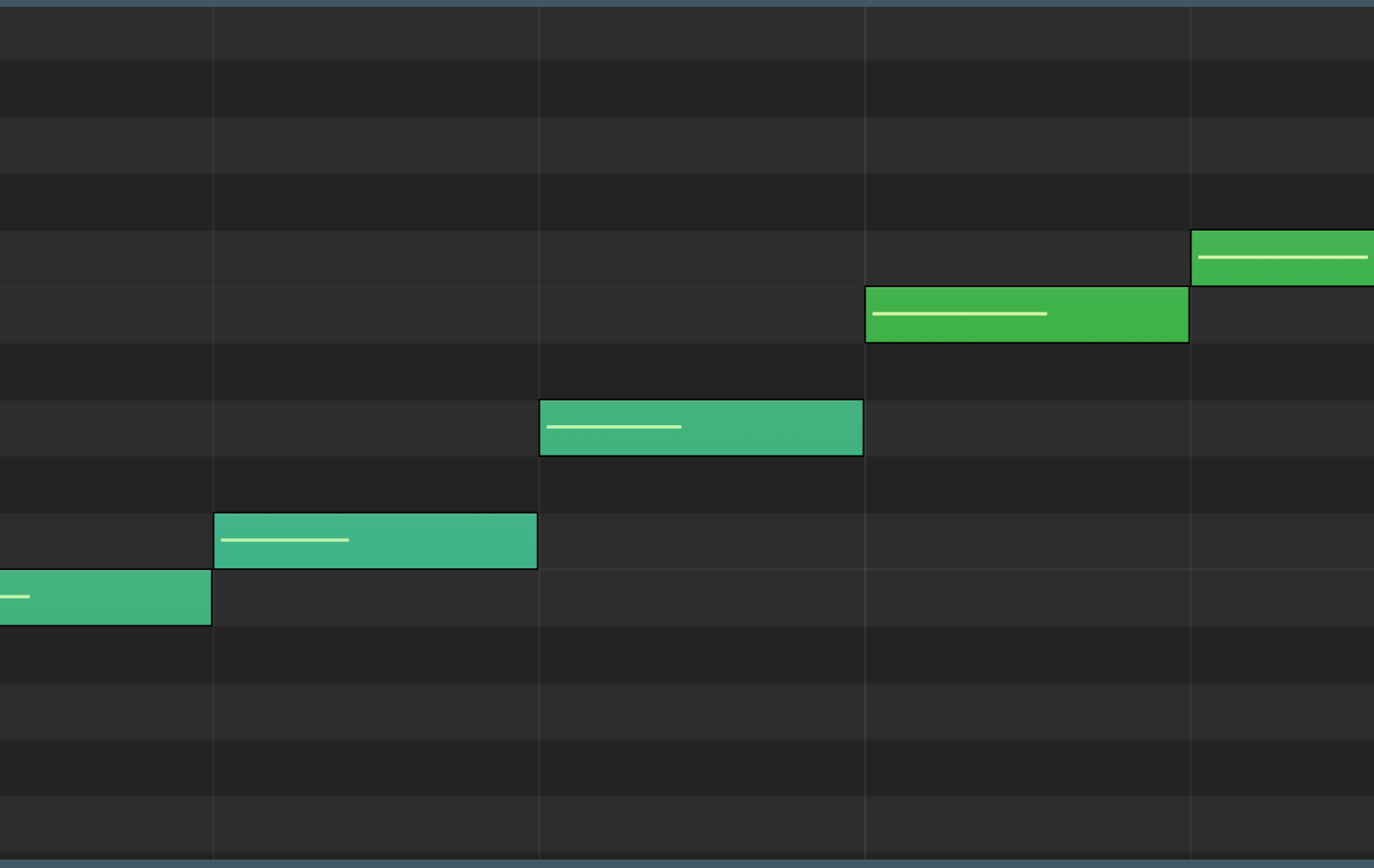
EASY THEORY FOR MUSIC PRODUCERS

USING BASIC NUMBERS AND PICTURES

The absolute fastest way to learn basic theory for electronic music production, even if you've tried and failed before!



Jumpstart EDM

Easy Theory for Music Producers Using Basic Numbers and Pictures

Version 1.0

Contents – Brief

Contents – Expanded

Welcome to the Family!

Hello, and welcome to the Jumpstart EDM family!

I want to personally congratulate you for taking a big step towards increasing your music production knowledge and pursuing your passion.

By downloading this PDF, you have joined an exclusive community of producers that is pioneering the future of music production. Most people only talk about what they want to do, but you actually *took action* to get better at your craft. And that's fantastic news because…

Jumpstart EDM's mission is to help new music producers learn the basics of EDM production as quickly and effectively as possible.

This guide was specifically designed to help you ***finish more music,*** faster, and without sacrificing creativity or quality.

Thank you so much for joining us, and please feel free to reach out at any time.

Happy Producing!

Eric Hitchens, Founder
Jumpstart EDM LLC

Preface

Some Explanations & Disclaimers

General Background: We acknowledge that anyone can go on the Internet and instantly find the notes for every scale, chord, and progression that ever existed. In fact, we provide complete sets of all major and minor scales in Appendix D. Therefore, this book is not intended to be a watered-down, quick-reference "cheat sheet."

Instead, it is intended to be a thorough, in-depth textbook for those who really want to increase their understanding of how music works from the ground up. We go *deep* into explaining musical systems and provide clear, visual, walkthrough-style examples of how to make all the most important scales in electronic dance music (EDM).

We developed this book with the intention of helping producers bypass some of the common frustrations we ourselves experienced with traditional music notation. We believe that classical staff notation is useful for the practicing instrumentalist, but it is unnecessary for the computer musician who spends most of his time editing MIDI notes and not arranging scores for symphonies.

A Note on Writing Style: You'll notice that we use the impersonal "we" throughout the text, as well as the use of tables, charts, formulas, and terms like "recursive." This stems from the founder's background in physics and mathematics, and it is this systematic, analytical way of looking at music that has allowed us to completely revolutionize our understanding of *how and why music actually works*.

Most college-level textbooks on music theory are extremely dry and force you to accept the classical system because "that's just the way it is." Most

books just force you to *memorize* dozens of terms instead of explaining the *reasons* behind them.

That's because there aren't many real reasons why the classical system is the way it is. We specifically wrote this book to guide readers as if no classical system existed. We asked questions like:

"What if all you had was the piano and had to explain the keys? How would you name the keys, starting from scratch, without flats and sharps?"

Although the explanations in this book use a new system, called Simple Music Notation™, we acknowledge the necessity of being able to reference the classical names of notes in the DAW and in discussions with colleagues. Therefore, we present the basic concepts via a discovery-based process in Part I - Fundamentals, with the intention of guiding the reader through a musical, experimental introduction of sorts. Part I is written to provide simplified explanations of musical terms in classical notation, as well as to introduce what I believe are significant improvements.

