

By The Numbers

Using Numbers to talk about, study or play music

Emphasis: Music Theory, Mandolin Theory

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This article was prompted by the section titled *Chord progressions by the numbers*, page 16 of the PDF e-book, *Mandolin Master Class* by Bradley Laird. It was written for the Woodshed Study Group at Mandolin Café. The Mandolin Café is a website devoted to all things mandolin-related, and hosts a lively discussion forum dedicated to mandolinists worldwide. The Woodshed Study Group is one of many social groups that are also hosted in these forums. The Woodshed group was begun with an online study of the *Mandolin Master Class* text. You can visit the Mandolin Café [here](#). The actual discussion forums are found [here](#), and the Woodshed Study Group can be found [here](#). There is no charge for membership, and the reader is welcome to join in studies with us at any time.

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What's this all about?

In any study of music, whether a formal study of music theory or just a hobbyist's foray into learning a few tunes on a musical instrument, you will soon encounter what can be a bewildering array of numbers that are used to refer to many things. Music teachers and advanced musicians are prone to **rattle off numbers at any time** while discussing music, and to the new student it can quickly become confusing as to just what the numbers mean and what exactly they refer to. Don't you just hate it when that happens? If you're new to the language of music and don't have a solid grasp of what all these numbers mean – then of course you do! Consider, for instance:

1. On a stringed instrument, each string or course of strings is numbered.
2. On a fretted instrument, each fret is numbered.
3. In a musical scale, each note is numbered.
4. Chords which are built from those notes are also numbered.
5. Musical intervals spanning multiple notes are also numbered.
6. Additional numbers are added to chord names to indicate *chord extensions*

The same number could be used to indicate many different things. My own main instruments are guitar and mandolin. So, what does it mean if a teacher or band leader says to me, **"Play the third?"** Does this mean to play the third string on my instrument? Does it mean to play the note at the third fret of the string I'm on? Does it mean to play the third note in a particular scale? The third chord in a particular key? The third interval above or below the note I'm currently on?

The answer will depend on the **context** – and the context (and the answer) can only be understood by me if I have a solid grasp on how numbers are used, and just what they mean, in each of these concepts: string numbers, fret numbers, scale degrees, chord numbers, chord extensions, and musical intervals.

In the present context, we're mostly concerned with chord numbers and extensions, but this article will serve as a brief introduction (or review) to each of these concepts in order to (hopefully) dispel any confusion that arises between them. We'll begin by taking a look at our instruments, then move on from there.

Instrument Anatomy

The instrument we are most concerned with in this article is the mandolin, though I may refer a bit to the guitar, or others, for clarification on some things. The parts that we are numbering on the physical instrument itself are the **strings** and the **frets**.

Numbering of the strings – Courses

The strings of a stringed instrument are counted in “**courses**”. So, an instrument with only one string, like a homemade, one-string cigar box instrument (or a one-string wash tub bass) has *one course*.

The typical, standard guitar has six strings tuned to different pitches; therefore, six courses. The typical, standard twelve string guitar has twelve strings—*but still only six courses*. This is because on a twelve string guitar, the strings are laid out in 6 pairs. Each pair of strings forms one course. Each pair is typically tuned either in unison, or in octave tuning, so that each course produces a single musical note.

On a stringed instrument, the strings are numbered like this: If you were to place the instrument into a stand or on a hanger, so that the neck is pointed upward and the body downward, the strings (or courses) are numbered from right to left. Using a guitar again as an example, and numbering from right to left, the high E string is string one, the B string is two, the G string is three, the D string is four, the A string is five, and the low E string is string number six. This numbering method is shown in the first image below. The second image shows that the same system is used for the six courses of a twelve string guitar.



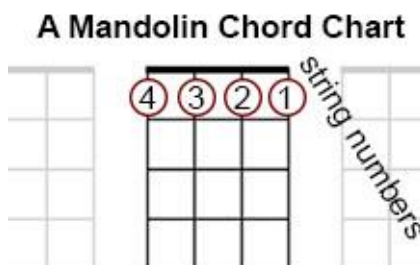
Referring to “string one” on a twelve string guitar indicates the *first course*, and actually includes both of the high E strings. The term “string” and the term “course” can be used interchangeably, so the first, second, third, etc. “string” can refer to a double or triple “course” of strings, depending on the instrument. Some instruments have **multiple strings to a single course**, and the twelve string guitar was only the first example of this.



This image of an old ten-string tiple further illustrates how strings, or courses, are numbered. Note that although this tiple has ten strings, there are only four courses, two triple courses and two double courses. For the purpose of discussing fingerings, or the reading of tablature or chord charts, we would speak of it as four strings, numbered from right to left facing the headstock.

In summary, strings (or courses) are typically numbered as if facing the headstock upward and numbering from right to left.

Applying this string-numbering principle to the mandolin, we can readily see that although a typical mandolin has eight strings, they make up four double courses, so the strings of a mandolin are numbered from one to four, from right to left as though facing an upturned headstock.



