this type of voiceleading so I could get "A's" on my homework and tests when I was taking traditional music theory courses. As it turns out the solution is worth knowing without regard to the parallel 5th issue. Why? Because Mmm Mmm, it sounds good. Shown below are two ways of "voicing" the F to G progression. The first way uses a parallel voicing and the second moves the voices in the opposite direction of the root movement. If this is not clear, think of the fact that moving from an F to G is UP, yet in the second voicing all three notes of the F chord move DOWN to notes of the G chord. Perhaps surprising is that although there are no common tones, the movement between the chords is very smooth. Two of the notes move only a 2nd the other note moves a 3rd. That is nearly the same scalewise motion you would get with a parallel voiceleading of the same chords.

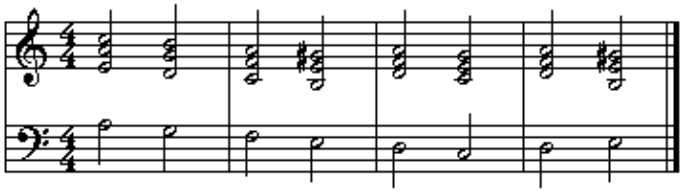
Root Movement up a 2nd in Major.

Most of the chords in the following example follow a root movement up a 2nd.



Root Movement down a 2nd in Minor.

Most of the chords in the following example follow a root movement down a 2nd.



Here is a third fact about diatonic chord progressions:

Root movement of a 2nd = NO common tones.

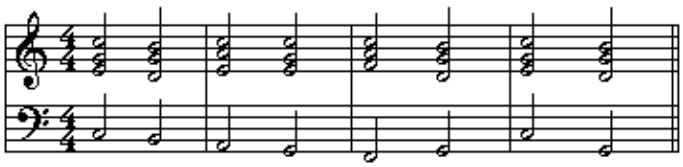
Did you know that?
If not, you should memorize this fact also.

Open MIDI file

Line progressions

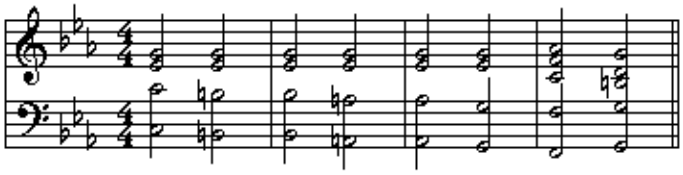
The term "Line Progression" is used to describe a progression of several chords in which a scalewise "line" is embedded. The line can be either part of a diatonic scale, often beginning on the tonic and moving down the scale, or the line can be part of chromatic scale, especially true in some minor key progressions that use both the natural and raised sixth and seventh scale degrees (remember, the three forms of minor vary in their sixth and seventh scale degrees). In line progressions the root movement is not really the issue as some line progressions utilize cycle progression and other root movements, while other line progressions are essentially a single chord with one moving voice that creates the line.

The diatonic line is extremely common in Major keys. The song "When a Man Loves a Woman" by Percy Sledge is a good example. The bass line of this song is a descending major scale beginning on the tonic. For the first five chords the bass line descends creating a line that helps "glue" the chord progression together.



C G/B Am C/G F G C G

A familiar line progression in a minor key involves a descending chromatic scale starting on the tonic. There are several variations on this idea. Some of the compositions that use this type of chromatic line include My Funny Valentine, Masquerade, Stairway to Heaven, and Chopin's Prelude in Em. The following example has the chromatic line in the bass although sometimes the line is used as an inner voice.



```
Cm   Cm/B   Cm/Bb   Cm/A   Cm/Ab   Cm/G   Fm    G
```

Open MIDI file

11.6

Using tried and true chord progressions

The chord progression shown in this section are frequently used in popular music. Included are both the chord name and a roman numeral analysis of the chords whithin the context of the key.

```
Eb    Cm    Fm    Bb

 I    VI    II     V
```

Major – 50's Do Wop music

```
C     F     G     F

I    IV     V    IV
```

Major – Good Lovin', La Bamba

```
  C    C+    C6    C7
  I    I+    I6    I7
```

Major – Baby Hold On to Me, Hooked on a Feeling

Minor – James Bond, Secret Agent Man

Open MIDI file

Backcycle progressions

These next two chord progressions can be described as containing "backcycle" progressions. Do you see why?

Backcycle in Major
Pachelbel's canon

```
D    A    Bm    F#m    G    D    G    A
```

```
 I   V   VI   III   IV   I   IV   V
```

Open MIDI file

Backcycle in Minor
Hotel California

```
  (verse)
||:  Bm   F#   A   E   G    D   Em   F#   :||

      I   V   VII  IV  VI  III  IV   V


  (chorus)
  G    D   F#   Bm   G    D   Em   F#

  VI  III   V    I   VI  III  IV    V

(_IV___I_)          (_IV___I_)
  (in D)              (in D)
```

Notice that both the verse and the chorus end on a half cadence (V chord). There is one authentic cadence located half way through the chorus (F# to Bm) as the 8 bar chorus is built on two 4 bar phrases. The Eagles studio recording of this song ends with a fade out on a guitar solo over the chords of the verse.

Open MIDI file

Back cycles are common to Rock &Roll. Some songs that come to mind are Gloria (Them), Hey Joe (Jimi Hendrix), You Wreck Me (Tom Petty) and Jumpin' Jack Flash (Rolling Stones)

This last one is based on cycle progressions. Do you see them?

Minor – Autumn Leaves

There are two way to look at this progressions. One way is to analyze all of the chords in the minor key. That analysis is the first one listed below. In that analysis you should be aware that the VII chord is Major and diatonic to the natural minor form. The V chord is also Major yet it is diatonic to the Harmonic minor form not the Natural minor form. A second view of the chord progression is recognizing that the first four chords comprise a II–V–I–IV progression in the relative major key. The II–V–I progression is one of the VIP's (Very Important Progressions) and it is common for a jazz tune to have some cycle progressions in a variety of keys. This is one of the many examples. The 8 bar analysis is this: Relative major key for the first four bar and then in the minor key for the last 4 bars. The final key is minor therefore the song is considered to be in a minor key.

```
1)
 Am   D    G   C   F#o  B  Em

 IV  VII  III  VI  II   V  I
(------ in E minor --------)
```

```
2)
 Am   D   G   C     F#o  B  Em

 II   V   I   IV    II   V   I
(--- G major ---)  ( E minor )
```

Open MIDI file

By the way, Pachelbel's canon and Hotel California are both called backcycles because the 1st–2nd, 3rd–4th, 5th–6th chords are related by a root movement of Down a 4th (or, if you prefer, Up a 5th). Note that not all of the root movements in these examples are backcycles but enough of them are backcycles for the term to apply.

Additionally, Autumn Leaves is a cycle progression because the root movement of all of the chords of the verse section are related by a root movement of Up a 4th (or Down a 5th). This is a rare example from the literature that uses ALL of the chords of the key in a cycle progression. Most examples of cycle progressions are limited to fewer chords in a row. Certainly II–V–I is popular and you don't have to look too far to find III–VI–II–V, it's quite familiar to those who play Jazz standards, but Autumn Leaves is an extreme example of cycle progressions. This song is a lock as a first ballot member of the "Cycle Progression Hall of Fame".

11.7

Harmonizing a diatonic melody

Let's use the chords we have learned in this course to harmonize a melody. A commonly known christmas carol "Joy to the World" is an easy example to use. The opening phrase is a descending major scale starting on the tonic and moving down one full octave.. The second phrase contains one leap then a scalewise motion back up to the high tonic. Using only these two phrases, we'll harmonize them a few different ways to hear what happens.

First is a harmonization using the primary chords (I, IV, V). This is an example of a simple yet traditional harmonization of this tune.

Next is a harmonization of every melody note using primarily parallel motion. The bass sustains "pedal tones" in the first two measures. A pedal tone (also called a pedal point) is a bass note sustained or repeated while chords are changing so that sometimes the pedal tone is not a member of the triad being played above it.

The rest of the harmonizations are more advanced than we have learned in this course. They represent some of the possibilities that these melody notes provide.

The third harmonization has an unusual first phrase that descends downward and settles on the IV chord. The second phrase ends with a deceptive cadence. Were you deceived?

The fourth harmonization begins on the IV chord similar to "Let It Be" by the Beatles. It uses a deceptive cadence in the second measure and an even stronger pull to the Am chord in the last measure. Notice that the last chord is preceeded by an E major chord. E major is the V chord in A minor. The last two chords make up an authentic cadence in Am minor. This is one way that you can modulate to different keys by using an authentic cadence in the new key. This technique works well when there is a chord that can connect the two keys, some chord that is diatonic to both the old key and the new key. In this case the common chord is the F chord that preceeds the E chord. The F chord exists as a IV chord in the key of C and also as a VI chord in the key of A minor. It is at the F chord at the beginning of measure 3 that the key pivots away from C and towards

A minor. This technique of modulation is called "Common Chord Modulation" and in this case the F chord is the common chord (also called the pivot chord). This is an advanced harmonic idea, it won't be on any test, if you were wondering. You're Welcome.

The last one is way beyond the course work. The first three chords are a II–V–I in E minor. It sounds a little like Mendelsohn's Bridal March don't you think? The reason this E minor chord progression is possible even though the melody is actually in C major is because the first four melody notes (C, B, A and G) are also in the E minor scale.

Below is a Roman numeral representation of the harmonies. Capital Roman numerals represent diatonic chords. Non–diatonic chords are shown with an extension added.

Below is a roman numeral analysis of the different harmonic variations. This sort of analysis is a little deep for this course. It won't show up on any test.

```
                    4 measure phrase
          beats
    |----|----|----|
    |1    2    3    4 |1   2   3   4 |1  2  3  4 |1  2  3  4 |

1)  I    V    I   IV  I   V   I      IV    V     I


2)  I   VII VI V  IV III  II  I      II    V     I
   ped.C-----  G------------- C


3)  I  VII  III  VII  VI  V   IV     II    V     VI


4) IV  III II I  II   I   V   VI     IV   IIIma  VI

                                   (_VI_____V____I_)
                                          VI


5) #ivo VIIMa III VII I   V   VI     IV   IIo   bVI  bVII  I

  (_II____V____I_ )
         III
```

Open MIDI file

11.8

Non–Diatonic progressions

This is a little beyond the scope of this course, so I'll present just a small taste of this type of harmonic treatment. The last example of the previous section contains a chord (the E major chord) that is non–diatonic to the key of C but is actually diatonic to the situation (the modulation to A minor) This section will present two different non–diatonic examples. The first uses minor chords only. This type of emphasis on a specific chord quality is sometimes used in film scoring and other situations where you want to create a certain ambience or mood.

Assuming any one of these triads is the tonic triad, none of the others exist as diatonic triads in that key. Put another way, the A minor triad is not diatonic to the keys of C minor, Eb minor or F# minor. Notice the root movement of this chord progression. Each adjacent root is a minor 3rd (or enharmonic equivalent) apart.

```
Am   Cm   Ebm   F#m   Am   Cm   Ebm   F#m   Am
```

The next example uses mostly major triads. It starts and ends with a C triad but most of the triads are outside of the C major scale.

```
C   Cdim   B   G   A   F#  Ab   Bb   C
```

Although these are only two of the multitude of possible examples, they demonstrate how this more vague and wandering sound of non−diatonic harmony differs from diatonic harmony.

Open MIDI file

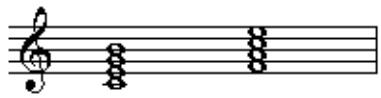
Seventh Chords

Sect.1

Many discussions of Seventh chords begin with the type known as a 'Dominant 7th' chord as it is the most common of the 7th chord types. From a historical perspective the use of dominant seventh chords preceeds the use of other types. In today's music however, the use of a variety of types of 7th chords is fairly common. Since this document discusses all of basic types of 7th chords I will begin here with the Major 7th chord because today that chord is often used as a standard from which to compare and measure the other forms.

Major 7th Chords

A major 7th chord is a four note chord consisting of a major triad with an additional tone added that is a major 7th interval from the root. The resulting chords contains four different letter names. The major 7 chord contains the same notes as the first, third, fifth and seventh note of a major scale. When thinking of the chord as a stacking of thirds notice the alternating pattern of ma3 (Root to the third) , mi3 (third to fifth), ma3 (fifth to seventh). Below are two different major 7th chords, one rooted on C and the other rooted on F.



As shown above, these voicing are called "close" position because the notes are compressed into a single octave range, as close as possible. On the keyboard these voicings are comfortable and on the guitar the major 7 chord is fairly easy too. As we change to other forms of 7th chords the close position voicing remains easy on a keyboard but on guitar the fingerings become difficult. For that reason it is common on the guitar to use open position voicings. The use of the term open position in this case simply means it is NOT close position and the chord member are NOT arranged in the order Root, 3rd, 5th, 7th.

Sect.2

Major 7 guitar voicings

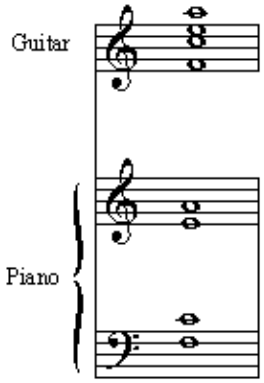
Two typical open position voicings are used in this section. They are arbitrarily named "Voicing I" and "Voicing II".

Voicing I opens the structure by moving the 3rd of the chord up an octave. There are two examples of that voicing one rooted on string 5 and one rooted on string 4. The numbers below the diagram indicate on which string the chord members are located. Even though the two examples look different, they are equivalent as far as their intervallic structure. In fact, if you play the voicing on the right at the 8th fret it contains the same pitches as the voicing on the left at the 3rd fret (both a Fma7 chord) and the notes on the staff look exactly the same for both versions of voicing I. Guitarist should think of these two versions of voicing I as two ways to

play the same thing. When playing major 7 chords rooted at other pitches you may find that one of the two is more convenient than the other.