If You Find Errors: We wrote this book over several months and spent extensive time researching and quality-checking the information contained in the illustrations, charts, and formulas. However, no one, and no textbook, is perfect. If you find technical or grammatical errors in this book, please contact us at eric@jumpstartedm.com, and we will publish a running errata on our website until a new, corrected version is released. If conflicting technical information exists in this book (e.g. if two identical charts have differing information), then go with whatever is in the appendices and contact us for clarification.

We sincerely hope that reading through this book will provide you with an "aha" moment. We know writing it certainly provided many of them for us!

Brief Summary of Terms

The TL;DR for Musical Terminology

If you are brand new to music theory or production, we recommend that you head straight over to Part I – Fundamentals. This section is intended to be a very condensed review of terms for those who are already familiar with music theory and want a quick refresher before heading into the main chapters.

What is a scale? Simply put, a **scale** is a set of ordered **notes**. You can think of notes as keys on a piano. The most common scales in Western music are made up of 7 unique notes. For this reason, we call them **heptatonic scales** (from Greek *hepta*, meaning *seven*). The vast majority of electronic and classical music has been written in heptatonic scales. We will also briefly address **pentatonic scales** (5-note scales) in this book because they are also common in electronic music.

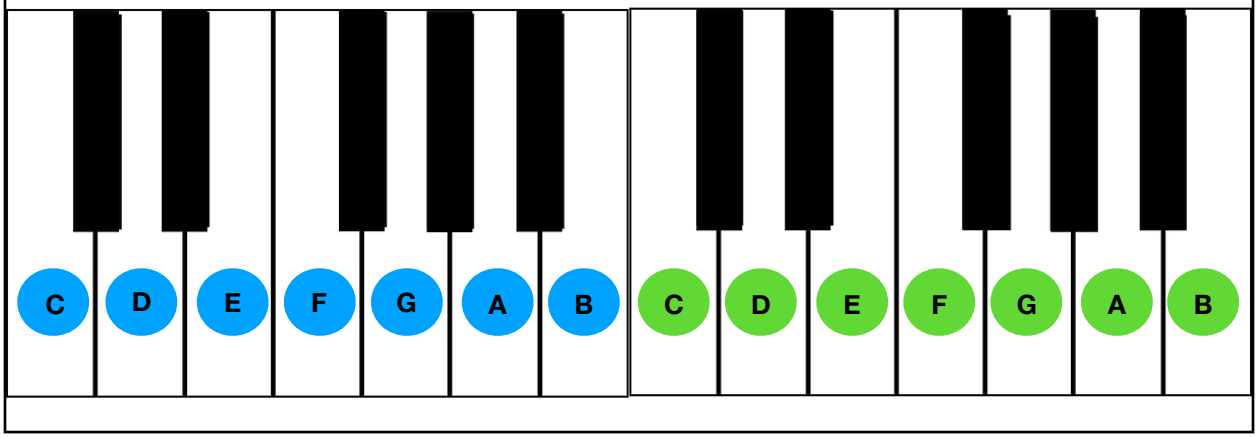
Notes on the keyboard only ever contain the letters A through G. The first note in a scale is called the **tonic**. We may also refer to a scale as a **musical key**. The way that the notes are ordered in the scale determines the scale's **mode**. The two most popular modes are the **major** and **minor** modes. Most EDM is written in the minor mode.

We can refer to a certain scale by listing its tonic note followed by its mode. For example, a scale that starts off with A in the major mode would be called "A Major." We can refer to this as "the A Major scale," or "the key of A Major." We capitalize both the tonic and the mode in this book. We abbreviate major scales by listing their tonic. We list minor scales by listing the tonic followed by a lowercase "m." For example, the abbreviation for A Minor is "Am," and the abbreviation for F Major is "F." For pentatonic scales, we refer to them with the above method and add "pentatonic." For

example, a major pentatonic scale starting on F would be called “F Pentatonic.”

If we write a piece of music using only the chosen notes of a certain scale, we say that we are “playing in key.” As we play the notes in a scale, they repeat in higher and lower segments on the keyboard called **octaves**. Let us consider the key of C Major, as shown in Figure 0.1.

FIGURE 0.1 - KEY OF C MAJOR



Here, we have a zoomed-in view of a piano keyboard that shows us the component notes of C Major, over the range of two octaves. The octaves have been colored differently to show their difference.

C Major contains the notes:

C D E F G A B

And we can give each note in the scale a corresponding number:

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

Note that there is a C in the green octave as well as in the blue octave. We say that these notes are an octave apart, and that they are **octave-equivalent**. The human brain hears them to be very similar notes because their corresponding **frequencies** are multiples[1] of each other by exactly 2.

Frequency is a measure of how fast sound vibrates. We measure frequency with the unit **Hertz (Hz)**, where 1 Hz = 1 vibration per second. The range of frequencies from 0 to approximately 60 Hz is called the **sub bass** range.

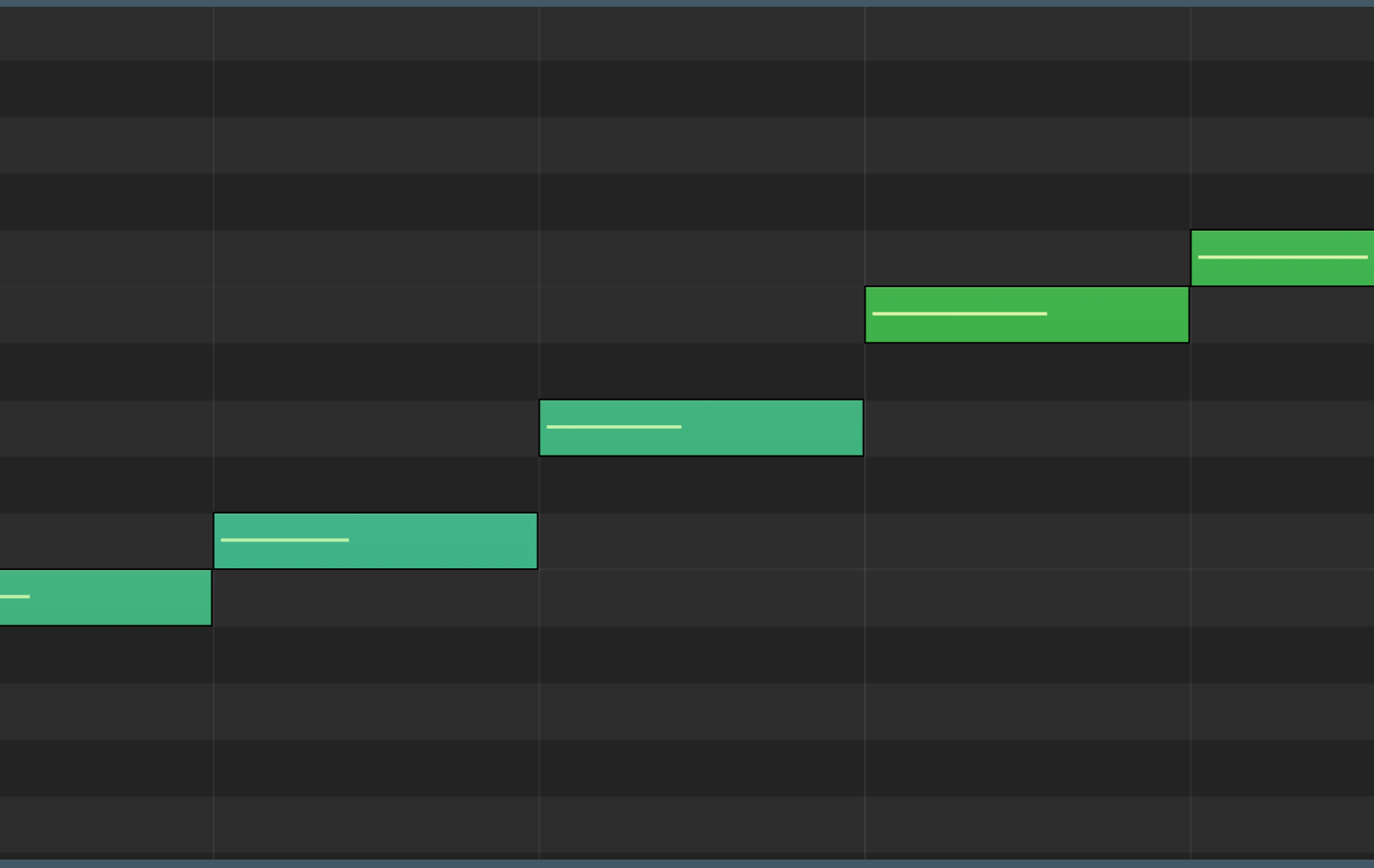
We can refer to any note on the piano by listing its letter name, followed by its place on the keyboard in a subscript. Thus, the first C on the piano is C_1. We call this notation **scientific pitch notation (SPN)**. We mention SPN because it is used to denote piano keys in **digital audio workstations (DAWs)**, where producers create electronic music. A DAW is a computer application used to create, record, or edit audio.