Frets – Numbering of the frets

On fretted instruments, such as guitar or mandolin, each fret is assigned a number. Numbering begins from the nut, or the “zero” fret. Some instruments actually have a zero fret located adjacent to the nut; otherwise, the nut itself can be considered a zero fret. An unfretted string—meaning a string that you do not “shorten” by placing your finger on the string behind a fret—can be called an “open string” and when plucked it produces an “open note” which is the note that the string is tuned to. When you use your finger to fret a string, in essence shortening the string in order to make a higher pitch note when plucked, the shortened string can also be called a “stopped” string, as opposed to an open string, or it can also be called a “fretted” string, and when plucked it produces a “stopped” or “fretted” note.

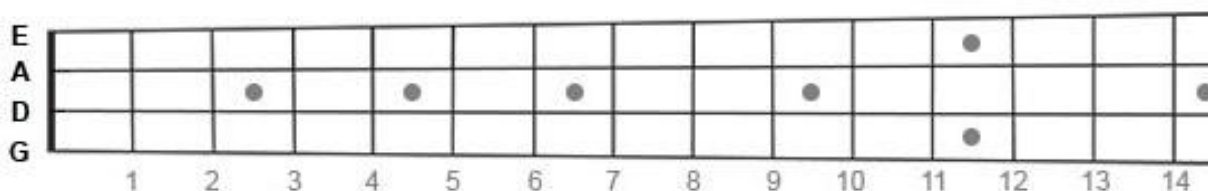
No matter how the instrument is oriented, the frets are always numbered from the nut. Typically, fretboard diagrams are drawn with the concept of the nut facing left, thus string one is at the top of a fretboard diagram, string four is at the bottom of a mandolin fretboard diagram, and the frets are numbered in sequence from left to right.

Mandolin Fretboard Diagram

NUMBERINGS:

The strings are numbered top to bottom. E=1st, A=2nd, D=3rd, G=4th

The frets, represented by vertical lines, are numbered from the nut, left to right



Usually, a student who just begins learning a particular instrument such as guitar or mandolin gets their first use of numbers in learning the numbers associated with the frets and strings—numbers that refer to the physical anatomy of the instrument, and that help the student to find notes on the instrument. Whether the number 3 refers to a string or a fret position will depend on the context. Beginner students

are easily able to understand a sentence like, “Play the third string at the second fret to make an E note.”

As a student begins to play more with other musicians, or undertakes to learn about musical concepts like scales and chord-building, other numbers come into play. Statements like the following can be pretty confusing when you first start out. What do they mean?

“The mandolin is tuned in fifths.”

“Go to the four chord.”

“This song goes to the minor second there.”

“Use the seventh on that last beat before going back to the one.”

“Add the flatted seventh to the triad to make a dominant seventh.”

Just for kicks, when I wrote the statements above, I had notes in mind for some numbers and chords of a song in mind for others; can you tell which is which? If any of it is confusing, the confusion comes from one or both of these: What is the context? And, how much do you know about scale degrees, intervals, and chord progressions? I’m hoping that the following sections will help a bit toward clearing the fog.

Scales – Numbering the scale degrees

Once we leave behind the numbers associated with the physical anatomy of our instruments, we need to navigate the numbering of individual notes, and then the numbering of chords which grows from the note numbering, and the intervals which also grow from the note numbering.

In Western Music in general, it is helpful to relate the concepts of music back to the **Major Scale**. I’m going to discuss here the numbering of *scale degrees* as representing the notes of the major scale. Before benefitting from this, it will be helpful if the reader understands a few things like 1) the twelve notes of Western music, which make up the *chromatic scale*, and the half-step (semitone) intervals of that scale, and 2) the definition of a major scale and the concept of the relative minor. This is important information, because once the reader is armed with an understanding of that, they can construct any major or natural minor scale in any key, at least on paper, and will have at least a theoretical knowledge that will make all the proceeding talk of numbers intelligible and useful.

I’ll offer some brief introduction to those concepts here before proceeding, but note: Pains have been taken both in our text, *Mandolin Master Class* by Bradley Laird, *as well as* in our previous lessons at The Woodshed Study Group, to cover these concepts in a way to help the reader understand these basic building blocks. You can work through these earlier lessons here: [The Woodshed](#)

The Chromatic Scale

There are only twelve notes in all of Western Music, and their names are based on only seven letters of the alphabet. These notes taken altogether make up what is known as the **chromatic scale**, and each of these notes is one half-step apart. The notes are given in chart form below.

A	A#/Bb	B	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab
---	-------	---	---	-------	---	-------	---	---	-------	---	-------

When studying the notes in our chart, **take note of the following:**

1. The boldface notes are also called *natural notes* simply because they do not contain sharps or flats. I made these notes boldface in order to point them out, they do not have to be boldface in actual usage.
2. The other notes each have two names, separated by a slash. When musically raising the note A one half-step, we get a note A#. When musically lowering the note B one half step, we get a note Bb. A# and Bb are two names for the same note-tone in our system of music¹.
3. There is *no other note* between the natural notes B & C, or between the natural notes E & F. Remember this fact: There is a half-step between B & C and between E & F – all other *natural notes* are a whole step apart! Thus, they have sharp or flat notes between them. *Each of the twelve notes of the **chromatic scale** is a half-step apart!*

And for additional emphasis, I'll repeat: The natural notes E & F, and B & C are **special!** They have a half step between E & F and between B & C, while *all other natural notes are a whole step apart!*

A	A#/Bb	B	C	C#/Db	D	D#/Eb	E	F	F#/Gb	G	G#/Ab
----------	-------	----------	----------	-------	----------	-------	----------	----------	-------	----------	-------

The Major Scale

While there are many ways to approach music theory, the method I prefer is the one I consider easiest and least complicated. That is to introduce numbers and learn about numbers as related to the *scale degrees* of the *major scale*. A musician can spend a little time coming to understand the major scale very well, and take that knowledge later to build upon and learn about just about anything having to do with notes and chords in Western Music. In the introduction to this section, I made the statement that it would be helpful if the reader understands a few things like 1) the twelve notes of Western music, which make up the *chromatic scale*, and the half-step (semitone) intervals of that scale, and 2) the definition of a major scale and the concept of the relative minor. Having briefly introduced item one just above, we'll move now to the definition of the major scale.