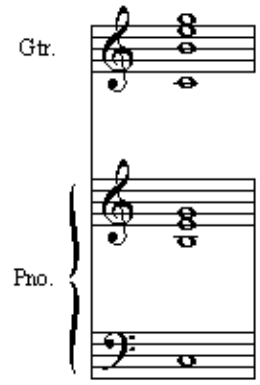
NOTE: guitar music sounds an octave lower than written so the equivalent piano voicings show the actual pitch.

```
/-------  Voicing I  --------\
  ___________      ___________
  |_|_|_|_|_|_|    |_|_|_|_|_|
  |_|_|_|_|_|_|    |_|_|_|_|_|
8 |(o)|_|_|_|    3 |_|(o)|_|_|
  |_|_|_o_|_|      |_|_|_|_|_|
  |_|_o_|_o_|      |_|_|_o_o_o
    R 5 7 3            R 5 7 3
```



The second voicing used in this section moves two chord tones, the 3rd and the 5th, up an octave. Here are two examples of that voicing one rooted on string 6 and one rooted on string 5. Both these examples can be used for a Cma7 chord, the one on the left should be played at the 8th fret or the one on the right should be played at the 3rd fret.

```
 /-------  Voicing II  --------\
   ___________      ___________
   |_|_|_|_|_|_|    |_|_|_|_|_|
   |_|_|_|_|_|_|    |_|_|_|_|_|
8 (o)|_|_|_o_|    3 |(o)|_|_|_o
   |_|_o_o_|_|      |_|_|_o_|_|
   |_|_|_|_|_|      |_|_|_|_o_|
   R   7 3 5          R   7 3 5
```



Once again, even though the two guitar voicings look different, they are equivalent as far as their intervallic structure, they just use different sets of strings.

Keyboard players do not run into this situation because on a keyboard there is only one version of each pitch, yet this concept of multiple versions of the same thing is 'business–as–usual' on the guitar.

Sect.3

Other Seventh chords

If you build a 7th chord on every scale degree of the major scale you will find that two of the chords are major 7 chords, the I chord and the IV. Although the triad at the V position is major, the addition tone of the 7th chord is not a major seventh from the root of the chord but instead a minor 7th. We will examine the 7th chords at all scale degree in a moment. First, a few definition of other 7th chords.

Here is a list of some of the terms and symbols used in association with 7th chords. This isn't a complete list but it will be a good start. A discussion follows the list.

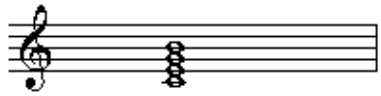
name	symbols		
Major 7	ma7	7	
Minor 7	mi7	m7	–7
Dominant 7	7		
Minor 7 flat 5	m7b5	Ø7	
Half diminished 7	(alternate term for m7b5)		
Diminished 7	^{o}7		

NOTE: the alternate symbol for major 7 is supposed to be a triangle symbol followed by the number 7. Also the alternate symbol for half–dim is supposed to be a circle with a slash through it followed by the number 7. They don't show up properly in many browsers.

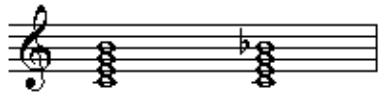
Using the major 7 chord as a standard structure, the other types of 7th chords can be defined by how there differ from the major 7 chord. As an example, the Dominant 7 chord can be defined as the same a Major 7

except the 7th is lower one half step. The formula for the common 7th chords is listed below.

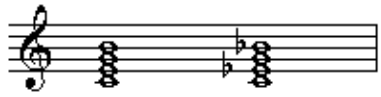
A number system can be used with the standard Ma7 represented by the sequence "1 3 5 7"



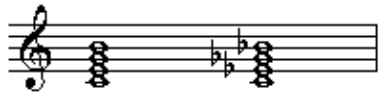
Dominant 7th chord (7) structure: 1 3 5 b7
like major 7th with a lowered 7th
(The second chord is a Dominant 7th chord)



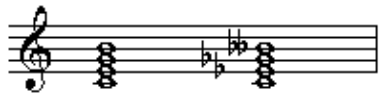
Minor 7 (mi7, –7) structure: 1 b3 5 b7
like major 7th with a lowered 7th and 3rd
(The second chord is a Minor 7th chord)



Half diminished 7 (m7b5) structure: 1 b3 b5 b7
like major 7th with a lowered 7th, 3rd and 5th
(The second chord is a Half Diminished 7th [Minor 7b5] chord)



Diminished 7 (dim7, o7) structure: 1 b3 b5 bb7
not like major 7th because it has a doubly lowered 7th and a lowered 3rd and 5th. (the doubly lowered 7th is an enharmonic of a major 6th from 1)
(The second chord is a Diminished 7th chord)



A word about the use of the symbol "b" (flat) is in order. When you apply these formulas to keys containing sharps, often the lowered notes (numbers with a "b") actually turn out to be naturals (not literally flats).

An example illustrates:

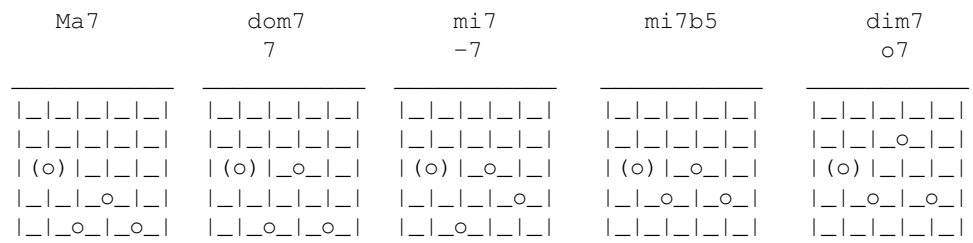
Dma7 is spelled D F# A C#. Applying the formula 1 3 5 b7 to create a D7 chord will yield D F# A C. There are no flats involved. The "b7" really means "lowered 7th" and in this case "C#" is lowered to become "C".

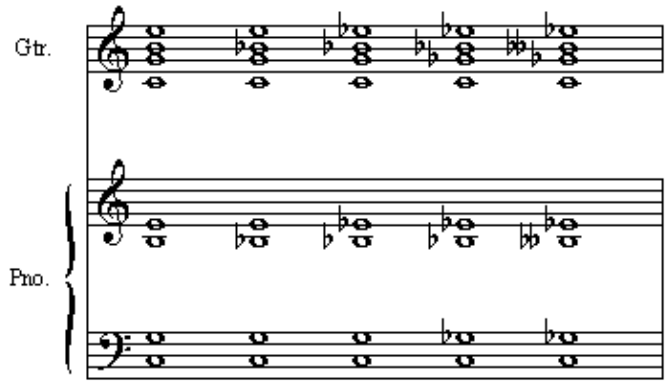
D F# A C# (Dma7) D F# A C (D7)
[insert image]

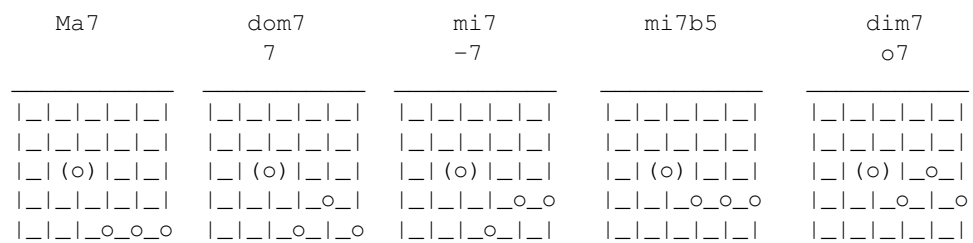
Sect.4

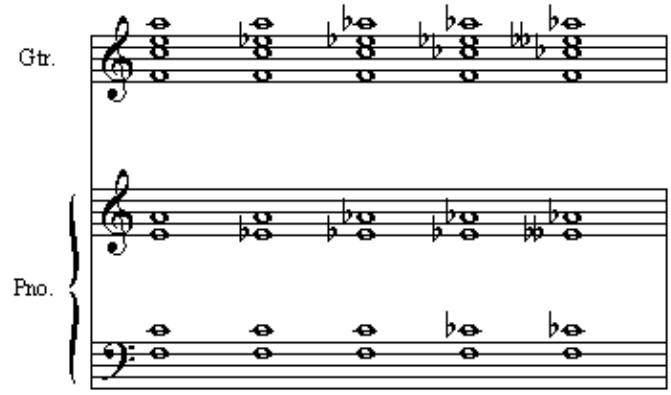
Seventh chord guitar voicings

Shown below are the chord diagrams for the different common 7th chords. These voicing are based on the four Ma7 chord voicings shown earlier (voicing I and II). Each column to the right makes one appropriate change to the chord in the column to its left.

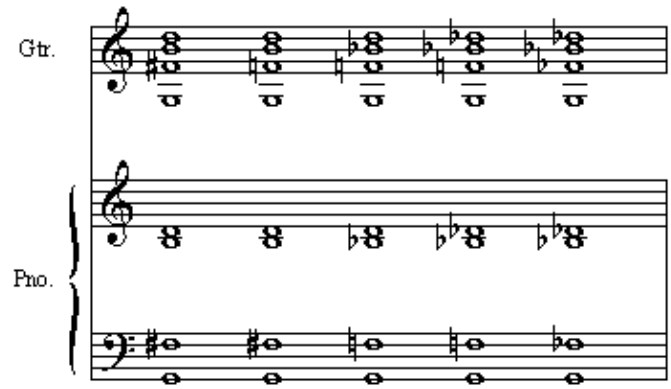




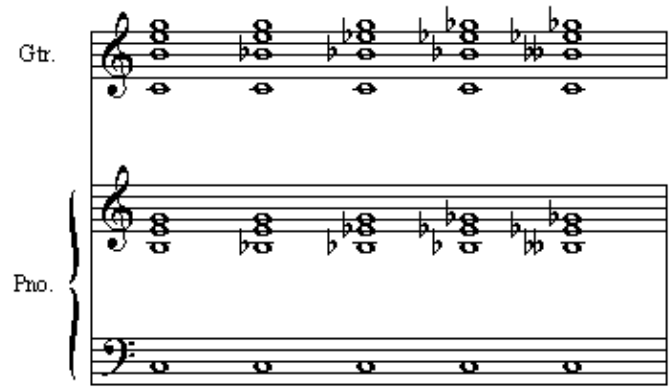




Ma7	dom7 7	mi7 -7	mi7b5	dim7 o7
|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|
|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_o_|	|_|_o_|_o_|
(o)|_|_|_o_|	(o)|_o_|_o_|	(o)|_o_o_o_|	(o)|_o_o_|_|	(o)|_|_o_|_|
|_|_o_o_|_|	|_|_|_o_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|
|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|



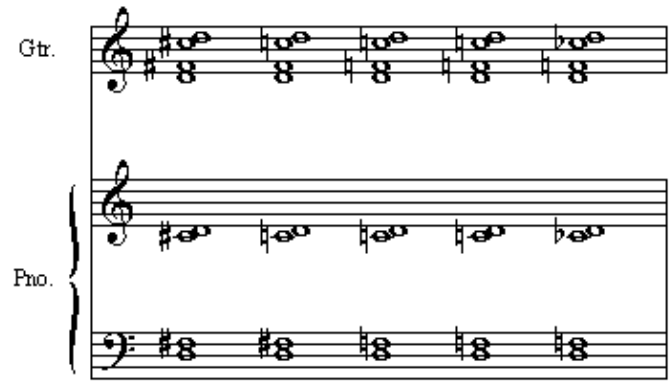
Ma7	dom7 7	mi7 -7	mi7b5	dim7 o7
|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|
|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_o	|_|_|_o_|_o
|(o)|_|_|_o	|(o)|_o_|_o	|(o)|_o_|_o	|(o)|_o_|_|	|(o)|_|_|_|
|_|_|_o_|_|	|_|_|_|_|_|	|_|_|_|_o_|	|_|_|_|_o_|	|_|_|_|_o_|
|_|_|_|_o_|	|_|_|_|_o_|	|_|_|_|_|_|	|_|_|_|_|_|	|_|_|_|_|_|



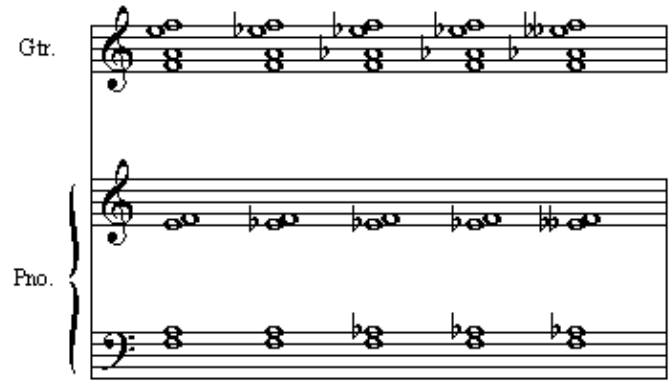
7th chords with no 5th

The next two rows contains voicings of 'incomplete' 7th chords. These chords contain no 5th and instead double the root. Note that since the 5th of the chord is not included in these voicings, the mi7 and mi7b5 look the same. These voicing are useful in creating smooth voice−leading as will be shown later.

```
   Ma7          dom7          mi7          mi7b5          dim7
                 7            -7                           o7
 ___________  ___________  ___________  ___________  ___________
|_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_|
|_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_|
|_|_|_|_|(o)|_||_|_|_|(o)|_||_|_o_|(o)|_||_|_o_|(o)|_||_|_o_|(o)|_|
|_|_o_|_|_|_||_|_o_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|o_|_|_|
|_|(o)|_|_|_||_|(o)|_o_|_||_|(o)|_o_|_||_|(o)|_o_|_||_|(o)|_|_|_|
|_|_|_o_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_|
```




```
   Ma7          dom7          mi7          mi7b5          dim7
                 7            -7                           o7
 ___________  ___________  ___________  ___________  ___________
|_|_|_|_|_|(o)|_|_|_|_|_|(o)|_|_|_o_|(o)|_|_|_o_|(o)|_|_|_o_|(o)|
|_|_|_o_|_|_||_|_|_o_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_|
|_|(o)|_|_|_||_|(o)|_|_|_||_|(o)|_|_|_||_|(o)|_|_|_||_|(o)|_o_|_|
|_|_|_|_|_|_||_|_|_|_o_|_||_|_|_|_o_|_||_|_|_|_o_|_||_|_|_|_|_|_|
|_|_|_|_o_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_||_|_|_|_|_|_|
```



Sect.5

Diatonic Seventh chords

Its valuable to memorize the diatonic 7th chords in the major scale as they form the basic harmonic system that supports melodies using that scale. The major scale (and its modes) have a pattern of sevenths chords as follows:

```
Diatonic 7th chords in MAJOR
   I    II    III    IV    V    VI     VII
  ma7   mi7   mi7    ma7   7    mi7   m7b5

Two specific examples in the keys of C and Eb:

            I     II    III    IV    V    VI    VII
Key of C:  Cma7   Dm7   Em7   Fma7   G7   Am7  Bm7b5
Key of Eb: Ebma7  Fm7   Gm7  Abma7  Bb7   Cm7  Dm7b5
```

[insert image]

Dorian simply starts with the first mi7 and then cycles through the chord sequence. Notice that when referenced to dorian the I chord is mi7. Dorian is a minor type mode. If you are interested in modal jazz, you need to be at one with this harmonic environment.