The black keys on the piano are referred to by using marks called **accidentals**. The black key in between G and A, for example, may be referred to as either G♯ (G-sharp) or A♭ (A-flat). This duality of notation for the same note is referred to as **enharmonic equivalency**.

Note that there are exactly 12 piano keys in between the C's in the green and blue octaves, but there are not 12 notes in the key of C Major. We say that C Major is **diatonic** because it doesn't contain every note in between the green and blue C's and is instead constrained to the seven selected in the figure. If we used every note in between the green and blue C, we would call that a 12-note, **chromatic** scale.

[1] You can also think of them as multiples of 1/2.

PART 1 - FUNDAMENTALS



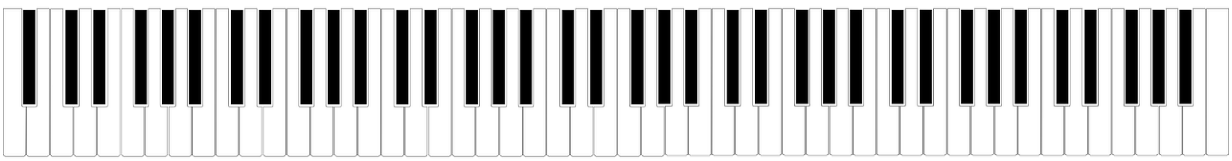
Jumpstart EDM

Chapter 1: What's in a Name?

1.1 The Piano Keyboard

Take a look at the piano keyboard below:

FIGURE 1.1 - OVERHEAD VIEW OF A PIANO KEYBOARD



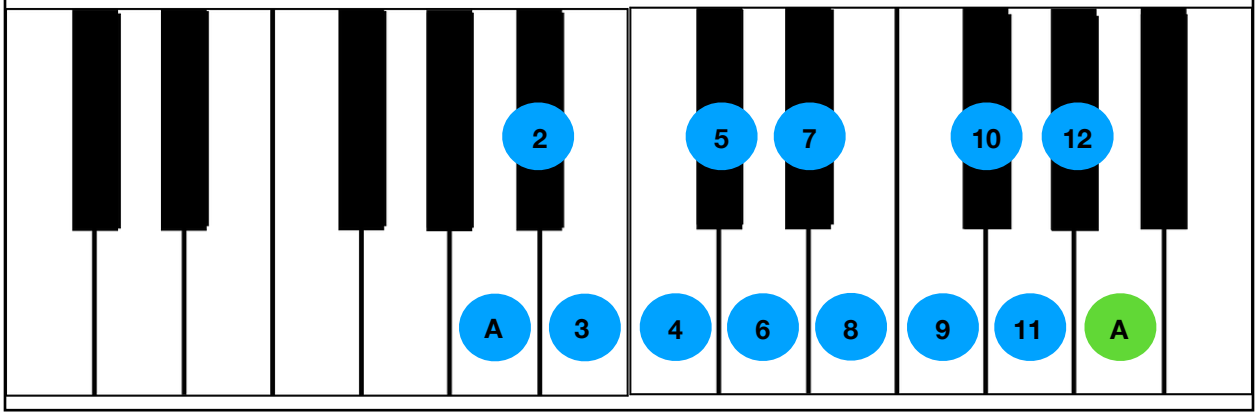
If you're new to music or just starting out with music theory, the above Figure 1.1 can be overwhelming.

There are 88 total keys on a piano – where do we start? Which keys do we care about, and how do we combine them to make our music sound good?

Fortunately, we really only need to pay attention to certain *sets* of them. If you pay attention to the black keys, you'll notice that they repeat in sets of 2 and 3 in between the white keys. Moving left to right, we can think of the set of all keys in between each "repetition" as a different section of the keyboard. We'll call this section an **octave**.

For example, take a look at Figure 1.2 below, which is a zoomed-in view of Figure 1.1. We'll pick a key and call it "A." Then, moving along the keyboard, starting with the blue A as 1, we count 12 keys before returning to another A on the piano. The set of blue keys is what we mean by the term "octave." We can also say that the musical distance, or interval, between the blue and green A's is also an octave.

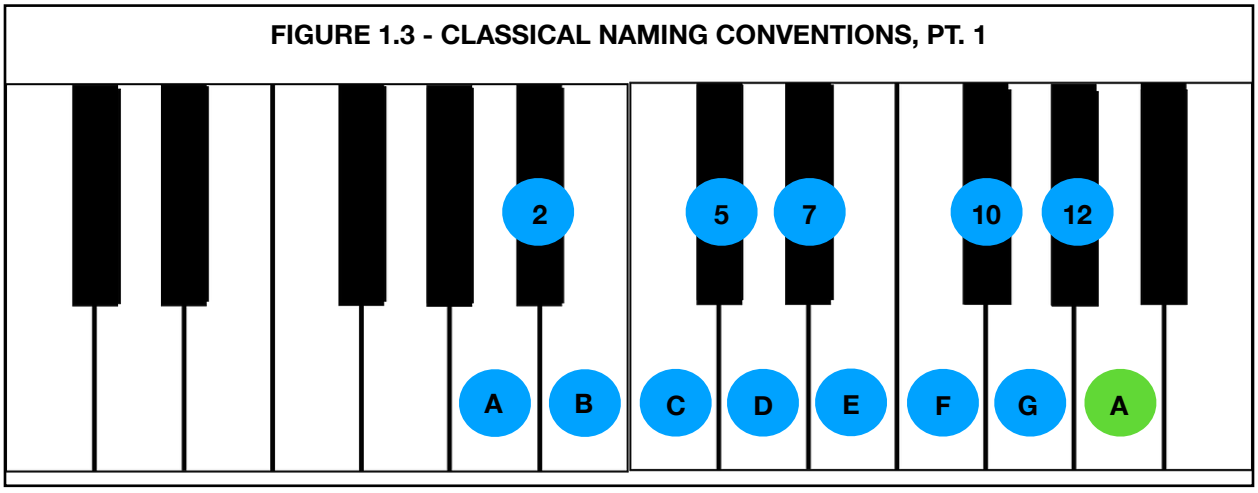
FIGURE 1.2 - ZOOMED-IN VIEW OF A PIANO KEYBOARD