A **major scale** consists of eight notes ascending, with a half-step between the 3rd and 4th, and a half-step between the 7th and 8th, and all other notes are a whole step apart—and the eighth note is the same as the first, an octave above the first.

It could also be said that the major scale consists of only seven notes, or of seven notes plus the octave (which of course makes eight = octave). Whether you prefer to count the major scale as seven notes, or as eight notes that include an octave, *doesn't matter*. What matters in the definition is *having the correct intervals*. There is a half-step between the 3rd and 4th notes, and a half-step between the 7th and 8th notes, and all other notes are a whole step apart. This pattern of intervals is exactly what defines the major scale, and any musician would do well to memorize this.

Now let's have a look at the C major scale:

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

The C major scale (and the A minor scale, which is the *relative minor* of C major) are the common diatonic scales that contain all natural notes, with no sharps or flatsⁱⁱ. Our chart for the C major scale has **numbers above each note** and in many ways, these numbers are far more important than the letter names! Those are the numbers of the *scale degrees*. Notice that the 3rd and 4th notes are E & F, respectively. Also that the 7th & 8th notes are B & C, respectively. A glance at the chromatic scale (and hopefully burned into the reader's memory) tells us that these notes are a half step apart. The definition of a major scale says that there must be a half-step between 3 & 4 as well as between 7 & 8, and all other notes are a whole step apart.

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

So, it really doesn't matter what scale we are considering—any major scale can go into that chart, and those same numbers will indicate the correct scale degree. The note names only have to cover all seven letters of the alphabet, and maintain the correct intervals. As an example, we'll have a look at the A major scale below:

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

While writing out an A major scale, I had to use three sharps in order to maintain the correct intervals of the major scale. What are the correct intervals? A whole step between all notes except for 3 & 4, and 7 & 8, which have only a half-step between them.

Extra credit, anyone? Here's a self-test to see how you can put this knowledge to use. In the charts below, write out a G scale, adding sharps as necessary to raise certain notes. Then, to see how you might have to *lower* some tones instead of raising them, write out an Eb scale.

G scale

1	2	3	4	5	6	7	8
G							G

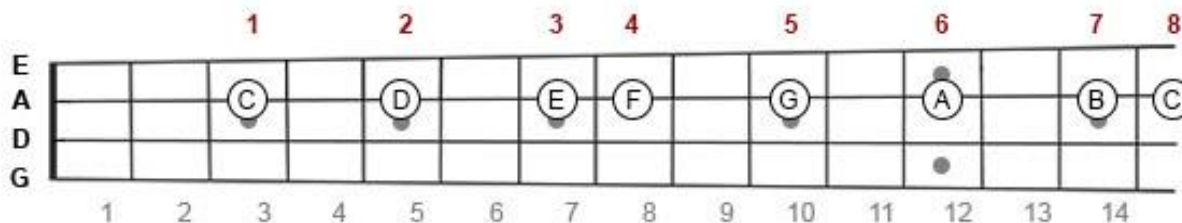
Eb scale

1	2	3	4	5	6	7	8
Eb							Eb

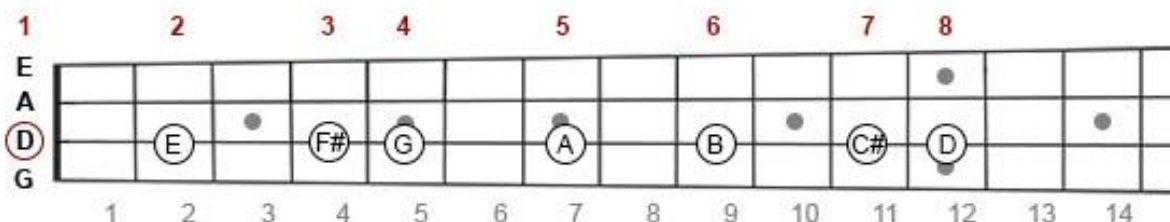
Numbering of the Notes

Just to re-cap now, the first set of numbers we're using beyond the fret and string numbers, are the numbers assigned to **notes** – in this case, notes which are the scale degrees of a major scale. The third note in a major scale is always the same distance from the root, no matter what major scale we are discussing. The scale degrees from scale to scale are the same, because the intervals between notes are the same for every major scale. The following images show the scale degrees (numbers) for the notes of a C major scale and a D major scale from the mandolin fretboard.

C major scale degrees shown in red.



D major scale degrees shown in red.