[insert image]

```
Diatonic 7th chords in DORIAN
   I    II    III    IV    V     VI      VII
  mi7   mi7    ma7   7    mi7   m7b5    ma7

[insert image]

The 7th chord harmony system work the same way for the rest of the modes.

The Phrygian mode is common in flamenco music, and its characteristic
feature of a half step between the first two scale degrees is very
recognizable.

Diatonic 7th chords in PHRYGIAN
   I    II    III    IV     V      VI    VII
```

```
  mi7    ma7   7    mi7   m7b5    ma7   mi7
```

[insert image]

The lydian mode is commonly used in jazz. Frequently jazz
player use the lydian mode during major seventh chord.

```
Diatonic 7th chords in LYDIAN
   I    II   III    IV       V    VI     VII
  ma7   7    mi7   m7b5    ma7   mi7    mi7
```

[insert image]

The Mixolydian mode shows up in Boogie Woogie, Blues, Funk, Rock &Roll
and some folk songs.

```
Diatonic 7th chords in MIXOLYDIAN
   I    II      III     IV    V    VI    VII
   7    mi7    m7b5    ma7  mi7   mi7   ma7
```

[insert image]

The Aeolian mode is very common and is also know as natural minor.

```
Diatonic 7th chords in AEOLIAN
   I      II     III    IV    V    VI    VII
  mi7   m7b5    ma7    mi7  mi7   ma7    7
```

[insert image]

The Locrian mode is not as common. Since the tonic chord doesn't
have a perfect fifth interval, it is an unstable sound that usually
doesn't work as a convincing tonic chord. That's the beauty of it.

```
Diatonic 7th chords in LOCRIAN
   I       II    III   IV      V    VI   VII
  m7b5    ma7   mi7   mi7    ma7   7    mi7
```

Sect.6

Minor Scale

You can apply the same procedure to minor scales to create another harmonic system suited for minor keys. The 7th chord harmonic system for Natural minor is the same as shown above for AEOLIAN. AEOLIAN and Natural Minor are identical. Nothing new is gained by creating modes of the natural minor scale because they already are contained within the modes of the major scale. You get to leverage your previous knowledge of the Major scale and it's modes. For easy reference the harmonic sequence for Natural minor is shown again below.

[insert image]

```
Diatonic 7th chords in Natural Minor
   I      II     III    IV    V    VI    VII
  mi7   m7b5    ma7    mi7  mi7   ma7    7
```

Harmonic Minor

The 7th chord harmonic systems for Harmonic and Melodic minor are a little different. Shown below is the 7th chord harmonic system for Harmonic minor.

```
Diatonic 7th chords in HARMONIC MINOR
   I       II        III     IV     V     VI     VII
  mi#7   m7b5     ma7#5   mi7    7     ma7     o7
```

[insert image]

Notice the different chord structures at I and III. The tonic mi#7 chord (sometimes called miMa7) is a minor triad with an added tone a major 7th interval from the root. In some keys the "#7" is not a "sharp" but instead a "natural" in a context that contains many flats. The mediant ma7#5 chord is an augmented triad with a major 7th from the root added to completed the chord. As before, in some keys the "#5" is not a "sharp" but instead a "natural" in a context that contains many flats. It is useful to think of the "#" symbol in this context as meaning "raised one half step" instead of literally meaning a sharp.

Here are the corresponding chord voicing for these new 7th chord types.

```
MiMa7 (mi#7)
 _____________    _____________    _____________    _____________
 |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|
 |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|
 |(o)|_|_|_|_|    |_|(o)|_|_|_|    (o)|_|_o_o_|_|    |(o)|_|_|_o_|
 |_|_|_o_o_|_|    |_|_|_|_|_o_|    |_|_o_|_|_|_|    |_|_|_o_o_|_|
 |_|_o_|_|_|_|    |_|_|_o_o_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|
   R 5 7 3          R 5 7 3        R   7 3 5          R   7 3 5
```

[insert image]

```
Ma7#5
 _____________    _____________    _____________    _____________
 |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|
 |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|
 |(o)|_|_|_|_|    |_|(o)|_|_|_|    (o)|_|_|_|_|_|    |(o)|_|_|_|_|
 |_|_|_o_|_|_|    |_|_|_|_|_|_|    |_|_o_o_o_|_|    |_|_|_o_|_o_|
 |_|_|_|_o_|_|    |_|_|_|_o_o_|    |_|_|_|_|_|_|    |_|_|_|_o_|_|
 |_|_o_|_|_|_|    |_|_|_o_|_|_|    |_|_|_|_|_|_|    |_|_|_|_|_|_|
   R 5 7 3          R 5 7 3        R   7 3 5          R   7 3 5
```

[insert image]

It is possible to create modes of the Harmonic minor scale and harmonic systems from those modes. See the appendix for examples.

Sect.7

Melodic Minor

Below is the 7th chord harmonic system for Melodic minor. Notice the IV, V, VI and VII positions! Consecutive dominant 7 chords follows by a pair of half−diminished 7 chords.

```
Diatonic 7th chords in MELODIC MINOR
 I     II      III    IV    V     VI        VII
mi#7   mi7    ma7#5    7    7    m7b5     m7b5
```

[insert image]

It is possible to create modes of the Melodic minor scale and harmonic systems from those modes. See the appendix for examples.

Sect.8

II – V – I

Major

A common chord progression is the II–V–I progression. This can occur in either major or minor keys and some compositions use nothing but this chord progression. When using 7th chords as the harmonic structure the progression is shown in a generic formula.

```
          IIm7 - V7 - Ima7
example:   Dm7   G7   Cma7
```

[insert image]

The are two important factors:

1. the **root movement** of the chords and
2. the **harmonic quality** of the chords.

The **root movement** of a II V I chord progression is always the same: Ascending P4 (or a descending 5th). In this case the starting root at position II is 'D', then up a P4 to G and finally up a P4 to C. If you choose to go down a P5 instead you simply land on the same letter name in the next lower octave.

The **harmonic quality** of the chords in a II V I progression in major is also predictable: When using 7th chords using notes from the MAJOR SCALE, the II chord is always m7, the V chord is alway 7 (dom7), and the I chord is always ma7. You should memorize both these essential musical truths regarding II V I progressions in major. Let me repeat that for anyone who aspires to improvise in the jazz standards style.

When using 7th chords in MAJOR, the II chord is always m7, the V chord is alway 7 (dom7), and the I chord is always ma7.

You need to absorb this fundamental truth, just as you need to become confident about recognizing the harmonic patterns used in both major and minor keys. The foundation is here in the II–V–I progression.

When you navigate your way through the II–V–I progression you will notice that there are common tones between each chord change. The II chord and V chord contain two common tones. Likewise the V chord and the I chord have two common tones (assuming all are 7th chords).

. [insert graphic]

Minor

The minor key presents more options and it is difficult to choose a single generic form. For example the tonic (I) chord is sometimes mi7 quality and sometimes mi#7 quality. The root movement is the same as major but the harmonic quality of the progression is more varied and for that reason some feel it provides more interesting options.

```
          IIm7b5  -  V7  -  Im7     or   IIm7b5  -  V7  - Im#7
example:   Dm7b5     G7     Cm7           Dm7b5     G7    Cm#7
```

[insert image]

Other variations include:

- using a IIm7 quality chord instead of IIm7b5
- using Im6 (minor triad with a ma6) instead Im7

Additional changes to these basic progressions is the subject of future lectures. The mutations of the V chord is of special interest and it provides some of the interesting tension found in jazz music. However at this point it is important to recognize a basic II V I when it's staring you in the face.

Analyze the following chord progression. I sometimes use this (or an extension of this formula) as a basis for scale and chord exercises

```
 ||            |         |               |          |
 ||:  Dm7  G7  |  Cma7   |  Bm7b5   E7   |  Am#7    |
 ||            |         |               |          |

  |            |         |               |          ||
  |   Gm7  C7  |  Fma7   |  Em7b5   A7   |  Dm6    :||
  |            |         |               |          ||
```

[insert MIDI link]

```
The next progression is from the first section of a tune
  named "Afternoon in Paris" by John Lewis

  ||          |           |          |              |
  ||: Cma7    |  Cm7  F7  |  Bbma7   |  Bbm7  Eb7   |
  ||          |           |          |              |

   |          |           |         |              ||
   |  Abma7   |  Dm7  G7  |  Cma7   | ( Dm7 G7 ) :||
   |          |           |         |              ||
```

[insert MIDI link]

Sect.9

Harmonic Analysis

The doctor is in.

Here's an analysis of the chord progressions. The first exercise is made up of II V I progressions in different but related keys.

```
 C:  II   V      I    Am:  II     V       I
||             |        |              |         |
||:  Dm7  G7   |  Cma7  |  Bm7b5   E7  |  Am#7   |
||             |        |              |         |

 F:  II   V      I    Dm:  II     V       I
 |             |        |              |         ||
 |   Gm7  C7   |  Fma7  |  Em7b5   A7  |  Dm6   :||
 |             |        |              |         ||
```

- Measures 1–2 complete a II–V–I progression in the key of C major. In the context of C major, Dm7 is rooted at the II position and G7 is rooted at V position. So far that satisfies one of the conditions of a II–V–I, i.e. the correct root movement. When examining the quality of the chords you see that the II chord is of minor 7 (m7) quality, the V chord is of dominant 7 (7) quality and the I chord is of Major 7 (ma7) quality. Bingo! that matches the pattern for a II–V–I in a major key. One lesson here is to be on the lookout for the sequence of chord quality "m7 – 7 – ma7", it might be a II–V–I in a major key. The root movement will confirm or deny.
- Measures 3–4 complete a II–V–I progression in the key of A minor (relative minor of C major). Once again the root movement satisfies the II–V–I intervals, this time however the reference is A minor. B is the second scale degree (II) and E is the fifth scale degree (V). The m7b5 quality of the first chord in measure 3 is a clue that a minor key may be lurking around. The II chord in minor is most often of m7b5 quality. In this case the progression Bm7b5 E7 Am#7 satisfies one of the formulas for II–V–I progressions in minor. Note that this version uses the variation with a raised 7th on the I chord (Am#7).
- The next line is similar except using the keys of F major and it's relative minor, D minor. Note the D minor progression uses the variation on the I chord of Im6 (Dm6).

Afternoon in Paris is also based entirely on II V I progressions that cascade through the keys of C, Bb and Ab.

```
 "Afternoon in Paris" by John Lewis

 C:   I    Bb:  II  V       I    Ab:  II    V
 ||         |           |         |              |
 ||: Cma7   |  Cm7  F7  |  Bbma7  |  Bbm7  Eb7   |
 ||         |           |         |              |

(Ab)  I    C:  II   V       I        II   V
  |         |           |        |              ||
  |  Abma7  |  Dm7  G7  |  Cma7  | ( Dm7 G7 ) :||
  |         |           |        |              ||
```

- It starts off in C major but quickly departs for Bb major using a II–V–I progression to get there. Since the II chord in Bb major is a Cm7 chord it make for an interesting change from the major sound of the previous Cma7 chord.
- That same idea is reused in the transition from Bb major to Ab major.
- These changes happen quickly, it might be overstating it to say that the tune 'modulates' to the key of Bb and Ab because the progression doesn't settle in those keys for any length of time.

> The harmony is kind of wandering around. Just driving thru, lookin' at the scenery but quickly it returns to the key of C. If you are improvising on these changes you'll need to be aware of the shifts in tonal center and play according, just staying in C major the entire time won't work.

The II–V–I progression is very common to jazz standards, bebop, and much of pop music but some other musical styles don't use it very much if at all. One additional value of learning to aurally recognize II–V–I is noticing when it isn't used. Many contempory Rock, and Hip–Hop songs don't use it at all. But II–V–I's still show up in the ballads in most any style.

Return to top of page

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MIDI file

X.1

Chord Charts

Chord charts are useful for sketching out the harmony of a song. Many times a band will use a chord chart as a basis from which to build an arrangement. Each player will interpret the chart by creating a specfic part: bass part, keyboard part, guitar part and so on. In this lecture we will look at some simple chord charts of some pop songs from the 60's.

With the recent re−release of Pet Sounds by the Beach Boys, I've been listening to alot of Brian Wilson's songs trying to find a couple of good examples for discussion. Much of his music on Pet Sounds is just too complex to discuss in the context of what we have learned. I have decided to discuss two songs that aren't as complicated yet still have interesting twists and turns. These songs are still a tad beyond what we have learned in this course. The Brian Wilson songs I'll discuss are "California Girls" and "Don't Worry Baby". Both of these songs modulate to different keys in the chorus and then return to the original key as it cycles back to the verse. Please understand that modulation is a topic that is usually studied after another full year of theory, just thought you should be aware of that.

Here is a chord chart for California Girls. It is in the key of B major, 5 sharps.

```
------------------------------------------------------------------------
     California Girls

4/4 | intro riff |  E   |  B7sus   |   E   |   A7sus   ||

vamp|  B  |  B  |

verse||:  B  |  B  |  A/B  |  A/B  |  E  |  E  |  F#  |  F#  :||

chorus|  B  |  C#m7  |  A  |  Bm7  |  G  |  Am7  |  B  |  B  || 1x back to verse
                                                                 2x continue

2 bar interlude|(notes: b f# g# f#  b f# g# f# | c# f# g# f# c# f# g# f# |

outchorus ||:   B   |   B   |   C#m7  |  C#m7   :|| (repeat and fade)

------------------------------------------------------------------------
```

Some words about the notation.

The vertical lines are barlines, the time signature is 4/4 so each measure contains 4 beats. The Capital letter by itself represent a major triad (ex. B = B major triad). A Capital letter with a "m7" represents a minor 7th chord (ex. C#m7 = C# minor 7th chord). This is a triad plus another note included making a four note chord. (We don't study 7th chords in this class, but they are next step after triads.) The "7sus" extention represents a 7th chord with suspended 4th chord, once again beyond the scope of this class. Briefly, a "7sus" chord is 7th chord with one of the notes changed or "suspended". There is a formula for all of the chords but it would only

bog down the discussion. The "A/B" notation represent a triad with a different bass note. This example means an A major chord with a B note in the Bass. The lower case letter names in the interlude section are individual notes (not chords).