1.2 Classical Naming Conventions

So now that we've named our first and last notes A, how do we go about naming the other notes on the keyboard? Let's say that we just list off the next letters in the alphabet for the white keys, as seen in Figure 1.3.

FIGURE 1.3 - CLASSICAL NAMING CONVENTIONS, PT. 1



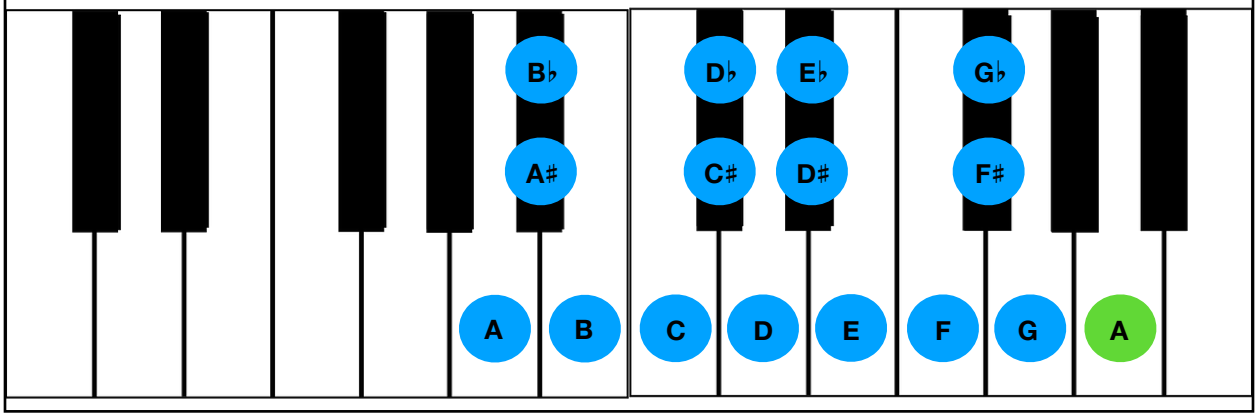
The next step is then to determine how to label the black keys. This is done by adding modifying symbols called **accidentals**. For example, the

black key in between C and D can be considered as both “one key above C” and “one key below D.”

To say that a note is “one key above another,” we call it a **sharp (♯)**. To say that a note is “one key below another,” we call it a **flat (♭)**. Thus, the key in between C and D may be referred to both as C♯ and D♭. We say that C♯ is one **half-step** above C, and that D♭ is one half-step below D**.** Whether we refer to it as C♯ and D♭ depends on the context, which we will dive into in Chapter 3.[2] The concept of a **step** is part of a larger concept called **musical distance**, or **interval**. Intervals are covered more deeply in Chapter 3.

For now, let’s modify our piano keyboard to reflect our new naming convention, in Figure 1.4:

FIGURE 1.4 - CLASSICAL NAMING CONVENTIONS, PT. 2



Okay so, what if we want to refer to a key that is two keys above another? Or two below? It turns out we use the accidentals called **double sharp (𝄪)** and **double flat (𝄫)**.

[2] Technically, the only reason why C♯ and D♭ are the same today is because of a tuning system called “equal temperament.” For more information, see Equal Temperament on Wikipedia: https://en.wikipedia.org/wiki/Equal_temperament

1.3 Pitfalls of the Classical System

At this point, any of the following questions may pop into your mind:

- Why did we choose to name the keys based solely on the white keys?
- Why do we only use the letters A through G?
- Why not use a different letter for each key and not use flats and sharps?
- Why not just use numbers?
- Why would we ever want to refer to something as double sharp or double flat??

The short answer is that this is just the way the musical system developed. It is what it is, and this way of referring to keys is the standard practice of the entire music industry. Depending on the context, E could be referred to as F♭ or D𝄪. F could be referred to as E♯ or G𝄫. Why would we ever want to do this?

We'll conclude this section by stating that the "same note, different name" philosophy is called **enharmonic equivalency**, and you can read about it more with a full keyboard reference in Appendix A.

But won't these weird names complicate things down the line when we get to more intricate concepts? Isn't there a better way to think about keys on the keyboard?

Yes.

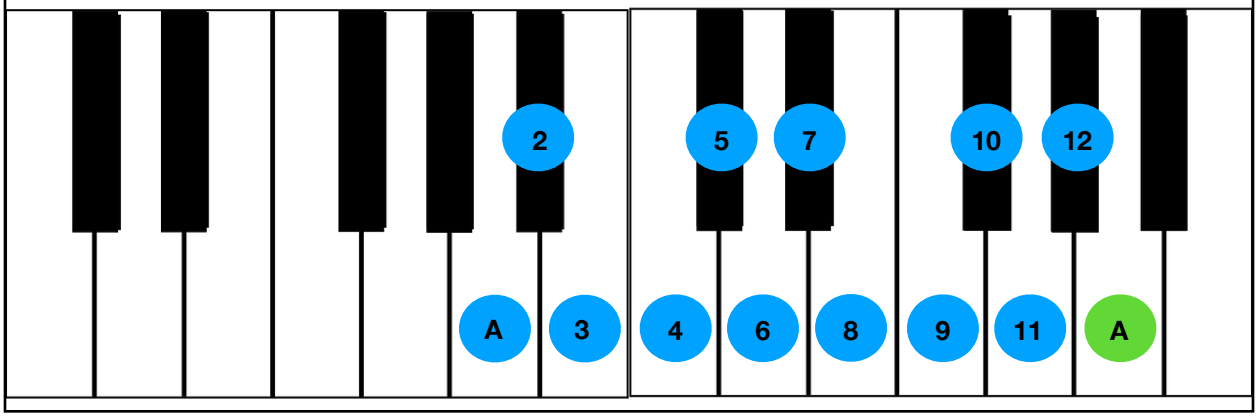
That's why Jumpstart EDM LLC created **Simple Music Notation™**.

Chapter 2: What Is a Scale?

2.1 The Chromatic Scale

Let's go back and look at the piano keyboard again. In Figure 2.1, we can label a sequence of keys on the keyboard with the numbers 1 through 12, where the key, A, is our starting point. We'll call A the **root** or **tonic note** of our selection of keys. After completing the 12-note sequence, we come back to our tonic note A, just in a higher section.