So, when musicians speak of 3rd or 4th, they could be speaking of a string number, a fret number or a note of a specific scale. Knowing how scale notes are numbered can help you to determine the context and to know what a teacher or other musician is talking about.

What About Minor Scales?

The intervals between the notes of a minor scale are different than that of a major scale. Remember, it is the **interval pattern** of half and whole steps that determines the quality of the scale. It is good to memorize the definition of a *major* scale from the start, which states that there is a half-step between 3 & 4 and between 7 & 8 while all other notes are a whole step apart. I'll not ask you to memorize the intervals of a minor scale at this point, but I'll show you here what they are. Look at this A minor scale:

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

The A minor scale above has all natural notes, no sharps or flats. They are the exact same notes as a C Major scale, except that they start on A and end on A. C Major is called the *relative major* of A minor—and, A minor is called the *relative minor* of C Major, because they share exactly the same notes. Since we know that there is only a half-step between the B & C notes, and between the E & F notes, a look at our chart will teach us that the definition of a *natural minor scale* would be eight notes ascending with a half-step between the 2nd & 3rd and between the 5th & 6th, and all other notes are a whole step apart. This holds true of all the *relative minor scales*. For any Major scale, the 6th degree of that scale is the *relative minor* of that scale. The note A is the sixth degree of the C Major scale. This sort of relative minor relationship holds true for all Major scales. For the D Major scale on the mandolin fretboard above, the relative minor would be B minor, because B is the sixth degree of D Major.

Musical Intervals

In music, an *interval* is simply a distance between notes. In Western Music, the smallest interval we'll consider is the half-step (also known as a *semitone*). We've already seen that our system of music has *twelve half-steps (semitones)* which make up the *chromatic scale*. The next largest interval is the *whole step (or tone)* which is made up of two half-steps.

Other Intervals

Other intervals are made by adding a certain number of semitones above the root note, and can be understood in one way by looking at scale degrees. Here are some examples using the scale of C (of course these relationships apply to any Major scale):

1	2	3	4	5	6	7	8
Perfect Unison	Major Second	Major Third	Perfect Fourth	Perfect Fifth	Major Sixth	Major Seventh	Perfect Octave
C	D	E	F	G	A	B	C

These musical intervals named in the chart above are measured from the root note. From the root note (in this case, the C) to itself is called the perfect unison. From the root note to the fifth degree (from C to G) is called an interval of a perfect fifth. From the root to the fifth there is a distance of *seven semitones or half-steps*. From the root note to its octave is, of course, *twelve semitones or half-steps* which becomes apparent if you think about it. A scale from root to the next octave must cover the distance of all twelve notes contained in a chromatic scale. That's why the octave of an open string note on the mandolin can be found at the twelfth fret, twelve half-steps away.

Anyone who can carry a tune at all, or at least remember a tune well in silence, can recognize the sounds of some of these intervals in relation to the root note. For instance, the perfect fourth is the interval used in the tune *Here Comes the Bride*. The first four notes of that tune consist of the root note followed by the fourth played three times (dah – dah, dah, dah). That is the sound of the fourth interval. The tune *Baa Baa Black Sheep* is another that opens with the root played twice followed by the fourth played twice. To remember the sound of the perfect fifth, hum the tune *Twinkle, Twinkle Little Star*. The first twinkle there is sung in the root note while the second twinkle is a perfect fifth above it.

Major this, Perfect that, yadda yadda yadda

Usually when speaking among musicians about these intervals, the ones shown in the chart above that correspond to the notes of the major scale can be called out in shorthand, as “the third”, “the fifth”, etc. and a descriptor is only added to the name if it is an “in between” note; example, the third = E in the chart above but to indicate an Eb we'd say “the minor third”.

Why are four of the intervals called “perfect” intervals? The unison, fourth, fifth and octave are special, as none of these notes can be considered either major or minor; they just “are.” The fifth is the most consonantⁱⁱⁱ of the intervals in a major scale except for the unison and the octave. The fifth belongs in all the major and minor chords, and extended chords. The inversion of the fifth is the fourth. A fifth (seven half-steps) *UP from the root* of C yields a G (the perfect fifth), while a fifth (seven half-steps) *DOWN from the octave* of C yields an F (the perfect fourth). There is plenty of information to be found on the perfect

intervals by simple internet searches for anyone who wants to know more. This section is concerned only with helping you to understand how the intervals are derived from the degrees of the major scale.

In addition to the intervals shown in in the chart on the previous page, there are names for the intervals that lie outside the scale, for example minor second, minor third, minor sixth, minor seventh. These are found by flattening the scale degree. In order to show this, I'll use a chart of the C chromatic scale.

1	-	2	-	3	4	-	5	-	6	-	7	8
C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
Perfect Unison	Minor Second	Major Second	Minor Third	Major Third	Perfect Fourth		Perfect Fifth	Minor Sixth	Major Sixth	Minor Seventh	Major Seventh	Perfect octave

As you can see from the chart, there is a note dead center with no name. There is no such name as a minor fifth; the fourth and the fifth are perfect intervals considered neither minor nor major but common to both types of keys or chords. The Gb, therefore, can have two other names, it is either an augmented fourth or a diminished fifth, depending on what's being done with it musically.