X.2

Common Chord Modulation

A short discussion of the concept of key. When a piece is in a key, one of the things available is the diatonic chords from that key. "Diatonic" means that only the notes of the prevailing scale are used to make up the "diatonic chords". Other chords are always available if a composer wants to use them, but these other chords are not "diatonic chords". Since California Girls is in "B", there is a set of chords in the key of B that sound good when used one after another, there are several different ways to move through the chords in the key. Here is a list of the first five triad in the key of B (chords are identified by roman numeral). The keys of A and G are included for comparison. Notice that there are a couple triads (C#m and E) in common to both the keys of B and A. However, most of the triads are not common to both keys. Notice also the two triads (Bm and D) in common to both the keys of A and G.

```
            I  II  III   IV   V
Key of B:   B  C#m  D#m   E   F#
Key of A:   A  Bm   C#m   D   E
Key of G:   G  Am   Bm    C   D
```

These keys are used in the chorus of California Girls

Listen to the song and follow along with the chart, counting the measures as you go. The chord progression in the intro is too complicated to discuss but after the intro it settles into the repeating figure (I've labelled it "vamp", a generic term used to indicate a repeating pattern) that is sometimes used in cowboy music. The chords of the verse are all diatonic to the Key of B except the A/B chord. This chord (an A triad with a B in the bass) gives it a mixolydian sound for a couple of bars (mixolydian is one of the modes discussed in a later lesson). I like that sound, "In my Room" uses it also. The short harmonic analysis of the verse is "it's in B major with a little of B mixolydian in bars 3–4". You may remember that there is only one note different between a major scale and a mixolydian. Mixolydian is frequently used in Rock music.

During the chorus the chord progression can be analyzed as follows:

```
|  B  |  C#m7  |  A  |  Bm7  |  G  |  Am7  |  B  |  B  ||
  I      II       I      II     I     II      I
  (in B major)    (in A major)  (in G major)   (in B)
```

The chord progression is both simple and brilliant. A simple two chord diatonic chord progression (I – II) played in three different key in succession. How does it sound so smooth with all of those key changes in succession? Notice the change from the key of B to the key of A occurs at the C#m7 to A change. refer back to the diatonic chords listed above and you see that C#m (and C#m7 as it turns out) was one of the common triads to both the keys of B and A. So C#m7 is in both of the keys and it makes for a perfect transition chord between the two keys. We call this common chord modulation and C#m7 is the common chord (also called a "pivot chord") between the old key (B) and the new key (A). Likewise the Bm7 chord is common to both the key of A and G and it helps connect those keys. The return to the key of B at the end of the line does not use this technique but the lift in the bass notes of the chords (G to A to B) provides a smooth return to the key of B.

If this doesn't make sense now, it will after you take Music 3 (first year music theory).

X.3

Don't Worry Baby

Below is a chord chart for Don't Worry Baby. It's a pretty gooey song that matches the lyrics about the righteous girlfriend of a car braggin' guy and how the world is right when she says "Don't Worry Baby" with music that is very soooooothing. I want to meet her.

The verses are in the key of E. All of the chords (E, A and B) are diatonic to E. The chorus is in the key of F#, all of the chords except the last measure of the chorus are diatonic to F#. See below for further comments.

```
-------------------------------------------------------------------
          Don't Worry Baby

4/4 ||:   E   |   E   |   A   |   A   :||

Verse||:   E   |   E   |   A   |   B   |   E   |   E   |   A   |   B   |

prechorus|   F#m    |    B7    |    G#m    |    C#7    |*

chorus|  F#  |  F#  |  G#m  |  C#7  |  F#  |  F#  |  G#m  |  C#7  |  E/B  B ||
                                                              back to verse

*outchorus ||:  F#  |  F#  |  G#m  |  C#7  :||

-------------------------------------------------------------------------------
```

The modulation from the key of E to the key of F# occurs in the prechorus section ("but she looks in my eyes and makes me realize when she..."). Once again Brian Wilson uses the common chord method for modulating. Look at the diatonic chords for the keys of E and F#.

```
            I    II   III   IV   V
Key of E:   E    F#m   G#m   A   B
Key of F#:  F#   G#m   A#m   B   C#
```

There it is, G#m. Common to both keys, it a "III" chord in the key of E and a "II" chord in the key of F#. It provides a smooth transition from the old key (E) to the new key (F#) because it is "diatonic" to both keys. The last chord of the prechorus lead into the chorus which is definitely in the new key of F#.

The last measure of the chorus contains and E/B chord which is not diatonic to F# major. It is a chord that sets up the return to key of E. It sounds different and makes the transition back to the key of E interesting.

```
Using a more generic Roman Numeral analysis, we come up with this:

4/4 ||:   I   |   I   |   IV   |   IV   :||

Verse||:   I   |   I   |   IV   |   V   |   I   |   I   |   IV   |   V   |

prechorus|   II    |    V7    |    III    |    VI7    |*
                                  II          V7
                              (--- in the Key of II --)

(in II)
chorus|  I  |  I  |  II  |  V7  |  I  |  I  |  II  |  V7  |  I64  V ||
```

```
                                                        (in orignal key)
                                                          back to verse

*outchorus ||:  I  |  I  |  II  |  V7  :||
```

The technique of common chord modulation is used frequently in classical music. It is one of the standard modulating techniques you would learn about in Music 3.

X.4

Norwegian Wood

This song by the Beatles uses the Mixolydian mode for the verse section. It has a majorish sound but it is not exactly major. The seventh scale degree is lowered one half step compared to major. Often it is written out with a major key signature and the lowered seventh is notated with a accidental. There are only two chords in this section. I and the VII chord in mixolydian. These are both major chords whose root is a major 2nd apart. I've shown the opening lyrics of the song. If you are familiar with the song you may remember the 3/4 meter.

```
Verse
         I     once had a   girl   or should I
3/4||:   E    |  E        |  E   |    E       |

        say  she once had   me
        E   |      D     |  E   |  E   :||

Bridge
  Em  |  Em  |  Em  |  Em  |  A  |  A  |  A  |  A  |

  Em  |  Em  |  Em  |  Em  | F#m | F#m |  B  |  B  |
```

The bridge of the song is in E minorish. Not quite natural, harmonic or melodic minor; the first 14 bars are Dorian. Only the last 2 bars of the bridge are outside of dorian, those bars function as a Dominant chord leading to the tonic of E in the verse.

Both the verse and the bridge are in "E" but it's not truely major or minor. The thumbnail analysis is "it's mixolydian during the verse and dorian during the bridge.". It's sort of a different spin on the common practice of starting in major and then going to the parallel minor. This time it's starting in mixolydian and moving to dorian of the same tonic. There are even less notes to modify to make that change. Do you know how many? Yep, only one. Lower the third of mixolydian and you have dorian. In fact some rock music uses chords from mixolydian and melodies from dorian at the same time. That one note difference creates a tension that is part of some more aggressive rock styles. It's true, I seen it, heard it, been there, done that.

Norwegian Wood doesn't use the two modes simultaneously however, it's one after the other. They take turns. No pushing, no fighting.

X.5

How do I start creating solos on guitar?

This section uses ascii text notation.

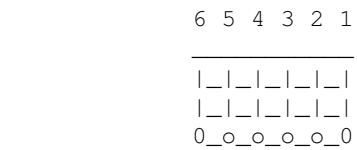
Here's a simple example using the blues scale and a basic shuffle groove. I've seen several different scales

referred to as the "blues" scale. The scale I'm using is sometimes called the "minor blues scale" and has a formula as follows:

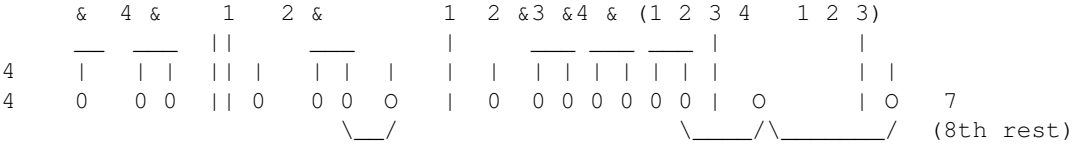
1 b3 4 #4 5 b7 (compared to a major scale)

In the key of "A" the notes are A C D D# E G.

This diagram shows the scale spanning two octave plus. (the big 0's on strings 1, 4 and 6 are roots of the scale, when played at the fifth fret, they are letter A.) I'll use this form of the blues scale for the example, but I'll use tabulature for the notation.



An important part of creating interesting musical lines is the rhythmic phrasing. This example uses a repeating rhythmic pattern of about four bars in length. It contains some common phrasing used in the blues. The pattern can be divided down into two shorter segments. Here's the rhythm:



It is a bit artifical to continue to repeat exactly the same rhythm over and over as this example does, but it allows for recognizable patterns. This example is pretty "scaley" so it might be a sound you are trying to avoid.

I start with an opening phrase, the 1st segment begins upward and twists back down at the end. The 2nd segment is simply descending scalewise motion. During the second phrase the 1st segment has the inverted contour of its corresponding segment in the first phrase. This time it begins downward with twist up at the end. The 2nd segment is descending scalewise motion this time starting one note higher in the scale compare to the corresponding segment in the first phrase. The last phrase's 1st segment is descending scalewise motion, this time with no change in direction. Finally the 2nd segment is identical to the 2nd segment of the first phrase. Certainly this a contrived example but here are the points that are important and maybe useful. These concepts can be applied to any melodic idea.

1) invert the melodic direction of a phrase. If you like something, try it upside down (and backwards too). Many times you find another interesting phrase.

2) repeat a rhythmic phrase while using new note choices, I overdid it in this example but it can help make for overall cohesion when used more sparingly.

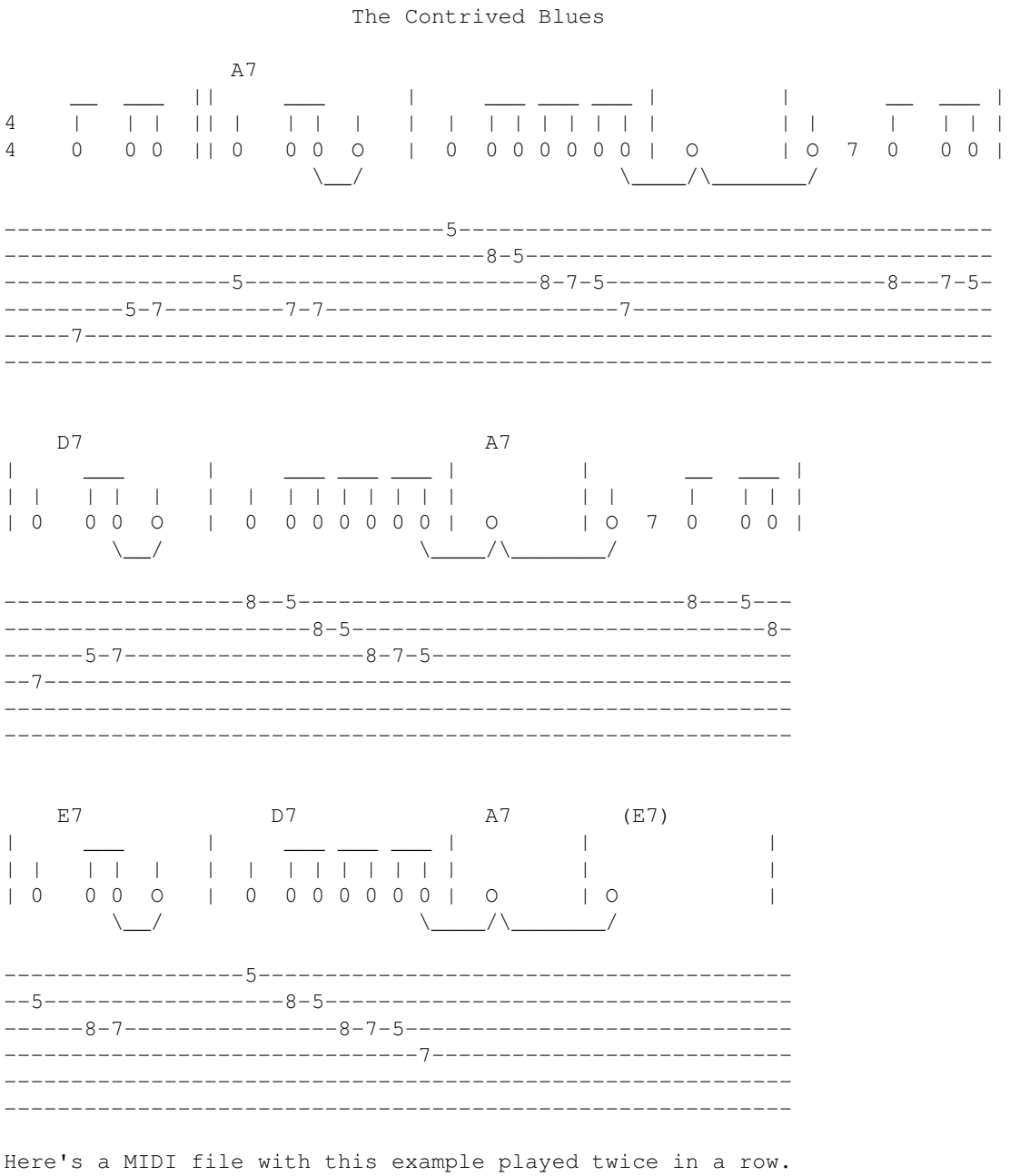
3) repeat a melodic contour starting on a different scale degree. In classical theory this is known as "sequencing" a melodic phrase.

4) It's OK to let a note ring out for a long duration. It's also OK to not play at all for a few counts.

Additional time tested melodic ideas not shown in this example include changing the direction of a melodic line after a large leap. The NBC musical logo is an example (G up to E down to C)

I hope this is food for thought.

Here it is:



Here's a MIDI file with this example played twice in a row.

The Contrived Blues

---

http://www.guitarland.com/Music10/FGA/MIDI/ContrivedBlues.mid

I have some additional one chorus 12 bar blues type solos in notation and tab, I'd be happy to send to a copy via USmail if you give me a mailing address. They might be useful for some ideas. I doubt that I will get them "web ready" during this quarter, but I can easily print out copies and mail them.