FIGURE 2.1 - REEXAMINING THE PIANO KEYBOARD

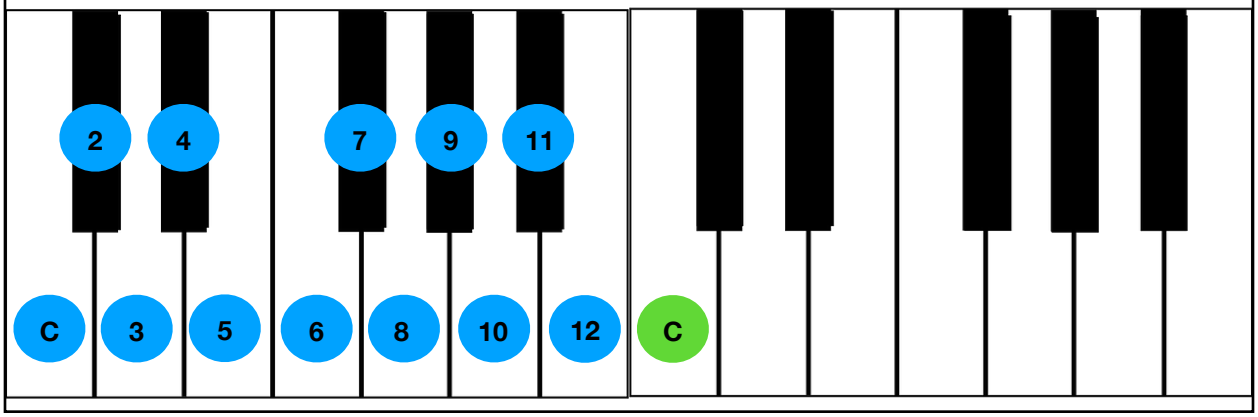


The interesting thing is that we don't have to limit ourselves to basing our 12-note selection solely on the note A. Let's see what this looks like when we choose our tonic to be C, as shown in Figure 2.2 (next page).

We still have a 12-note selection, and the 13th note is still our tonic, just in a higher position. Thus, we can choose *any* tonic *anywhere* on the keyboard, and we will still have a 12-note sequence of keys.

We'll call this sequence of keys the **chromatic scale**. The word "chromatic" comes from Greek *chroma*, meaning "color."

FIGURE 2.2 - CHOOSING C AS THE TONIC



You can think of a chromatic scale as the set of all 12 notes in between two notes of the same name on the keyboard. It has all colors (or flavors, or however you want to think of it) of notes that are possible to play on the keyboard.

2.2 Diatonic Scales, Pentatonic Scales, & Musical Modes

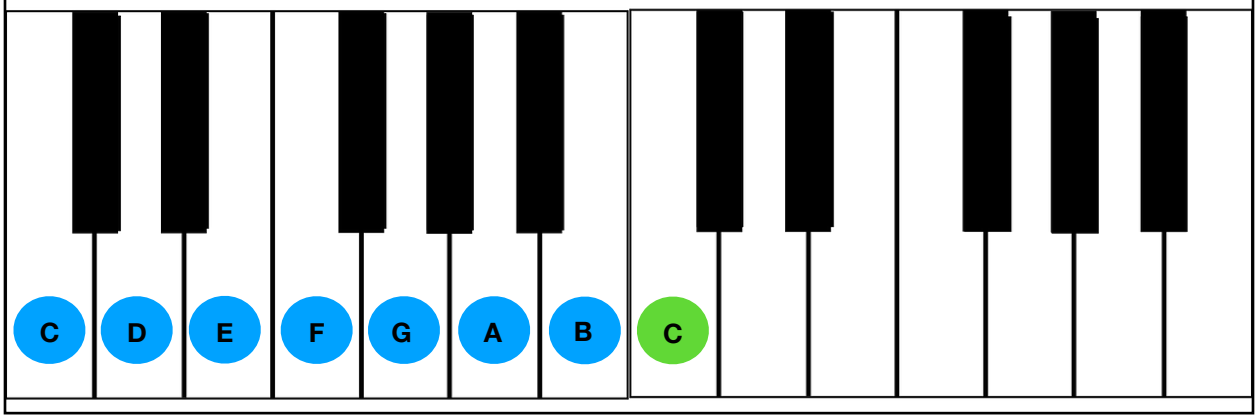
So what exactly is the point of having a chromatic scale, if all it tells us is that we can use every key on the piano? The real purpose of having the chromatic scale is to have a framework from which to build what are called **diatonic scales**. We also call diatonic scales **musical keys**.

Diatonic scales do *not* use every key on the keyboard. While diatonic scales still have root notes, they have a specific pattern that they follow. This pattern, also called a **musical mode** (see Chapter 5), determines how that scale sounds when you make music with it. Most Western music (including electronic music) is written in diatonic scales. Have you heard of “major” and “minor” scales before? Or major and minor chords? The terms **major** and **minor** refer to specific modes of diatonic scales. You can think

of a mode like a “mood,” because it determines how the music sounds and feels.

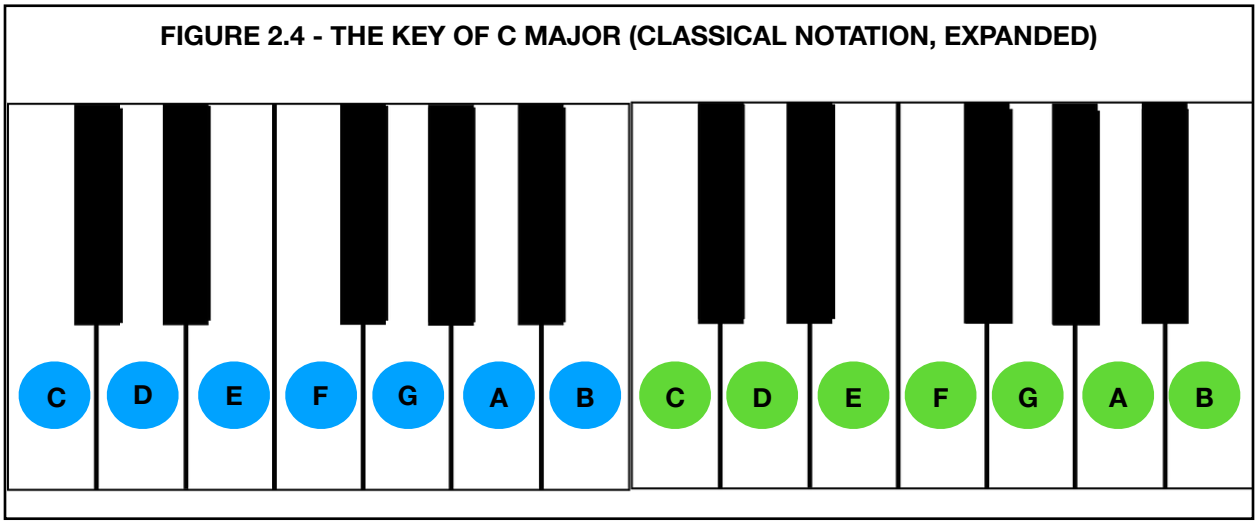
This is all rather dry and abstract, so let’s see a concrete example. In Figure 2.3, we see a diatonic scale whose tonic note is C. Because this scale contains seven notes, it can also be called a **heptatonic scale** (from Greek *hepta*, meaning “seven”). Using classical names, we have:

FIGURE 2.3 - THE KEY OF C MAJOR (CLASSICAL NOTATION)



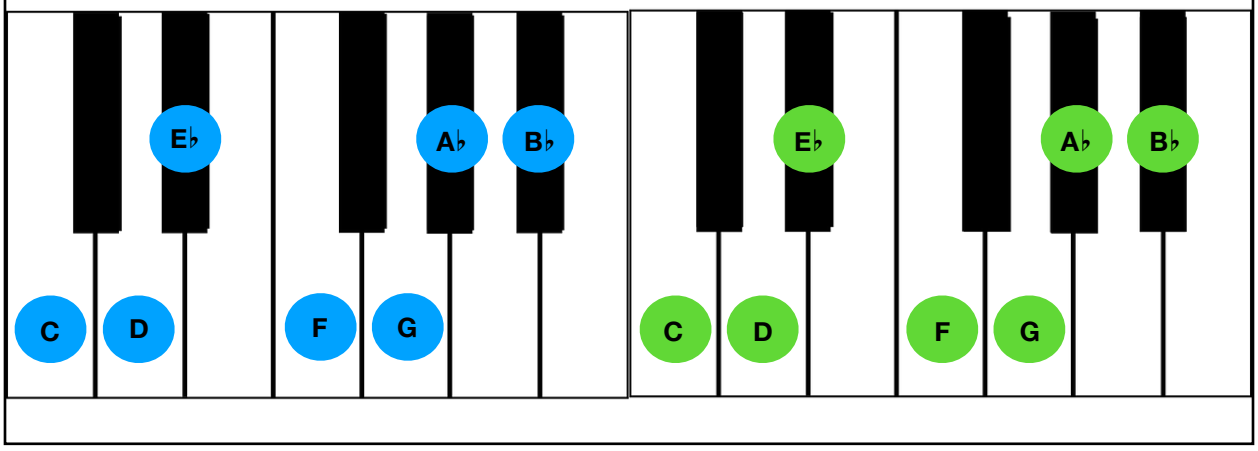
We call this scale C Major because its tonic note is C, and its mode is called “major.” Because the notes on the keyboard repeat the farther along the keyboard we go, we may as well show the higher octave as well. This is what the key of C Major looks like spanning two octaves, in Figure 2.4.

FIGURE 2.4 - THE KEY OF C MAJOR (CLASSICAL NOTATION, EXPANDED)



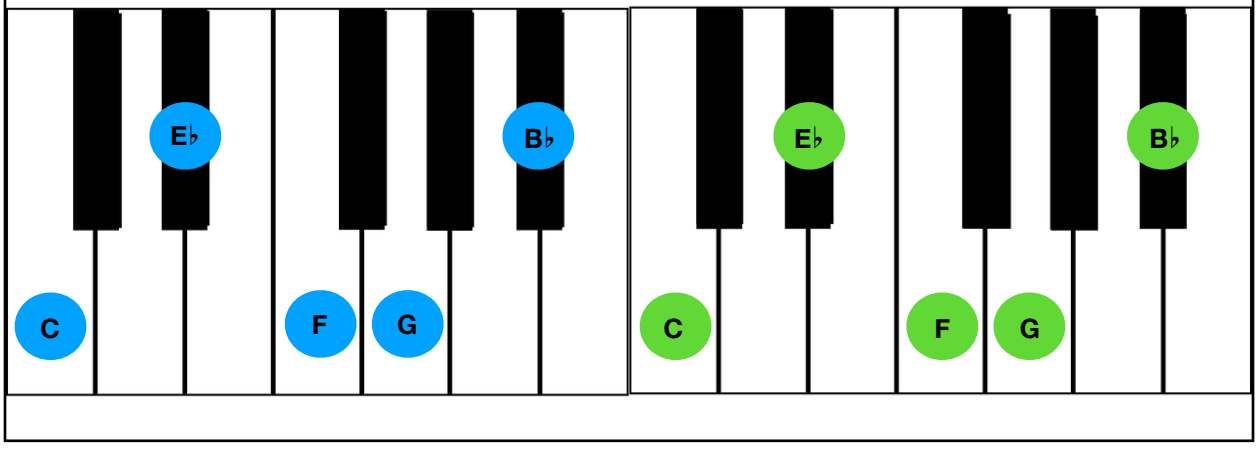
Notice that the pattern of keys remains the same in both the blue and the green octaves. Let's take a look at a different scale, this time the key of C Minor, in Figure 2.5:

FIGURE 2.5 - THE KEY OF C MINOR (CLASSICAL NOTATION)



We will go much further in-depth on how to make these scales and how they sound throughout this book, but before we do, let's also introduce the concept of **pentatonic scales**. A pentatonic scale (from Greek *penta*, meaning "five") contains only five notes. Figure 2.6 shows the C Minor Pentatonic scale:

FIGURE 2.6 - THE KEY OF C MINOR PENTATONIC (CLASSICAL NOTATION)



Chapter 3: Simple Music Notation™

3.1 What Is Simple Music Notation™?

We won't make you memorize dozens of names and descriptions of all the usual classical terms in this book. Rather, we're going to establish some simple number systems so that you can understand what is really going on behind the scenes. It's a unique system that Jumpstart EDM developed called **Simple Music Notation™** (or "**SMN**," for short) that was specifically designed to help you learn music theory faster and easier.

The entire purpose of SMN is to remove much of the frustration with rote memorization that the classical system demands. We'll disclose right off the bat that this is definitely different from what most others will teach you, and there are slightly different terms here than what you would see in a typical textbook.

But rest assured that all of the underlying, fundamental concepts presented here are the exact same that you would get from any introductory music theory course. They're just presented in a much clearer, cleaner, better way.