Similarly, any of the other notes above could be considered as augmented or diminished forms of their neighbors, so these names could be applied to other notes as well as to the Gb in the chart above. Confused? I could write a section on augmented/diminished notes if I thought it were necessary; but the concept is fairly simple even if it seems confusing. It has to do with lowering a note by a scale degree (diminish) or sharpening a note (augmenting). I'll add one more chart with some teeny tiny lettering for studying if you are really interested (or confused).^{iv}

1	-	2	-	3	4	-	5	-	6	-	7	8
C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
Perfect Unison	Minor Second	Major Second	Minor Third	Major Third	Perfect Fourth		Perfect Fifth	Minor Sixth	Major Sixth	Minor Seventh	Major Seventh	Perfect Octave
Diminished Second	Augmented Unison	Diminished Third	Augmented Second	Diminished Fourth	Augmented Third	Augmented Fourth Or Diminished Fifth	Diminished Sixth	Augmented Fifth	Diminished Seventh	Augmented Sixth	Diminished Octave	Augmented seventh

To summarize, the musical intervals discussed in this section have names derived from the degrees of the Major scale. It is important to familiarize yourself with the concepts of the unison, second, third fourth, fifth, sixth, seventh and octave. It is also helpful to know that many of these can be flattened to make a minor interval.

[Read a less complicated introduction to intervals by Louise NM at Mandolin Café](#)

[Wikipedia article on musical intervals](#)

[Wikipedia article on "perfect fourth"](#)

[Wikipedia article on "perfect fifth"](#)

... on to the next section, Chords by the Numbers!

Chord Numbering

Like just about everything else in music, chords can be numbered. People may call out a chord number to indicate what chord to play in a progression. A *chord progression* is the harmonic map of a tune or song composition. It tells which chords to play in what sequence, and how many beats are to be covered by each chord. Following could be a chord progression for *Mary Had A Little Lamb* in the key of C:

C / / / C / / / G / / / C / / /
C / / / C / / / G / / / C / / /

In that simple progression, the chord name indicates the first beat of each measure; beats 2, 3, 4 of each measure are indicated by slashes. However, it can be even better to indicate the chord changes in a progression with numbers, like this:

I / / / I / / / V / / / I / / /
I / / / I / / / V / / / I / / /

What makes this desirable is that it shows the chord progression of the song no matter what key you wish to play it in. The One chord is the key chord. In the key of G, for instance, the one chord would be G and the five chord would be D.

Limiting the Confusion of Numbering in Music

There are some simple devices I like to use to help limit the amount of confusion brought on by so much numbering going on in music. These conventions are helpful when *writing about music*, unfortunately, they don't help much when *speaking about music*. In those cases, we simply have to rely on context and on our musical knowledge. It's time to introduce those conventions now.

1. Arabic numerals for scale degrees. When writing about individual notes, or scale degrees I simply use Arabic numerals: 1, 2, 3, 4, 5, etc.
2. Spelled numbers for intervals. For musical intervals I try to stick with first, second, third, fourth, etc. or sometimes 1st, 2nd, 3rd, 4th, etc. I use these same devices for numbering strings and frets in writing, although on charts and diagrams I may use simple numbers.
3. Roman numerals for chords. For referring to chords, I stick with Roman numerals.
4. I use uppercase Roman numerals for Major chords, and lowercase Roman numerals for minor and diminished chords.

It's important to note that not everyone uses these same conventions. For instance, in the Nashville Numbering System for chord progressions, Arabic numerals are usually used to indicate chords rather than Roman numerals. There are many other ways people do it, but to avoid confusion I prefer to use the conventions I list above, and I'd be happy of course if everyone adopted these, but it's never gonna happen! Resisting standardization will always be a mainstay of the human experience, I think. Meanwhile, rest assured that there are many, many others who think the way I do. I didn't invent this stuff, I learned it; I like it, and that's the way I teach it or communicate in it.

Understanding the Basics of Chord Numbering

Fortunately, chord numbering follows the scale degrees, so like interval numbering, chord numbering is pretty simple once you have the foundation of understanding scales and scale degrees.

Only seven Roman numerals are used in chord numbering, since they correspond with the seven letters of the alphabet used for note names and chord names—or rather, they correspond to the seven note degrees that make up a diatonic scale!

So then,

Roman numeral I corresponds to the first scale degree of any scale: the root.

Roman numeral II corresponds to the second scale degree of any scale.

Roman numeral III corresponds to the third scale degree of any scale.

Roman numeral IV corresponds to the fourth scale degree of any scale.

Roman numeral V corresponds to the fifth scale degree of any scale.

Roman numeral VI corresponds to the sixth scale degree of any scale.

Roman numeral VII corresponds to the seventh scale degree of any scale.

Roman numeral I corresponds to the octave of course, since it is the same as the root.

The Concept of Key

What is a musical key? The key of a given piece ... the idea of “key” has to do with the tonic note and chord that a musical piece is centered upon. Play a note C, then a C Major chord ... center a song around those utilizing the notes and chords of the C Major scale. Or, play a note C, then the C *minor* chord ... center a song around those utilizing the notes and chords of the C minor scale.

A musical key centers around a specific note (called the tonic, or root) and its corresponding chord triad (Major or minor). We have seen and understand that a musical scale can begin with any note and end with its octave note. The beginning note is called the root, the tonic, or the key.