Enjoy,

X.6

More on Guitar chords

more ascii text from email an email conversation...

...

Dogs love trucks,

I love guitar questions.

```
>Mike,
>       For guitar, when you see a chord chart and it has a chord listed as A5
>or b5, etc., what is that, Is it a sharp fifth a flat fifth or what? I
>see it all the time and can't play a lot of certain songs because I
>don't know it.
```

You are correct, A5 means augmented fifth (sharp fifth) and b5 means flat fifth. The trick is knowing where the fifth is so that you can raise it or lower it. Usually these chords are more complicated than the simple triads we will study but the process is the same.

Take these two examples: G7b5 and G7+5

(more often than not the "+" symbol is used instead of "A" or "Aug", another alternate notation is the "#" symbol as in G7#5)

The regular G7 chord contains four notes, a root (G), a third (B), a fifth (D) and a seventh (F). The chord voicing shown below has the root on string 6, the 7th on string 4, the third on string 3 and the fifth on string 2. (this is only one of several versions of this chord).

(The following diagrams need a fixed width font such as courier to line up properly)

Using chord diagrams:

```
G7 (notes: G B D F)


6 5 4 3 2 1
___________
|_|_|_|_|_|
|_|_|_|_|_|
o_|_o_|_o_|
|_|_|_o_|_|
|_|_|_|_|_|
|_|_|_|_|_|

next is
G7b5 (notes: G B Db F)

6 5 4 3 2 1
___________
```

```
|_|_|_|_|_|
|_|_|_|_o_|
o_|_o_|_|_|
|_|_|_o_|_|
|_|_|_|_|_|
|_|_|_|_|_|
```

and finally
G7+5 (notes: G B D# F)

```
6 5 4 3 2 1
___________
|_|_|_|_|_|
|_|_|_|_|_|
o_|_o_|_|_|
|_|_|_o_o_|
|_|_|_|_|_|
|_|_|_|_|_|
```

Same thing in tab

```
      G7        G7b5       G7+5
1 |----------|----------|----------|
2 |--- 3 ----|--- 2 ----|--- 4 ----|
3 |--- 4 ----|--- 4 ----|--- 4 ----|
4 |--- 3 ----|--- 3 ----|--- 3 ----|
5 |----------|----------|----------|
6 |--- 3 ----|--- 3 ----|--- 3 ----|
```

(One more thing, the A5 symbol can also mean an A chord with only
 roots and fifths, sometimes called a power chord in hard rock.
 This useage would include G5, F5, E5, etc. however I don't think
 that pertains to your question.)

> Also what is the formula for suspended chords for example Asus9?

The sus symbol stands for suspended 4th. Usually it is a chord where
the third of the chord is replaced by the fourth. Here is a G7sus
(sometimes written G7sus4). Compare it to the G7 shown earlier.

G7sus

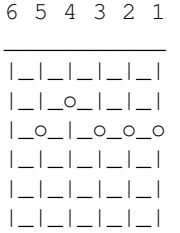
```
6 5 4 3 2 1
___________
|_|_|_|_|_|
|_|_|_|_|_|
o_|_o_|_o(o)
|_|_|_|_|_|
|(o)|_o_|_|
|_|_|_|_|_|
```

Most guitarist would use a barre at the third fret and perhaps
include the notes in the parentheses (another fifth on string 5,
another root on string 1) so that they could strum across the
strings. Otherwise they would have to use a fingerstyle
technique to avoid string 5.

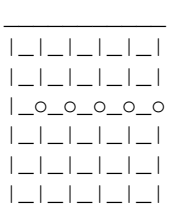
As it turns out Asus9 (often written A9sus) is the open strings
1-5. You can see why by examining C9 and C9sus. The C9

voicing is (from low to high) root, 3rd, 7th, 9th, 5th.

here's C9 (notes: C E Bb D G)



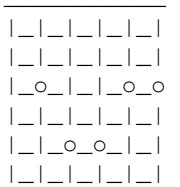
now C9sus (notes: C F Bb D G) - the 4th (F) replaces the 3rd (E)



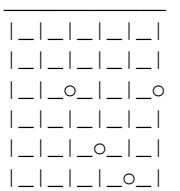
You can't play the same voicing for A9 (it runs out of room
if you move the C9 voicing down three frets) but the A9sus
turns out to be all open strings. The world's easiest jazz chord.
(Of course many different voicing for A9 are available at other
locations on the neck.)

Sus2 chords
Alot of player have experimented with a sus2 chord where
the third of the chord is replaced by a 2nd. Not only in
jazz but in some rock styles, group like the Police and U2
have used these chords. Sometimes these type of chords are
called "add 9" chords, i.e. Cadd9.

Csus2 (or, as I call it, C2) (barre the third fret)



Fsus2 (barre the third fret)



The "spread-out" version, prepare for pain. It's worth it.
Sting's tune "Message in a Bottle" uses this type of voicing
throughout the verse.

Bsus2

```
|_|_|_|_|_|
|_o_|_|_|_|
|_|_|_|_|_|
|_|_o_|_|_|
|_|_|_|_|_|
|_|_|_o_|_|

These chords are often used in place of a simple major (or sometimes minor) triad.
```

>Lastly, why do you usually mute the fifth string in lots of jazz chords?

The interval spacing (from low to high) of root, seventh, third, fifth is very common. The G7 examples above use that voicing. If the root is placed on string 6 the next note in that voicing will be on string 4. The more general principle is that the guitar is actually a low sounding instrument (it sounds an octave lower than it is written) and it can be a "muddy" sound if you voice small intervals (like second and thirds) on the lower strings. Just as a pianist might have a wide interval in the lower part (left hand) of chord voicing, many guitarist also like to use a wide interval on the lower part of their chord voicings. This frequently results in the fifth string not being needed.

This is by no means an absolute however, I can think of many examples where a jazz chord on guitar DOES use both 6th and 5th strings.

Here's one, Abmaj13, sometimes called Ab69(maj7), Use a first finger barre at the third fret, use the second finger on string 6 and the third finger on string 2. It can be used anywhere that you would use an Abmaj7 (and it's moveable to any other root).

```
6 5 4 3 2 1
_____________
|_|_|_|_|_|
|_|_|_|_|_|
|_o_o_o_|_o
o_|_|_|_o_|
|_|_|_|_|_|
|_|_|_|_|_|
```

X.7

More on beaming

Here's another email conversation:

Beaming can get a little involved but it usually comes down to the basic principle of using beaming to make the beats of the measure stand out visually. I'll try to give you a couple of examples plus some additional reasons why one might break these rules. Oh boy.

I'll try to use some hokey email notation (the examples require a fixed size font such as courier to line up properly.)

```
O = whole note

|
O = half note
```

```
|
0 = quarter note


__
|
0 = eighth note


__
|-
0  = sixteen note
```

The period (.) is used for dotted notes.

Assume you have a couple of sixteenth notes that start on the "and" of a beat.

(double dotted quarter, six sixteenths, a quarter)

```
     1  2 &   3        4
           ___  ________
4    |    |-|  |-|-|-|  |
4    0..  0 0  0 0 0 0  0
```

The above beaming shows use where the third beat begins because the third and fourth sixteenth notes are note connected. There is a beam group of two sixteenths, and another beamed group of four sixteenths. This coinsides with the beat structure of the 4/4 meter.

Here is a BAD EXAMPLE. Most* of the time this is not what you want even though it provides more symmetry. (symmetry? we don't need no stinkin' symmetry.)

```
     1  2 &  3         4
           _____  _____
4    |    |-|-|  |-|-|  |
4    0..  0 0 0  0 0 0  0
```

Here's another BAD EXAMPLE. The beaming doesn't help you understand the context of the written rhythm with regard to the beats of the measure. In fact for musicians who are used to seeing standard beaming this is misleading at first glance. If I encountered this I would think "hey, just a sec. what's the deal here. Oh OK, weird beaming" quickly followed by "who wrote THIS?"

```
     1  2 &  3         4
           _______  ___
4    |    |-|-|-|  |-|  |
4    0..  0 0 0 0  0 0  0
```

While I don't like this next one either, it's better than the two previous examples. At least it doesn't mislead you about where a new beat starts (it does "hide" beat 3 however)

```
     1  2 &  3        4
          ____________
4    |    |-|-|-|-|-|-|  |
4    0..  0 0 0 0 0 0 0  0
```

The rule(s):

** If you can't start a beamed group on the beat, then at least stop the beam at the end of the beat.

** Don't let the beam "spill over" to the next beat.

** Instead, start a new beamed group at that next beat.

Q. What about the two sixteenth notes in the middle of a quarter note beat (with a rest on the first and fourth sixteenths)?

A. You can beam those together

```
% = sixteenth notes rest

    1             2           3           4
       ___          ___         ___         ___
4      |-|          |-|         |-|         |-|
4   %  0 0   %   %  0 0   %  %  0 0   %  %  0 0   %
```

Notice that in places I use two sixteenth rests in a row instead of a single eighth note rest so that I don't "hide" beats 2 3 and 4. This rhythm is tricky to sightread.

Some reggae guitar parts have this rhythm.

```
---------------------------------
  *Rules were made to be broken
---------------------------------

One common situation where the beamed group spills to the next
beat involves eighth notes.  Frequently a series of four eighth
notes will be beamed together IF they begin ON the beat.


             _______
4   |   |    | | | |
4   0   0    0 0 0 0

If you follow the rules it would be as follows:

             ___  ___
4   |   |    | |  | |
4   0   0    0 0  0 0

Either way is common.

*** Other special situations ***

Sometimes the phrasing of a series of eighths note or sixteenth
notes is such that the composer feels the standard beaming isn't
useful for displaying the musical intent.  Let's say there is a
long series of 16 sixteenth notes with accents at the  1st, 4th,
7th, 10th, 13th, and 15th.  Actually this a common syncopated
rhythm.  If you the know the Led Zepplin tune "Rock and Roll",
the lyrics at the end of the verse (LONEly LONEly LONEly LONEly
```

LONE - LY time) provide an example those accents of the rhythm
(of course that isn't a series of sixteenths but the accents are
the same).

> = accent

```
     _______  _______  _______  _______
4    |-|-|-|  |-|-|-|  |-|-|-|  |-|-|-|
4    0 0 0 0  0 0 0 0  0 0 0 0  0 0 0 0
     >     >      >      >      >   >
```

This rhythm is said to have a subdivision of "3 3 3 3 2 2" and
you can vocalize the rhythm by saying the following number sequence
with the "1's" loud and the other numbers soft. Repeat until
in a trance.

```
1 2 3 1 2 3 1 2 3 1 2 3 1 2 1 2
>     >     >     >     >   >
```

Some composers might beam it as shown below. (I wouldn't, ...many
wouldn't, but we'll just frown and accept it)

```
     _____  _____  _____  _____  ___  ___
4    |-|-|  |-|-|  |-|-|  |-|-|  |-|  |-|
4    0 0 0  0 0 0  0 0 0  0 0 0  0 0  0 0
     >      >      >      >      >    >
```

I understand the purpose of this type of beaming but I would prefer
standard beaming with accent markings and phrase markings (not shown
here, it doesn't work well in text form).

>Question 1: I was wondering if you had an answer key for the Beaming
>worksheet. I wanted to make sure that I was getting it right.

It has completely slipped my mind that you don't have a key to the
Beaming worksheet. I made one up in the correct format and it is at:

http://www.guitarland.com/Music10/MusFund/Beaming/Images/Gifs/BeamingWsNo1key.GIF

>Question 2: Is it appropriate to use beaming in combination with a tie
>when you have a dotted note? For example, take the following measure:

```
>       _  _  _
>4  |   |  |  |  |
>4  0.  0  0  0  0
```

>(dotted quarter note, 3 eighth notes, one quarter note)

>You could rewrite this using beaming as follows:

```
>       _  ____
>4  |   |  |  |  |
>4  0.  0  0  0  0
```

Perfectly done.

>What about the following?

```
>      ___  ____
>4  |  | |  |  |  |
>4  0  0 0  0  0  0
>   ----
```

This is perfectly fine also. Many books would show the two side by side
to demonstrate how the "tie" and/or "dot" works. It is a matter of
preference as to which one you want to use.

>
>Here the four minus signs below the first quarter and first eighth notes
>are supposed to represent a tie.
>
>Is that "legal?" If so, would it be considered unusual or misleading
>style?

It's still completely legal throughout the free world ;-)
Both versions are used frequently, and both are considered the correct
notation of the rhythm.

Using Modes in Improvisation

The following are some thoughts on using the modes in improvisation as well as more general comments regarding improvisation.

Section.1

The basic chord structure in jazz

Although the triad is considered the basic chord structure for the purpose of studying harmony, the style of jazz typically uses 7th chords, i.e. Major 7th, Dominant 7th, Minor 7th, etc. as the most common chord structure. Seventh chords seem more common than triads in jazz, and it is also common to see even more complex chords such as 9th, 11th and 13th chords in jazz. More on the 7th chords can be found in this additional lecture on 7th chords.

Section.2

Using Modes with common chord progressions
Major keys

The II–V–I chord progressions and the subsets of II–V and V–I are the foundation of functional harmony. Many musicians think in terms of the modes of the major scale that is related to each chord of the II–V–I progression. As an example consider the II–V–I progression in the key of C: the II chord is Dm (or Dm7) the V chord is G (or G7) and the I is C (or Cma7). The C major scale is the source for all of the notes of the progression and a musician could improvise over that chord progression thinking the single scale of C major. Many musicians like to think in more detail by using modes of the major scale in direct relationship to the roots of the chords. So for the II chord the musician might think D dorian instead of C major. It's a subtle difference of course, as both contain the same notes. But when thinking in D dorian the chord tones of the prevailing harmony are 1, 3, 5, 7 etc of the current mode. When the harmony of the V chord, G7, is played the musician could improvise thinking in G mixolydian, again the same notes as C major. However when thinking in G mixolydian the chord tones of the the G7 are 1, 3, 5, 7 of the mode. Actually it's somewhat intuitive to think in this manner, one doesn't even need to know the names of the modes to use this technique. It's the same as thinking "on the Dm7 chord play the C scale but the Dm7 chord tones start on the second note of the C major scale. On the G7 scale, keep playing the C scale but the G7 chord tones start on the the fifth note of the scale, and on the C chord keep playing in C." Knowing where the chord tones are of the prevailing harmony is important to an improvising musician as they may want to play a melody that outlines the harmony. Thinking "D dorian to G mixolydian to C major" during a II–V–I in the key of C is really just a different way of looking at the major scale during a common harmonic context. It only looks complex in print, but it's really quite simple and many find it a useful technique even if they don't actually think of the modal names but instead are thinking of using the C major scale but emphasizing different portions of the scale according to which chord is being played. In this context one might think of D dorian as the portion of the C major scale that best represents the Dm7 chord and likewise G mixolydian as the portion of C major that best

represents the G7 chord giving more of a musical hologram regarding the role of C major within the chord progression. This is not to suggest that one should use this as a guide to the range or starting note of a improvised melody but instead the "modal thinking" can simply help the improviser keep track of the chord tones of the harmony by relating it to the scale that starts on the root of the current chord.