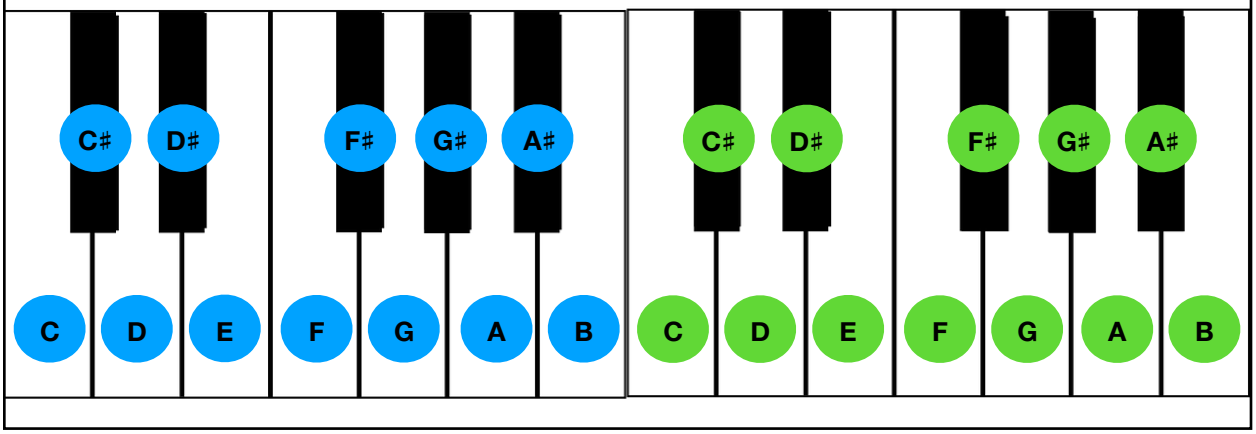
Even though Chapters 3 and 4 may seem a bit dry and terminology-heavy, we promise that these systems will make musical notes infinitely more easy to deal with in the future.

3.2 Musical Numbering Systems

3.2.1 Chromatic Numbering

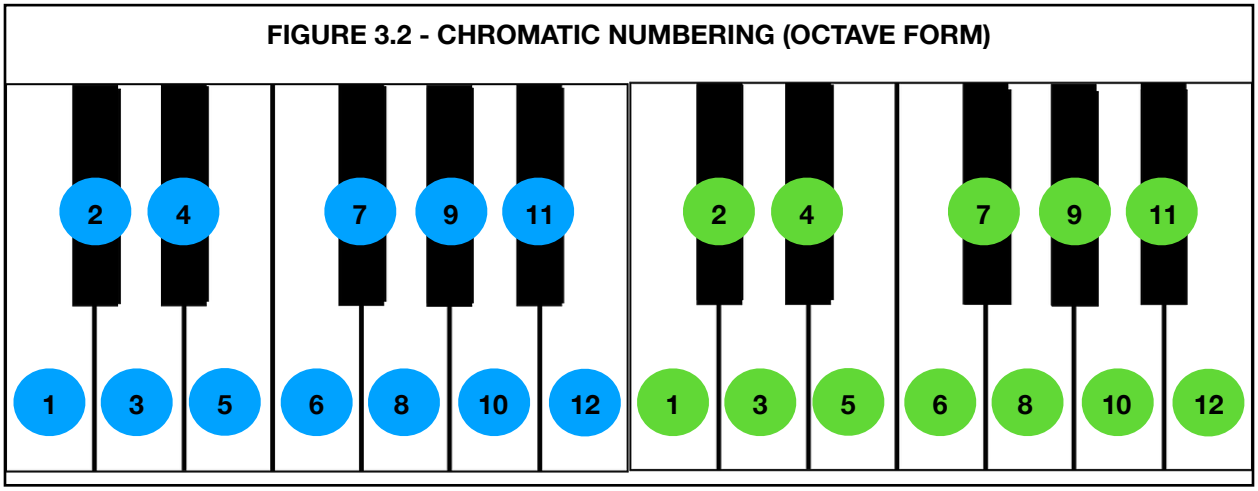
Let's take another look at the chromatic scale that we presented to you in Section 2.1. In Figure 3.1, we see a chromatic scale with tonic note C in classical notation (only using sharps for clarity):

FIGURE 3.1 - THE KEY OF C CHROMATIC (CLASSICAL FORM)



We now give each of these keys a number within their respective octaves, in Figure 3.2:

FIGURE 3.2 - CHROMATIC NUMBERING (OCTAVE FORM)

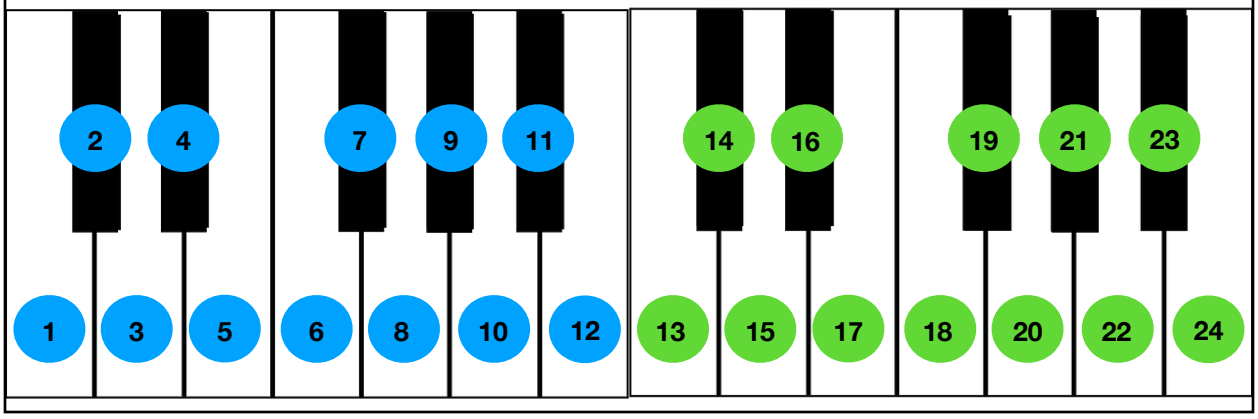


We color the octaves differently to show that the two octaves contain the same note names, but they are just located elsewhere on the piano. This format is what we call **chromatic numbering in octave form**.

We assign each note within the scale a number, from 1 to 12. We can then speak of any note within the scale by its number. For example, the blue C is 1. The green 4 is D♯, and the blue 10 is A.

But what if we want to refer to one of the green notes *in relation to* the blue notes? We can renumber the green notes to base their positions off of the *blue* tonic C, as shown in Figure 3.3:

FIGURE 3.3 - CHROMATIC NUMBERING (EXPANDED FORM)

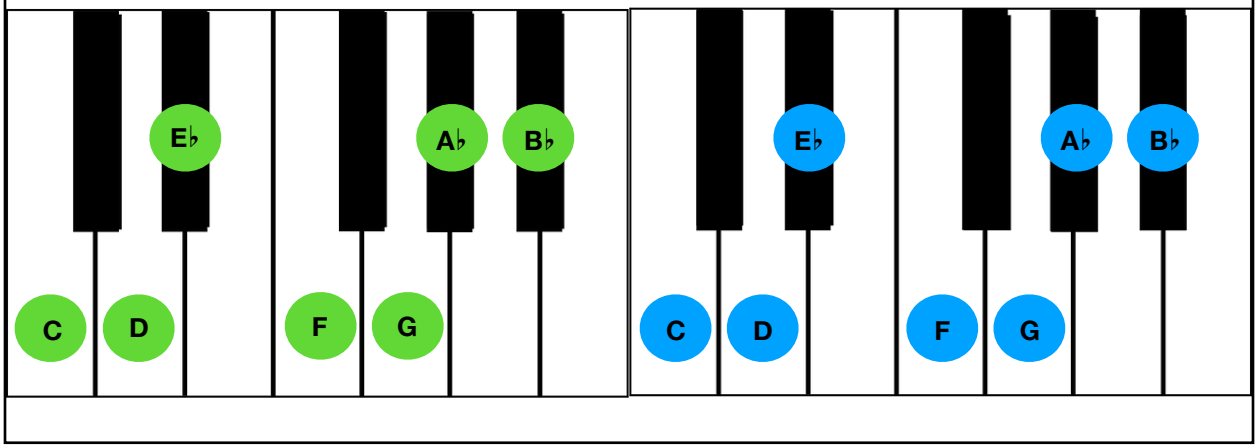


This is what we call **chromatic numbering in expanded form**.