The chord triad derived from that tonic note determines whether the key is major or minor. A major chord triad contains the root, the third and the fifth. A minor chord triad contains the root, the minor third and the fifth.

For any given key, for any given tonic note, there is a diatonic scale for that key, and the scale degrees help determine the chords that belong to that key. This is called *diatonic harmony*. “Diatonic” means literally “through the tonic” or “with the tonic”. “Harmony” refers to chord voicing. Melody in its most basic form is a string of individual notes that create a tune, a story. Adding complementary notes to the melody notes is called harmony. That’s what a chord is, a grouping of complementary notes played simultaneously. In diatonic harmony, the notes that make up the chords come from the scale degrees of the key.

Diatonic Harmony of a Major Key

C Major example:

1	2	3	4	5	6	7	8
C	D	E	F	G	A	B	C
I	ii	iii	IV	V	vi	vii*	I
C	Dm	Em	F	G	Am	Bdim	C

G Major example:

1	2	3	4	5	6	7	8
G	A	B	C	D	E	F#	G
I	ii	iii	IV	V	vi	vii*	I
G	Am	Bm	C	D	Em	F#dim	G

ANY Major chord example:

1	2	3	4	5	6	7	8
I	ii	iii	IV	V	vi	vii*	I
Major	Minor	Minor	Major	Major	Minor	Diminished	Major

The diatonic harmony of a **major key** determines that only three major chords belong to the key: The I, IV and V chords. All other chords built on the scale of the key will be minor chords, with one diminished chord built on the 7th degree.

Note that the Major chords are derived from the perfect unison, the perfect fourth, and the perfect fifth degrees, so once you learn the perfect fourth and perfect fifth intervals, it's easy to remember that those are the major chords found in a major key!

There is a video produced for the Woodshed Study Group by Henry Stevens that shows pretty clearly why this pattern of chords always arises from the diatonic harmony of the major scale. In the video, he uses the key of G as an example and builds each chord from the scale with graphics.

[Watch this video to learn more](#)

It's worth noting here that there are more than one way to write these chords in Roman numerals. While I prefer to write lowercase for minor and diminished chords, many people prefer to write uppercase Roman numerals for all chords. The author of our study material, Brad Laird, prefers to always use uppercase. The following table shows both methods of writing these chords:

I	ii	iii	IV	V	vi	vii*	I
I	IIm	IIIm	IV	V	VIIm	VIIIdim	I

I will continue to use only the uppercase/lowercase method here and elsewhere.

Diatonic Harmony of a Relative Minor Key

ANY natural minor key example:

1	2	3	4	5	6	7	8
i	ii	III	iv	V	VI	VII	i
minor	minor	major	minor	major	major	major	minor

Note: I am showing here the natural minor scale, which is the relative minor scale. There are two other 'derived' minor scales often used in modal music, the harmonic minor and the melodic minor. The diatonic harmony for each of those scales is given on the next page as well.

ANY harmonic minor key:

1	2	3	4	5	6	7	8
i	ii*	III	iv	V	VI	vii*	i
minor	diminished	major	minor	major	major	diminished	minor

ANY melodic minor key:

1	2	3	4	5	6	7	8
i	ii	III	iv	V	vi	vii	i
minor	minor	major	minor	major	minor	minor	minor

To study more about diatonic harmony, and to see better the differences in the three most common minor keys, I suggest reading this article:

[Unlocking the Mysteries of Diatonic Harmony](#)

What on Earth Does Diatonic Mean?

I've been tossing in or throwing around the descriptive term, "diatonic", ever since we left the section on "chromatic scale".

Here I'd just like to say that if there are things I've written in here that the reader finds difficult to understand, and you'd like to ask me about them personally, I'm always happy to respond. I can be contacted through the [Mandolin Café forum](#), The [Woodshed Study Group](#) or through my website at www.markgunter.net which makes liberal use of Facebook comments plugin.

Also, you can use a search engine, read [Wikipedia articles](#), etc. to learn more about these concepts.

Diatonic describes a scale, or key, (or the chord harmonies derived from diatonic scales) based on a seven note scale (like the major and minor scales we've discussed above) containing only two half-step intervals, and the half-step intervals are separated by two or three whole steps within an octave. I don't really want to wade too deeply into this, and it's not of great importance to this article. The point is that the chromatic scale, containing all the notes, needs to be whittled down to work well in a given key, or tonal center. The diatonic scale yields simpler major or minor seven note scales providing "keys" to build music with.

The word diatonic comes from the Greek, basically meaning ***moving "through the tones" of a scale pattern*** (*dia* = through; *tonic* = key or root tone).

Again, it is not really important to know all this in order to benefit from this article, and if you'd like to study more about diatonic scales an internet search will be your friend. There is plenty of free information available on all aspects of music theory. The purpose of this article is to introduce these concepts and show a bit about how the concepts relate to numbering in music.

In numbering the chords through a major scale, it is good to remember that the I, IV and V chords are major chords, and all other chords are minor, ii, iii, vi with the vii chord being diminished.