On the other hand, some prefer to ignore these modal viewpoints as they find them an exercise in over−analysis.

If you do use these techniques, the subsets II−V and V−I can be treated similarly when in the major keys. The common chord resolution of V−I is used countless times in the harmony of songs. As an improvising musician the most basic scale to play is the major scale of the I chord (George Russell argues that Lydian is the true scale for the I chord in Major). In the key of C the V−I is G7−Cma7 and the C major scale works over both chords. Using the modal thinking technique, a musician might think "G mixolydian to C major" for scale choices, knowing that they both contain the same notes but G mixolydian will contain the chord tones at the 1, 3, 5, and 7 positions of the mode.

Even though one might be thinking in terms of modes, the II−V−I harmony that is described in this section is not referred to as 'modal'. However, there are tunes that are considered inherently 'modal' discussed in the next section.

Section.3

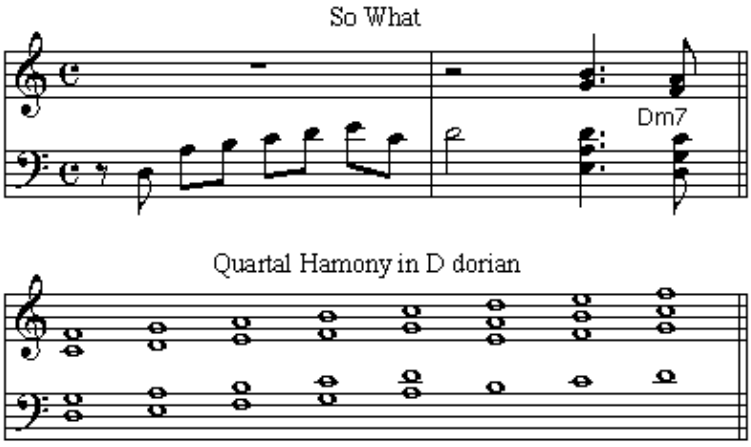
Minor Keys

The minor keys have more variety in scales and present an interesting study in chord/mode relationship. Before continuing, let me state that the term mode and scale are sometimes used interchangably and although the dorian mode is usually explained as originating from the major scale, the dorian mode is not considered dependent on the major scale for it's existence. Often the term dorian scale is used instead of dorian mode. Any scale can be used to create a set of modes. For instances if we start with the harmonic minor scale, we can create a whole new set of modes using harmonic minor as a "parent" scale (instead of major being the parent scale as is the case in the common modal system). Instead of creating additional names for all of the these modes, a new scale can be described as the "C harmonic minor−5th mode", meaning it's the same notes as C harmonic minor but starting on the fifth note. Modes of both the harmonic minor and melodic minor scales are used in jazz improvisation, increasing the number of available scales considerably.

Meanwhile, back to the regular modes, many jazz tunes in minor keys use the dorian mode as the scale for the I chord. Also there is a style of jazz known as 'modal jazz' which use the modes as the parent scale for a tonality. For instance the Miles Davis tune "So What" (from Kind of Blue) uses simple harmony that can be written on a chart as having two sections, A and B, in the following form.

```
 A                A                B                A
| 8 bars of Dm7  | 8 bars of Dm7  | 8 bars of Ebm7 | 8 bars of Dm7  |
```

The improviser will play several choruses of the AABA form during a solo. In reality, many more chords than the literal Dm7 structure are used but this is a result of improvisation not predesigned harmonic changes. A voicing used by pianist Bill Evans in the original Miles Davis recording of "So What", was a stacking of P4ths from D, to G to C, to F with a ma3rd on top to A. This voicing was not literally a Dm7 chord but it became a hip substitution for Dm7 that can be analyzed as Dm7sus4. In fact, Evans approaches the chord from a whole step above, all the notes of both chord structures come from the D dorian scale. The series of P4th also make it a candidate to be termed "quartal" harmony (chords built in 4ths) as opposed to the usual tertial harmony (chord built in 3rds). Below is the opening phrase of the main section of 'So What' and also an example of the typical voicings of quartal harmony applied to the D dorian scale.



For each 8 bar section of 'So What' the dorian scale is used. The Dm7 chord of the A section calls for D dorian and the Ebm7 of the B sections uses Eb dorian. The Dm7 isn't a II chord in C it is the tonic chord (I) in the key of D, D dorian. Many of the modal tunes of the 60's used modes from the major scale but like "So What" they weren't in the keys of the major scales but instead in the key of the mode's starting note. Tunes such as Maiden Voyage, Impressions, Little Sunflower, and Dolphin Dance make use of the Dorian, Phrygian, Lydian and/or Mixolydian scales in a manner that uses those scales as the parent scale of a tone center. Tunes suchs as this which do not use the traditional major or minor scales and instead use one of more of the modes as the parent scale are referred to as 'modal' tunes.

Even within non−modal tunes in jazz (i.e. jazz standards) it is common for the minor II−V−I chord progression to use dorian on the I chord. This is in contrast to classical music which might use aeolian (natural minor) as the scale used on the I chord in minor. In contrast to the how the major scale works over all of chords of the II−V−I in major, the dorian scale does NOT work over all of the chords of the minor II−V−I progression . During the II chord in minor the chord quality is usually m7b5 (sometimes called half diminished). In the key of Cm the II chord is usually Dm7b5. The mode that works well with that chord is D locrian (same notes as C natural minor). The V chord presents many possibilities for scale choices. One of the common choices for the V chord is C harmonic minor, 5th mode, i.e. C harmonic minor but start on G (the 5th note). Additional scale choices are mentioned in the section on Common Alterations and Substitutions.

Using the modal technique of matching the root of the chord to a starting tone of a mode, one way of navigating through the changes of the II−V−I in minor is to think "on Dm7b5 play D locrian, on G7 play C harmonic minor−5th mode and on Cm7 play C dorian" Unlike the II−V−I in major which in it simplist form boils down to a single set of notes (the major scale), in this case there isn't a single set of notes that satisfies all of the chords. Here we play D locrian (same as C natural minor), C harmonic minor then C dorian. The three scales contain one or two differences between them but they contain mostly common tones. Once again, the technique of selecting a scale for each chord isn't meant to make the musical situation overly complex but instead to give the player a very specific linear view of the harmonic progression. In this case we are in C minor and each of the chord/scale choices (Dm7b5/D locrian, G7/C harmonic minor−5th mode, Cm7/C dorian) provide a good set of notes for each specific chord.

Section.4

Instant Composing

The process of improvisation is very individual and each must find there own path but since improvisation is sometimes described as composing music in the moment, it is worth thinking of common compositional devices one could use "on the fly". Improvising in the the style associated with jazz standards is more based on the harmony of the songs than the original melody. However it is useful to examine some common manipulations of melodic material that can be used.

melodic variations

- inversion – invert the intervals of the melody
- retrograde – play the melody backwards
- retrograde inversion – upside down and backwards
- augmentation – stretch out the rhythms, i.e. turn quarternotes into half notes etc.
- diminution – compress the rhythms

Melodic inversion

The original melody can be used as a source to create new melodies. One technique involves inverting the melodic direction of the original melody. There are two different ways to use melodic inversion.

method one

One way involves changing the direction of the melodic interval of each note and use the same interval, i.e. if an interval from the original melody is an ascending 3rd then the inverted melody would be a descending 3rd. The quality of the 3rd (major, minor) could be adjusted so that you are in the same scale, i.e. if the original melody used an ascending major 3rd, the inverted melody might use a descending minor 3rd if the descending major 3rd resulted in a note outside the scale.

method two

Another way of using melodic inversion is to move to a interval that is the octave compliment of the original interval, i.e if the original melody moves from from C up to E (up a major 3rd), then the interval inversion would be from C down to E (down a minor 6th). In this manner, the inverted melody will contain the same notes as the the original but the melodic contour will be very different. However, this type of inversion doesn't work well for melodies containing as series of 2nds such as scale passages. The series of 2nds when inverted by this method turn into a very angular series of 7ths.

merging the two methods

The problem with method one is that sometimes the leap of a 3rd or larger when inverted will result in a note that just doesn't work. As mentioned above sometimes a simple adjustment from minor to major (or dim, or aug) in the quality of the of the interval will solve the 'wrong note' problem. Another solution might be to use method two when it results in a better sound. Also one can use the idea of inversion as a loose guide and simply change direction compared to the original, i.e. when the original melody moves up, the inverted melody move down, and vice versa, you choose the interval size for the inverted melody without strict adherence to the size of the interval from the original melody.

Melodic retrograde

The retrograde of a melody is that melody played backwards. This technique is one of the common

manipulation used with a tone row in 12 tone serial music. With a melody the results may or may not be of use to the improviser. But it is worth a quick experiment, perhaps a passage played backwards might be surprisingly expressive.

Melodic retrograde inversion

This process takes the original melody a plays it backwards and inverted. A strict mathematical processing of the original melody might not be useful material in many situations but a using this concept as a general guide for creating new material might prove fruitful.

Rhythmic Augmentation

This process takes a rhythmic passage from the original and stretches it out. One example would be to double the duration of all of the notes. Other ratios in time manipulation might be explored.

Rhythmic Diminution

This process takes a rhythmic passage from the original and compress it. One example would be play a rhythmic passage twice as fast. Other ratios in time manipulation might be explored.

All of these explorations of the original melody are the 'perspiration' that hopefully will lead to 'inspiration' during an improvisation. These melodic and rhythmic devices can be drawn from in the moment of creation and add cohesion to a improvisation if the improviser has previously explored the variations of the original melody in these ways during practice sessions. It is common for improvising jazz musicians to practice a piece over and over. But unlike a classical musician who is reading a score with precisely the notes required, the jazz musician strives to play it differently each time.

Section.5

Basic Training

The following is what I consider to be some of the basic training required to improvise in the style typical of jazz standards.

- II–V–I patterns
- knowing the harmonic landmarks (chord tones)
- common alterations and substitutions
- b9 and #9
- b5 and #5
- tritone substitution

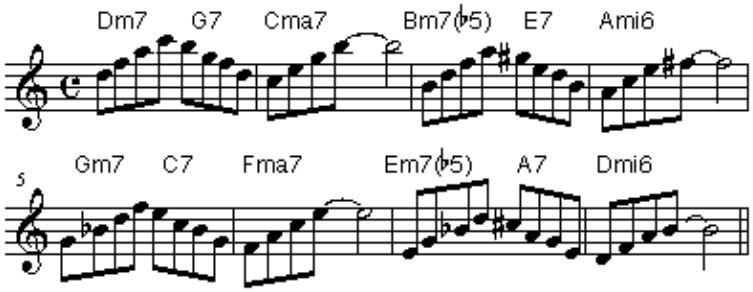
Many jazz musicians will practice melodic ideas using common chord progressions as a harmonic framework within which to paint their melodic improvisation. This practice session might consist of dozens of choruses being played so that many ideas can be explored. Commonly not a single note is written down and all improvisations and patterns are spontaneously sent directly from the mind to the instrument. I consider this process "preparing for the improvisation". No extended passages are memorized but you gain a good feel for the scales and harmonies of the piece on which you will improvise.

II–V–I patterns

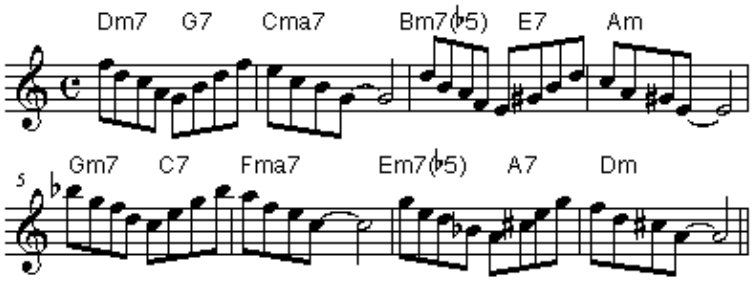
Below are two patterns I find useful. Both are melodic outlines of the II–V–I chord progression. The melodic essense of these pattern comes from a passage from Thelonius Monk's "'Round Midnight". In that phrase the harmony is II–V, and Monk's melody ascends root, 3rd, 5th, 7th of the II chord and resolves down a scale degree to the 3rd of the V chord. In this expanded melodic pattern here the phrase is extended to arpeggiate both the V and I chords as well. In the routine that I use, I start in the key signature of no sharps or flats (C/Am) first playing in C using Dm7–G7–Cma7 then move to the relative minor (Am) using Bm7b5–E7–Am#7 then move to the key signature of 1 flat, do the same

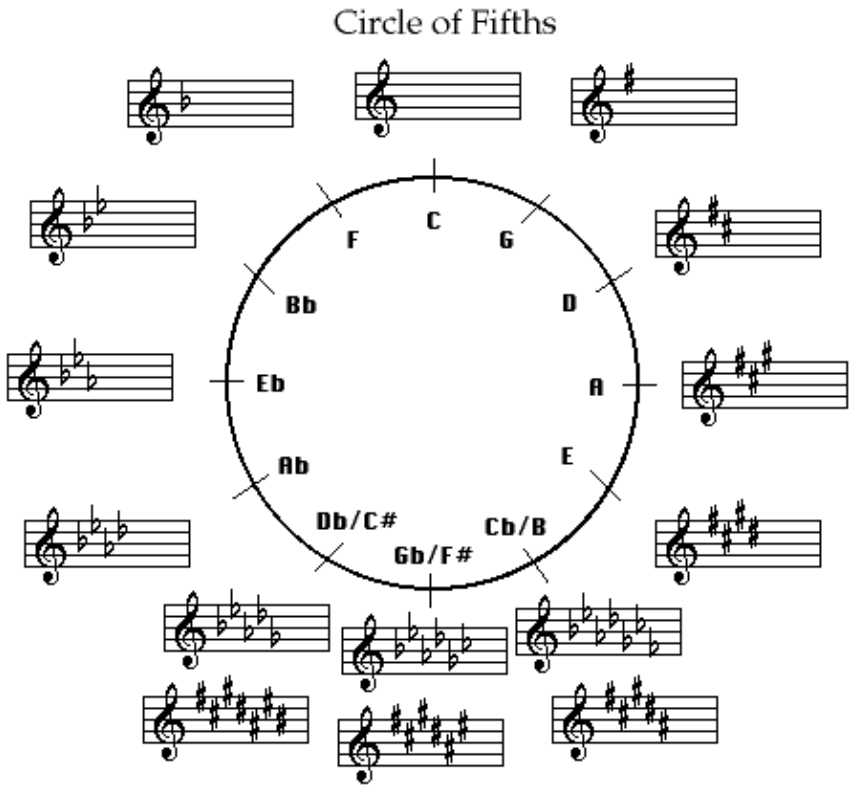
routine and continue all around the circle of fifths. This type of playing is considered 'inside' the chord changes.

pattern 1



pattern 2





I find the playing of these pattern helpful to my understanding of guitar fretboard. In an opposing viewpoint, others argue that practicing patterns is antithetical to true improvisation.