Back to Chord Numbering

Chords within a key

What I would like for you take away from all this is that there is a musical system of diatonic harmony that teaches us which chords are built “through the tones” of any key. In plain layman’s terms, when you have, for instance, any **major key**, the chords that belong to that key follow a set pattern:

I ii iii IV V vi vii* I (Major, minor, minor, Major, Major, minor, diminished)

Many, many songs use chords that stay within the key. The most popular chords for many, many songs are the I, IV and V chords. The ii chord and the vi chord are also common chords in many songs written in a major key. A student of mandolin will do well to learn fingerings for all the major and minor chords early in their musical journey.

Chords outside a key

Many popular songs also can use chords that are “outside the key”. You may encounter a song in the key of A that has a G Major chord in the progression. Perhaps a song in the key of C that has an A Major.

Normally, a G chord in the key of A would be a Gdim – and an A in the key of C would be Am – but music can be written using substitute chords that normally fall “outside the key”. Diatonic harmony explains why certain chords go together, but it is not a rule or a law that dictates what chords have to go together. It is good to understand what chords “go” with a given key, but it is a pleasure to find where the harmony of a song deviates from the “norm.” In music, the only real rule is to make something sound good. Songs are written to sound compelling, not to follow musical grammar.

Knowing how to read or understand how people refer to chords by numbers will be helpful to your playing with others, regardless of how much you may or may not understand the theory behind it. Here again is our chart showing how chords are numbered:

I	ii	iii	IV	V	vi	vii*	I
I	IIm	IIIm	IV	V	VIIm	VII*	I

*diminished

Chord Extensions and Numbering

When you see a chord that is named like G7, or GMaj7—that is, when you see a chord that has numbers included in the chord (sus4, add9, etc.) you are seeing what is called an *extended chord*, and the numbers added to the chord indicate the *chord extensions*.

What is a chord extension?

Beginning with the triad ...

Chords are built by stacking certain notes together and playing them together in harmony. The basic chord construction is made by stacking three notes together. Those three notes are called a *triad*. Example: The triad for G Major Chord consists of the notes G, B, and D. You can check this by playing a G Major Chord on your mandolin, then mind where your fingers are and puzzle out the notes you are playing. In the common “two-finger-G-chord”, you’d be playing a G on the 4th string, a D on the third string, a B on the second string, and a G on the 1st string. The only notes you play, even if you play all four strings, are the notes G, B and D because these form the **G Major Triad**.

Now let's look at another chord: D Major. The triad for D Major Chord consists of the notes D, F#, and A. You can check this by playing a D Major Chord on your mandolin, then mind where your fingers are and puzzle out the notes you are playing. In the common "two-finger-D-chord", you'd be playing an A note on the 4th string, a D on the third string, an A on the second string, and an F# on the 1st string. The only notes you play, even if you play all four strings, are the notes D, F# and A, because these form the **D Major Triad**.

These major triads (the chord's three notes) are made by stacking notes in a particular order. Henry Stevens has done a good job of showing how this is done in his video mentioned earlier, which you can view here: [Watch this video to learn more](#)

Also, there are a couple of paragraphs about this in the text we are using, *Mandolin Master Class* by Bradley Laird, at the bottom of page 46, in the section titled, "Major Chords."

Extending the chord (other notes are added to the triad)

When additional notes are added to a chord triad, the additional notes are considered to be extensions to the chords.

Some information on chord extensions is also given in our text, *Mandolin Master Class* by Bradley Laird, 46-51. I do not want to add more about chord extensions here, or to repeat what Brad has written there, so in the interest of covering mainly the *numbering* facet of chord extensions, I'll say here that we use the scale in **two octaves** for building the chord extensions, which is why you'll sometimes see the numbers 9, 11 or 13 used in chord names. We'll use the key of G Major, therefore our chart will show two octaves of the G Major Scale:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
G	A	B	C	D	E	F#	G	A	B	C	D	E	F#	G

Highlighted in yellow is the G Major Triad, and highlighted in green are the common extensions you are likely to see, although these are by no means all the extensions available, or even the most common ones. What you can see from the chart above is the normal pattern of adding notes to the chord is to add every other note along the scale. In popular music, you are more likely to see a dominant 7th chord than any other extended chord, and that chord falls a bit outside the chart above. We'll discuss a couple of common chord extensions next, then we'll discuss a couple other chord alterations.

GMaj7

GMaj7 is made by stacking the 7th note of the scale on top of the triad. This chord has four notes: G, B, D and F#. This chord will sound a bit "dissonant", and for good reason. The note F# is only a half-step away from the root or key note—there is only a half-step between the 7th and 8th of a major scale—and because of this, the ear hears a very strong pull toward the key note of G. The further away from a root or tonic note along the scale, the more consonant the note may sound; the closer to the root a note is, the less consonant it may sound played together with the tonic. This is why the D note, which is the perfect fifth in G, is the most consonant note—it is a full fifth above the root, and a full fourth below the octave. (Inversely, the C note, or perfect 4th, is a full fourth above the root and a full fifth below the octave).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
G	A	B	C	D	E	F#	G	A	B	C	D	E	F#	G

G7 – The Dominant 7th Chord

G7 is a much more common chord than GMaj7 or any of the other chord extensions. When a chord is given as G7, D7, C7, etc. rather than GMaj7, DMaj7, CMaj7, etc. it indicates the Dominant Seventh Chord rather than the Major Seventh Chord.