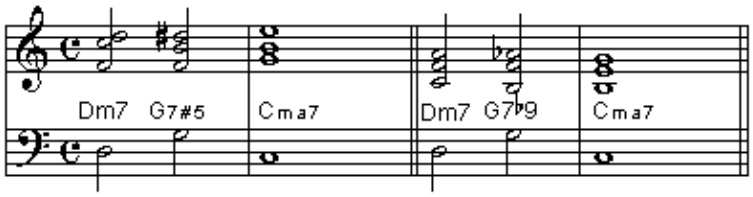
knowing the landmarks

When one is confident about finding the chords tones of the harmony in a II–V–I it is easier to improvise in the context of music that commonly uses that chord progression, i.e. jazz "standards". The above patterns will allow you to become familiar with the landmark notes of the moving chord progression. One exercise that is used by jazz musician is 'running the changes', that is to play a series of eighth notes or faster throughout the tune's changing chord progression, often outlining the chord structure in manner similar to the shown exercise.

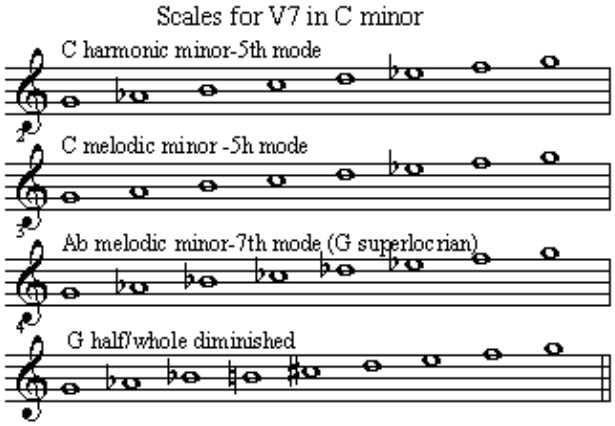
It is during these practice sessions that an improviser will learn the sound of the different chord tones of the harmony of the song.

Common Alterations and Substitutions

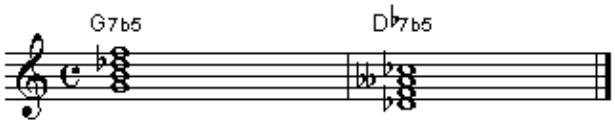
If one uses the basic scale choices discussed above several interesting notes choices are NOT available. Jazz musicians have long been attracted to certain altered tones especially when the V chord is being sounded. It is common to hear jazz musicians altering the 5th or 9th of the V chord. On the V chord in C (G7) the 5th is D and the 9th is A. The altered 5ths are Db (b5) and D# (#5) while the altered 9ths are Ab (b9) and A# (#9). Sometimes these tones are the result of a chromatic scale segment being used, i.e. playing the note D on the Dm7, the note D# on the G7 (using a #5) followed by the note E on the Cma7 chord. Another example of chromaticism is using the note A on the Dm7, the note Ab on the G7 (using a b9) followed by the note G on the Cma7 chord.



In addition to the C harmonic minor−5th mode mentioned above as a scale choice for the V chord, C melodic minor−5th mode is another choice. Another is the seemingly odd (but very effective) choice of Ab melodic minor−7th mode (sometimes called G superlocrian). This scale contains the root, 3rd, and 7th of the G7 chord plus that altered 5ths (b5 and #5) and 9ths (b9 and #9). When starting on G this scale is spelled G, Ab, Bb (A#), Cb (B), Db (C#), Eb (D#), F, G. Still another choice is the half/whole diminished scale starting on G: G, Ab, Bb, B, C#, D, E, F, G, which contains both altered 9ths (Ab, Bb/A#) and the enharmonic of the the b5 (C#/Db). The use of altered tones provide an introduction to a concept sometimes known as playing "outside". This concept of playing outside can be taken to extreme where the scale choice purposely conflicts with the prevailing chord. In these examples the "outside" quality is more mild, providing some tension that is resolved in the change to the I chord.



The V7 chord with the 5th lowered is an interesting chord structure. The chord G7b5 is spelled G, B, Db, F. As it turns out, that is the enharmonic spelling of another chord of the same structure whose root a tritone away from G (say what?) Yes, a G7b5 contains the same notes (enharmonically) as Db7b5 which is spelled Db, F, Abb (G), and Cb (B).



Since these two chords are enharmonically equivalent, the notion of substituting a Db7 type chord for a G7 type chord has been expanded to include several chords from the Db7 family to be used as substitutes for the G7 in the II−V−I chord progression. When the Db7 is substituted for G7 the progression becomes Dm7−Db7−Cma7 which is analyzed as II−bII−I. This technique is known as

"tritone substitution". This chord substitution technique is, of course, available to those who are playing the chords but it can also be used by someone who is playing a single line improvisation.

Below are some examples of these ideas.

b9 and #9

[insert example of II–V–I pattern using b9, #9]

b5 and #5

[insert example of II–V–I pattern using b5, #5]

tritone substitution

[insert example of II–V–I pattern with tritone substitution]

Section.6

Is this really improvising?

Indeed, I am suggesting that the improvising musician doesn't simply create a ad lib solo without first preparing for the musical situations that will be encountered during the solo section, i.e. the chord changes and the implied scale choices. The improvising musician needs to have technical command of several scales and know sound of those scales in their mind's ear. Even a collection of certified "hip" licks might be at the tip of one's fingers. So, is this really improvising? It's true that if you prepare for the improvisation with the techniques described here that you would be 'qualified' to play in a uncreative pattern oriented manner that is lacking in musical spirit, we've all heard that sound. But there isn't any reason that being prepared should result in a lack of creativity. I find that being prepared for the situation is liberating, I can go outside on a limb if I want because I'm confident I can find my way back inside the chord changes if I get in trouble. And if I want to play inside, I'm confident that I won't accidentally play any clams.

I remember attending a music education conference several years ago where the pianist Mike Garson was performing/lecturing. He told a story of when he lived outside of London and rode the train into the city. A classical viola player rode the same train and they would talk. The violist was curious about improvisation and asked Garson how long would it take the violist to learn to improvise well, as this wasn't something that he was used to doing on his instrument. Garson, who measures practice time in 100 hour blocks (i.e. "it will probably take x hundred hours to do this, x hundred to do that") outlined a practice routine for the violist and after a week or so the violist confessed that he wasn't really willing to put in that kind of effort.

There is no magic pill.

Return to top of page

Scales using MIDI note numbers

Sect.1

MIDI – not an overview

MIDI, Musical Instument Digital Interface, is a computer protocol that allows electronic musical instrument manufacturers to design devices that are compatible across all brand names. MIDI is not terribly complicated yet a full explanation is beyond the scope of this lecture. I'll define the elements that are relevant to this discussion as they come up.

MIDI comunicates by sending messages (a package of bits grouped together to form some predefined code) along the MIDI cable that connects two MIDI devices. These MIDI cables are plugged in by the user (you or me) into the MIDI jacks (either IN, OUT or THRU, THRU sends the IN messages back out so you can chain several MIDI devices together) It is a one way flow of information in the MIDI cable. As an example, consider a synthesizer and a drum machine used together. You could conect the synthesizer's MIDI OUT to the drum machine's MIDI IN (using a MIDI cable). Now the magic happens, when you play the synthesizer, the drum machine will sound different percussion sounds according to which key on the synthesizer you are pressing. If you want the button on the drum machine to activate the synthesizer, then you have to connect another MIDI cable from the drum machine's MIDI OUT to the synthesizer's MIDI IN. In it's standard protocol, MIDI travels down one way streets.

Some current techonologies have allowed for different type of hook ups, but within the standard protocol of MIDI you normally hook the MIDI OUT (or MIDI THRU) of device−1 into the MIDI IN of device−2, if you need two way communication then you would connect device−2's MIDI OUT to device−1's MIDI IN.

I remember the first time I hooked up my DX7 to my DrumTrax machine in 1985. I pressed keys on the DX7 and drum sounds started coming out of the drum machine and I broke out laughing. It was a fairly new technology then but now it's as common as earthquakes in California.

Another great thing about MIDI is that it spells "THRU" the way it should be spelled.

Sect.2

MIDI NOTE ON message

For our discussion the important MIDI message is the Note On message. The Note On message contains four pieces of information, (1) Note On code (2) MIDI channel (3) note number (4) velocity value. For our discussion only the note number is relevant. Computer software will of course use all 4. The note number relates to the specific key that was pressed. Middle C is designated as "60" in MIDI talk. Although the concept of "keys" does exist in MIDI sequence files, Note On message don't distinguish between C# and Db, it's just 61 to MIDI (each MIDI number represents one half step, so 61 is one half step above 60). If we start a major scale on middle C, we can write out the values in MIDI note numbers.

MIDI Note Number	60	62	64	65	67	69	71	72
Number of half steps		2	2	1	2	2	2	1
Note Names	C	D	E	F	G	A	B	C
Whole / Half		W	W	H	W	W	W	H

Hmm, the last note C has a MIDI note number of 72, a difference of 12 from the starting C. That makes sense, there are 12 half steps in an octave. So if middle C is MIDI note number 60, then what is the MIDI note number for the C one octave lower?

I'll wait .....

Yes, 48 is the MIDI note number for that C.

Sect.3

Computer terms

There are several ways you could use the MIDI note number to create MIDI NOTE ON messages to send to devices. The actual programming is very complex and a discussion here is not appropriate even if I was qualified to present one. But the logical principles relate directly to the material we have been studying in this course.

Before continuing, I need to define the concept of an "array" and "loops" as they relate to computer programming. In computer programming the are many different things that fall under the general category of "variables". As its name states it holds a value that can vary. At one moment it is set to a certain value, later the program might change it to a different value (according to the programmer's code).

An array is a collection of variables (in our case numbers) that are referenced by a single name along with an index number. For example the set of numbers 15, 2, 33 and 42 could be stored in an array named "numbers" like this:

```
numbers[1] = 15
numbers[2] = 2
numbers[3] = 33
numbers[4] = 42

(usually arrays start at 0 instead of 1)
```

I've selected arbitrary numbers in this case, but if these were numbers of importance, you could access all of them using what is known as "loop". Here's a simple example of how the loop works. Using two simple variables (not arrays) named "index" and "my_number", we can create a loop. I'll use a notation known in computer programming circles as "psuedo code". It isn't any real programming language (although PYTHON looks somewhat like psuedo code) but it shows you the basic logic.

```
index = 1  (set index to equal 1)
begin loop
  check if index is less than 5, if it is, do the loop,
     otherwise jump out the loop.
```

```
  my_number = numbers[index]
  do something with my_number
  ...
  add 1 to index and go to beginning of the loop
end loop
```

Here is what happens each time thru the loop. (The line numbers indicate which time thru the loop.)

1. index equals 1, numbers[1] is 15 so my_number is set to 15
2. index equals 2, numbers[2] is 2 so my_number is set to 2
3. index equals 3, numbers[3] is 33 so my_number is set to 33
4. index equals 4, numbers[4] is 42 so my_number is set to 42
5. index equals 5, so the loop is finished

The "do something with my_number" section is where the program performs its magic. The loop is used to merely get the different numbers that have been stored in "numbers[]". Once you get the number, you perform the magic (process the number somehow).

Another important term is "function". A function is a chunk of computer code that performs a specific task. It is often used several time in a program so it is efficient to write the code once and then "call" the function name instead of writing out the code each time. The "do something with my_number" section in the above loop example would call one or more functions. Often a function will have "parameters" that the function uses to do a task that needs some addition information. As an example, in a class grading program, you might define a function that enters a. grade into a file. The parameters might be

1. the student's name
2. the name of the test
3. the grade.

The function, in pseudo code, might look like this:

```
EnterGrade(student_name, test_name, score)
```

In the above case, the parameters `student_name`, `test_name`, and `score` are "fed" to the function `EnterGrade()`.

A deep understanding isn't neccessary right now, I'm simply introducing the terminology. Here is a list of the computer terms used in the remaining discussion.

- variable
- array
- loop
- function
- parameter

So what's this have to do with MIDI and scales? I thought you'd never ask. We're not thru yet.

Sect.4

Using MIDI numbers to create scales

If you wanted to write a program that could play scales, you would definitely use arrays. We've used arrays to learn scales also. Did you notice? Remember this array: W W H W W W H. Yeah, that's the major scale array. Well we didn't call it that at the time but that is one way a computer programmer might view it. More convenient however, is to think in terms of numbers so now our mantra, eh, array is this: 2, 2, 1, 2, 2, 2, 1. We'll use this array to create a scale player in a moment but first let's get the basic loop structure together. Remember the technique for building scales? As a review here's the major scale.