A Dominant 7th chord is formed by adding the **flatted** 7th note to the triad. In our G scale example, rather than adding an F# we would add an F note, which is the flatted 7th degree of the G scale. So a G7 contains the notes G, B, D and F. This chord has a bit less stable sound than the Major7 chord, and has plenty of motion or pull to it. The G Major chord is the V chord in the key of C—it is the dominant chord of the key of C—the least stable chord in the key of C because it is far from the root and wants to resolve to the root. When playing in the key of C, it is common to encounter a G7 chord, especially as a passing chord to the IV or I chord. The flatted 7th (F note) is common to the key of C, in which G7 is the dominant V chord, while the note F# is *not* common to the key of C.

It is good to understand how a seventh chord is made, and what is the difference between a major seventh chord and a dominant seventh chord. It is also good to remember that the shorthand form of G7 indicates a dominant seventh chord rather than a major seventh.

G6

A G6 chord is simply made by adding the sixth degree to the major triad. The notes of a G6 are G, B, D and E. This chord is not nearly as prevalent as the 7th chords.

G9 – G13

Chord extensions are typically stacked thirds up to 13 – this covers all the notes of the scale. On most stringed instruments, some notes have to be omitted to get the voicings. There is more information on which notes are normally omitted in our text as well as in the following Wikipedia article:

[Extended Chord](#) Wikipedia article

Other Chord Alterations

Here a couple of other chord variations to illustrate the use of numbers in chord names and what the numbers mean. In these cases, the chord is not extended, but rather the chord triad is altered.

Suspended Chords

Gsus2 or Gsus4—again, using G as the example, the suspended chord drops the third degree from the chord triad, so rather than 1 – 3 – 5 (G, B, D) the chord drops the B note. A Gsus2 drops the B note and adds the 2nd scale note A, so the structure of Gsus2 would be 1 – 2 – 5 (G, A, D). And the more common Gsus4 chord would be 1 – 4 – 5 (G, C, D)

Augmented

Gaug indicates an augmented 5th so this chord triad changes from 1 – 3 – 5, to 1 – 3 – #5 (G, B, D#).

Wrapping Up

Now to wrap up this article. We've covered a good bit of territory in here. Some of it has been very elementary and easily explained, and other of the material has been a bit heavier. Some of it could only be introduced, because to explain further would be to write a book on music theory. It is my hope that what has been introduced can be understood, and will help in getting a handle on the sometimes confusing use of overlapping numbers in music.

I would encourage you to go back and on page 8 make sure that you can understand what makes a major scale, well enough to write out the scales in the blanks provided there. I'd also encourage you to watch the videos referenced, and read the articles referenced in the course of this little article. And if you still haven't had enough, and have found this article helpful, please join in discussion with us in the Woodshed Study Group at the Mandolin Café Forum.

Disclaimer. *I have written about these topics to the best of my ability, but I claim no expertise or authority on the subjects of music and music theory. I welcome corrections, and am happy for the reader to know that this is written to be helpful, but is by no means the final word on anything whatsoever.*

Notes:

ⁱ A musical note **tone** having two names, like A#/Bb, is called an *enharmonic equivalent* and both A# and Bb are names for the exact same note on most of our musical instruments, which are tuned to 12 Tone Equal Temperament Tuning these days. There are other tuning schemes used historically, but 12TET is the most commonly used, and is assumed in this paper.

ⁱⁱ Actually, there are seven **modes** to go with each major scale, and each of these modes can be considered a distinct diatonic scale. The "relative minor" or "natural minor" scale is the 6th mode of the C Major scale, and there are the other modes to be considered as well. So technically, C Major and its relative minor, A minor, are not the *only diatonic scales* that contain *only natural notes*. Other modes derived from the C major scale will also be diatonic scales that contain only natural notes. Introducing and discussing each of the other modes is beyond the scope of this article.

ⁱⁱⁱ **Consonant** means that the sound of the perfect fifth *blends very, very well* in harmony with the root note.

^{iv} A bit more information on Augmented and Diminished Intervals. Any interval can be "augmented" by raising the note a half-step. **Diminished intervals** are either made from *minor intervals* by lowering the note a half-step, or made from *perfect intervals* by lowering the note a half step. Lowering a major interval results in a minor interval; lowering a minor interval results in a diminished interval. Lowering a perfect interval *does not* result in a minor interval, because perfect intervals can't be called major or minor—so lowering a perfect interval also results in a diminished interval. Sometimes, augmenting or diminishing an interval note will result in double sharps or double flats! Here is a version of the same chart shown on page 11 that shows the actual note names of the augmented and diminished intervals found in the key of C major:

1	-	2	-	3	4	-	5	-	6	-	7	8
C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
Perfect Unison	Minor Second	Major Second	Minor Third	Major Third	Perfect Fourth		Perfect Fifth	Minor Sixth	Major Sixth	Minor Seventh	Major Seventh	Perfect Octave
Diminished Second (Dbb)	Augmented Unison (C#)	Diminished Third (Ebb)	Augmented Second (D#)	Diminished Fourth (Fb)	Augmented Third (E#)	Augmented Fourth Or Diminished Fifth	Diminished Sixth (Abb)	Augmented Fifth (G#)	Diminished Seventh (Bbb)	Augmented Sixth (A#)	Diminished Octave (Cb)	Augmented seventh (B#)