1. Start on the first note
2. second note is up a whole step
3. third note is up a whole step
4. fourth note is up a half step
5. fifth note is up a whole step
6. sixth note is up a whole step
7. seventh note is up a whole step
8. eighth note is up a half step

That would make an eight step process without using a loop. It could be done that way. But it's not very clever or flexible. Assume that `PlayMIDI(a_note)` represents tons of computer code (called a function) that can send a MIDI NOTE ON message from the computer's MIDI OUT jack. (MIDI devices will connect their MIDI IN to the computer's MIDI OUT) In reality we need the computer to send more than a NOTE ON message because we also need a NOTE OFF message after the appropriate amount of time has elapsed. For the purposes of this discussion I'll omit those details and assume that the note is a constant duration and it gets shut off somehow. We are primarily concerned with determining which note to play, not how long to play it. The "a_note" variable determines which MIDI note number is put into the MIDI NOTE ON message prior to it being sent out. The `PlayMIDI()` function logic is not shown here, we'll leave that to the real programmers. `PlayMajorScale()` is the name given to our scale playing function. The variable "starting_note" used in the parenthesis is used to set the starting value of "a_note" The logic of the `PlayMajorScale()` function is shown below. Here's the basic idea in psuedo code.

NOTE: If you've never studied computer languages you might be perplexed by the seemingly weird algebra "a_note = a_note +2". It isn't algebra, it's a variable being updated to a new value, in this case, we add 2 to variable "a_note".

```
functions:
PlayMIDI(a_note)
PlayMajorScale(starting_note)

variables:
a_note
starting_note

function ----------------------------------------
PlayMajorScale(starting_note)
  a_note = starting_note
  PlayMIDI(a_note) - wait for duration

  a_note = a_note + 2  (a_note now equals 62)
  PlayMIDI(a_note)

  a_note = a_note + 2  (a_note now equals 64)
  PlayMIDI(a_note)

  a_note = a_note + 1  (a_note now equals 65)
  PlayMIDI(a_note)
```

```
  a_note = a_note + 2  (a_note now equals 67)
  PlayMIDI(a_note)

  a_note = a_note + 2  (a_note now equals 69)
  PlayMIDI(a_note)

  a_note = a_note + 2  (a_note now equals 71)
  PlayMIDI(a_note)

  a_note = a_note + 1  (a_note now equals 72)
  PlayMIDI(a_note)
end function PlayMajorScale() -------------------

we could use the function like this:

starting_note = 60
PlayMajorScale(starting_note)
```

We used all of the values in our major scale array but we didn't use them AS an array and we didn't use a loop to go thru the repetitive process. A better and potentially more flexible version would use a loop. If you're still interested meet me in the next section.

Sect.5

Using Scale arrays

When we create scales we do a repetitive task, mainly, finding the next note. We are looping thru this repetitive task, each time using the next value in our major scale array to help us find the correct note. You might not have thought about in that way before but that pretty much sums up the process. We will store our major scale array, 2, 2, 1, 2, 2, 2, 1 in a variable named, hmmm, let's see, what's a good name?,... OK, let's use "major_scale".

We need a way to tell our function how many numbers are in our scale array. Since arrays start at index "0" not "1" we can use the vacant major_scale[0] location to store the info we need. There are more efficient ways of write this in computer talk, but the basic idea is as follows:

```
major_scale[0] = 8 (upper limit used in loop)
major_scale[1] = 2
major_scale[2] = 2
major_scale[3] = 1
major_scale[4] = 2
major_scale[5] = 2
major_scale[6] = 2
major_scale[7] = 1
```

We have an array variable named "major_scale[]" which contain 8 numbers, the first is the total count of numbers and the following numbers represent the intervals between the adjacient notes of the major scale. we can loop thru and do the repetitive task using a new number from the array each time thru the loop. Here's the logic, it's just like we humans use, wow imagine that. This time we'll call our scale player "`PlayScale()`".

functions:
```
PlayScale(starting_note, scale_array)
PlayMIDI(a_note)
```

variables:
```
starting_note
a_note
```

```
index
interval
scale_array
limit

function--------------------------------
PlayScale(starting_note, scale_array)
  limit = scale_array[0]
  index = 1  (set index to equal 1)

  a_note = starting_note
  PlayMIDI(a_note)
  begin loop
    check if "index" is less than "limit", if it is, do the loop,
       otherwise jump out the loop.
    interval = scale_array[index]
    a_note = a_note + interval
    PlayMIDI(a_note)
    add 1 to index and go to beginning of the loop
  end loop
end function PlayScale()-------------


The function could play a C major scale when it is used like this:

starting_note = 60
scale_array = major_scale
PlayScale(starting_note, scale_array)
```

Here a blow−by−blow account of what happens with these last three lines:

- the parameter "starting_note" is set to 60
- the parameter "scale_array" is set to match major_scale
- the function is fed the parameters and "called" to action.
- limit is set to 8 (major_scale[0] equals 8)
- index is set io 1
- set a_note to starting_note (60)
- play first note − PlayMIDI(60) a_note = 60
- loop starts
- update interval to 2 (index equals 1, major_scale[1] equals 2)
- update a_note to 62 (a_note + interval)
- play second note − PlayMIDI(62)
- update index to 2 and check if "index" is less than "limit"
- update interval to 2 (index equals 2, major_scale[2] equals 2)
- update a_note to 64 (a_note + interval)
- play third note − PlayMIDI(64)
- update index to 3 and check if "index" is less than "limit"
- update interval to 1 (index equals 3, major_scale[3] equals 1)
- update a_note to 65 (a_note + interval)
- play fourth note − PlayMIDI(65)
- update index to 4 and check if "index" is less than "limit"
- update interval to 2 (index equals 4, major_scale[4] equals 2)
- update a_note to 67 (a_note + interval)
- play fifth note − PlayMIDI(67)
- update index to 5 and check if "index" is less than "limit"
- update interval to 2 (index equals 5, major_scale[5] equals 2)

- update a_note to 69 (a_note + interval)
- play sixth note – PlayMIDI(69)
- update index to 6 and check if "index" is less than "limit"
- update interval to 2 (index equals 6, major_scale[6] equals 2)
- update a_note to 71 (a_note + interval)
- play seventh note – PlayMIDI(71)
- update index to 7 and check if "index" is less than "limit"
- update interval to 1 (index equals 7, major_scale[7] equals 1)
- update a_note to 72 (a_note + interval)
- play eighth note – PlayMIDI(72)
- update index to 8 and check if "index" is less than "limit"
- fails check because index now equals limit so the loop is done

`PlayScale()` creates the same scale as `PlayMajorScale()` but it does it with a loop and it uses a different value of the scale array each time thru the loop (in this case the scale array is set to a "major_scale" array). Even though it may seem like more steps this way, the computer is so fast it is no problem, this is exactly the kind of thing the computer does really well. This is a more flexible way of doing it because we can feed the `PlayScale()` function a different scale array!

The difficult MIDI programming is hidden inside the function PlayMIDI(a_note) but all of the music logic is shown above in PlayScale().

Sect.6

More Scale arrays

We have learned the arrays for the minor scales. Let's present them in our computer array form:

```
natural_minor[0] = 8 (upper limit used in function)
natural_minor[1] = 2
natural_minor[2] = 1
natural_minor[3] = 2
natural_minor[4] = 2
natural_minor[5] = 1
natural_minor[6] = 2
natural_minor[7] = 2

Most programming languages allow you to set-up arrays in an easier manner:
natural_minor[] = "8, 2, 1, 2, 2, 1, 2, 2"
(remember the number 8 is used in the function to set the limit of the loop)

using this shorter version, here's Harmonic minor.

harmonic_minor[] = "8, 2, 1, 2, 2, 1, 3, 1"


and finally Melodic minor.

melodic_minor[] = "8, 2, 1, 2, 2, 2, 2, 1"
```

If we use the `PlayScale()` function with one of these scale arrays it will play a minor scale.

```
starting_note = 62 (the note D)
scale_array = harmonic_minor
PlayScale(starting_note, scale_array) (the function will play D Harmonic minor)
```

```
starting_note = 53 (the note F)
scale_array = melodic_minor
PlayScale(starting_note, scale_array) (the function will play F Melodic minor)
```

This function "thinks" like we do, it uses a scale formula to create the scale. Feed it a different formula, you get a different scale. You can feed it all sorts of scales. Here are some other scale arrays, the numbers (except for the first) represent the intervals between the scale degrees. These scale patterns (and more) are in the cerebral computer memory of improvising musicians. Improvising musicians also have a PlayScale() function packed away in their brain.

```
dorian       = "8,2,1,2,2,2,1,2"
phrygian     = "8,1,2,2,2,1,2,2"
lydian       = "8,2,2,2,1,2,2,1"
mixolydian   = "8,2,2,1,2,2,1,2"
aeolian      = "8,2,1,2,2,1,2,2"
locrian      = "8,1,2,2,1,2,2,2"

lydian_domiant   = "8,2,2,2,1,2,1,2"
super_locrian    = "8,1,2,1,2,2,2,2"

minor_pentatonic = "6,3,2,2,3,2"
major_pentatonic = "6,2,2,3,2,3"
minor_blues      = "7,3,2,1,1,3,2"
major_blues      = "7,2,1,1,3,2,3"

whole_half_diminished  = "9,2,1,2,1,2,1,2,1"
half_whole_diminished  = "9,1,2,1,2,1,2,1,2"

starting_note = 64
scale_array = minor_blues
PlayScale(starting_note, scale_array)  (plays the E minor blues)

  "my baby left me...and my dog did too...whoa, whoa, I got the blues"
```

Sect.7

Intervals

This idea is easy to extend to intervals. They can be used just like scales but they only have two notes, a starting_note and an interval. The interval is an offset number equal to the number half steps in that interval. For example, the interval of minor 2nd can be represented by the number 1, a major 2nd is 2, a minor 3rd is 3, a major 3rd is 4 and so on. The appropriate function would look like this:

```
function
PlayInterval(starting_note, interval)
  a_note = starting_note
  PlayMIDI(a_note)  (wait for duration)

  a_note = starting_note + interval
  PlayMIDI(a_note)  (wait for duration)
end function PlayInterval()
```

To make it easier to deal with names instead of numbers, programmers often define a bunch of "constants" as shown below. I've include the most common enharmonics (i.e. aug_2nd and mi_3rd both equal 3).

constants

```
intervals
p_unison  = 0
mi_2nd    = 1
ma_2nd    = 2
aug_2nd   = 3
mi_3rd    = 3
ma_3rd    = 4
p_4th     = 5
aug_4th   = 6
dim_5th   = 6
p_5th     = 7
aug_5th   = 8
mi_6th    = 8
ma_6th    = 9
dim_7th   = 9
aug_6th   = 10
mi_7th    = 10
ma_7th    = 11
p_octave  = 12

note names... incomplete list
C4 = 60
C#4 = 61
Db4 = 61
D4 =  62
D#4 = 63
Eb4 = 63
...
```

Now you don't have to translate everything into numbers. Instead the functions can be called like this.

```
PlayInterval(D4, mi_7th)  (it plays D4 followed by C5)

PlayInterval(Eb4, - p_5th)   (it plays Eb4 followed by Ab3, notice the minus sign.
                              this is a descending interval)
```

Sect.8

Chords

Chords can be represented with arrays just like scales. The difference is that with chords several notes play together instead of one after another. The array for triads need only contain three numbers. The first is again used to set the limit of the loop and the second and third numbers represent the interval from the root–to–third and third–to–fifth respectively.

```
ma_triad[]   = "3,4,3"
mi_triad[]   = "3,3,4"
dim_triad[]  = "3,3,3"
aug_triad[]  = "3,4,4"
```

The function `PlayChord()` is the same as `PlayScale()` except that the loop doesn't wait for the note to finish, instead it zips thru the loop so quickly that all of the notes will appear to sound at the same time. Since I've been ignoring the details of turning the NOTE ON message off, the function looks the same as PlayScale() but with some different parameter names.

functions:
```
PlayChord(root, chord_array)
PlayMIDI(a_note)
```

```
variables:
root
a_note
index
interval
chord_array
limit

function--------------------------------
PlayChord(root, chord_array)
  limit = chord_array[0]
  index = 1  (set index to equal 1)

  a_note = root
  PlayMIDI(a_note)
  begin loop
    check if "index" is less than "limit", if it is, do the loop,
       otherwise jump out the loop.
    interval = chord_array[index]
    a_note = a_note + interval
    PlayMIDI(a_note)  (DONT WAIT, loop again)
    add 1 to index and go to beginning of the loop
  end loop
end function PlayChord()-------------


The function could play some triads when it is used like this:

PlayChord(C4, major_triad)

PlayChord(Eb4, augmented_triad)
```

By using negative numbers you can play inversions. The second and third numbers represent the interval from the root–to–third and third–to–fifth respectively. Note that in the 1st inversion arrays the interval from root–to–third is down a sixth instead of up a third (making the third of the chord the lowest tone). Likewise, in the 2nd inversion arrays the interval from third–to–fifth is down a sixth instead of up a third (making the fifth of the chord the lowest tone).

```
ma_triad_1inv[]   = "3,-8,3"
mi_triad_1inv[]   = "3,-9,4"
dim_triad_1inv[]  = "3,-9,3"
aug_triad_1inv[]  = "3,-8,4"

ma_triad_2inv[]   = "3,4,-9"
mi_triad_2inv[]   = "3,3,-8"
dim_triad_2inv[]  = "3,3,-9"
aug_triad_2inv[]  = "3,4,-8"

PlayChord(C5, mi_triad_1inv)

PlayChord(Bb4, ma_triad_2inv)
```

Sect.9

Links

If you want ot pursue programming in MIDI, check out MIDIShare a free MIDI API (application programmer's interface) for the Mac and Windows 95/98. It was created by grame research in france. I found that reading the documentation gave me a better idea how MIDI programming works. MIDIShare contains all of the difficult code that performs the MIDI magic. That's great news for those like myself who wanted to get started in MIDI programming but didn't have a clue as to where to begin. I began a couple of years ago with MIDIShare after a blind search at yahoo on "MIDI API" brought up a link to the MIDIShare site.

The current version of JAVA from Sun Microsystems has support for MIDI. Apple's Quicktime Music Architecture also fully supports MIDI. I'm very excited about the potential of MIDI, JAVA and online music education. It's going to be very interesting. Below are some links that you also might find interesting. Well, I guess I'm thru.

MIDI related links

- MIDI Home Page (Netherlands)
- Intro to MIDI
- MidiShare site
- MIDI Web.com
- Macintosh MIDI Users Internet Guide a good list of links at this site.
- Yamaha's MIDPLUG site
- Opcode's Mac Products
- Demo version of Sequencing Software
- Computer Music Bibliography.
- Sun Microsystem's Java Site
- Java tutorial, Sun's online java tutorial. most excellent.
- Apple's QuickTime Tools
- Charles Kelly's MIDI files page
- Laura's MIDI Heaven

Return to top of page