3.2.2 Diatonic Numbering

We can do the same thing with diatonic scales. Let's go back to C Minor, as mentioned in Chapter 2. This time, we only have seven, not twelve, notes in the scale. Figure 3.4 shows the original classical names.

FIGURE 3.4 - THE KEY OF C MINOR (CLASSICAL)



Once we have the classical names set up, we can once again represent them with numbers in both octave and expanded formats (Figures 3.5 and 3.6 below):

FIGURE 3.5 - THE KEY OF C MINOR (DIATONIC NUMBERING, OCTAVE FORM)

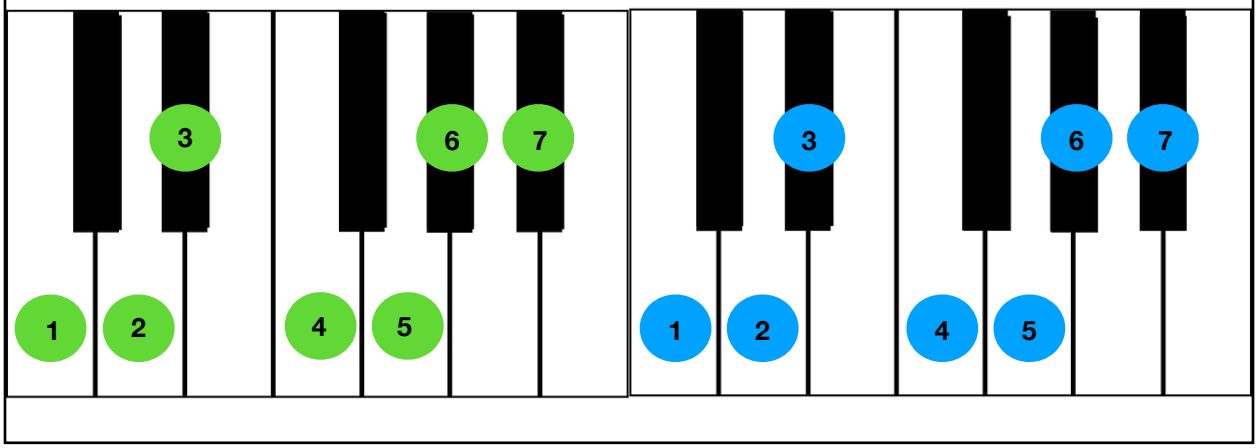
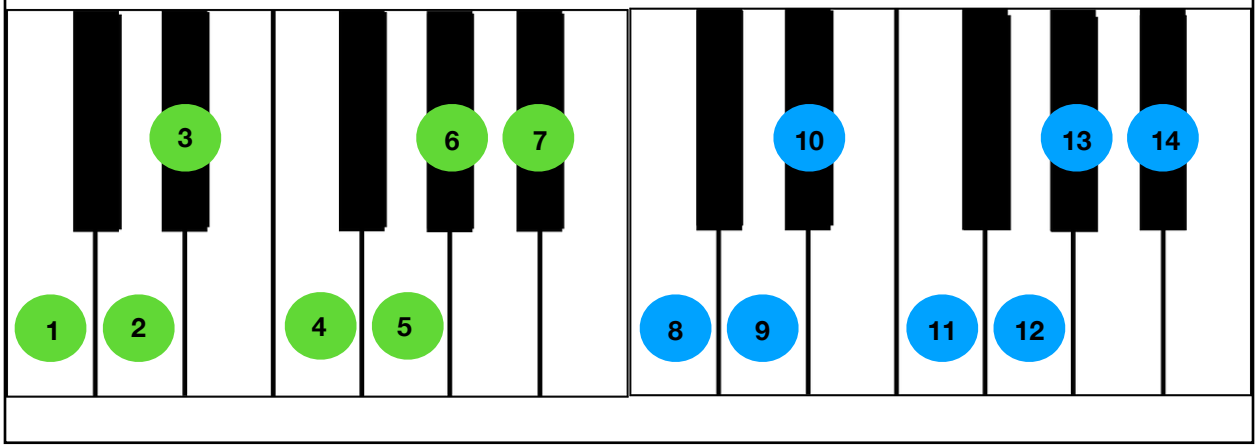


FIGURE 3.6 - THE KEY OF C MINOR (DIATONIC NUMBERING, EXPANDED FORM)



3.2.3 Pentatonic Numbering

In an identical manner to how we treated diatonic numbering, we can also establish pentatonic numbering with the same methodology, as shown in Figures 3.7, 3.8, and 3.9:

FIGURE 3.7 - THE KEY OF C MINOR PENTATONIC (CLASSICAL)

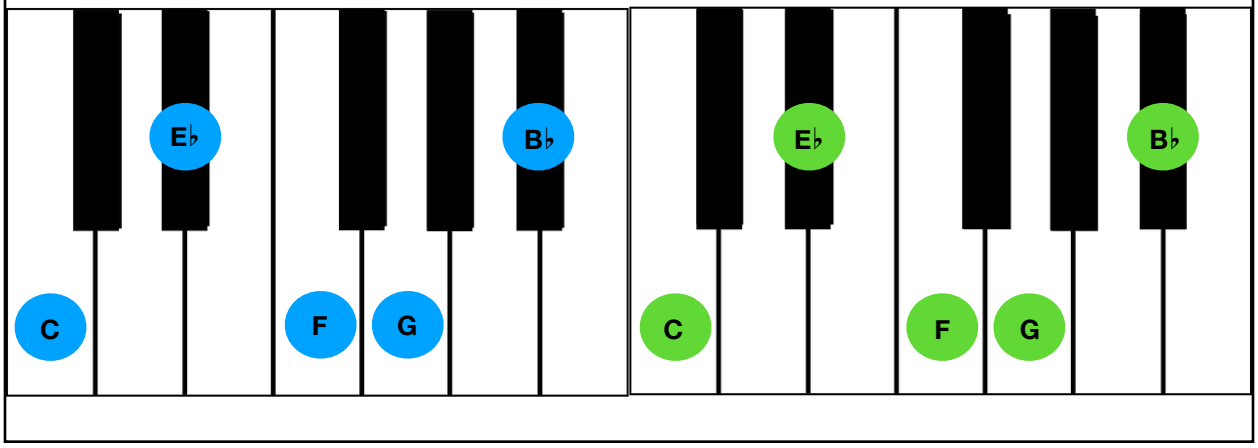


FIGURE 3.8 - THE KEY OF C MINOR PENTATONIC (PENTATONIC NUMBERING, OCTAVE)

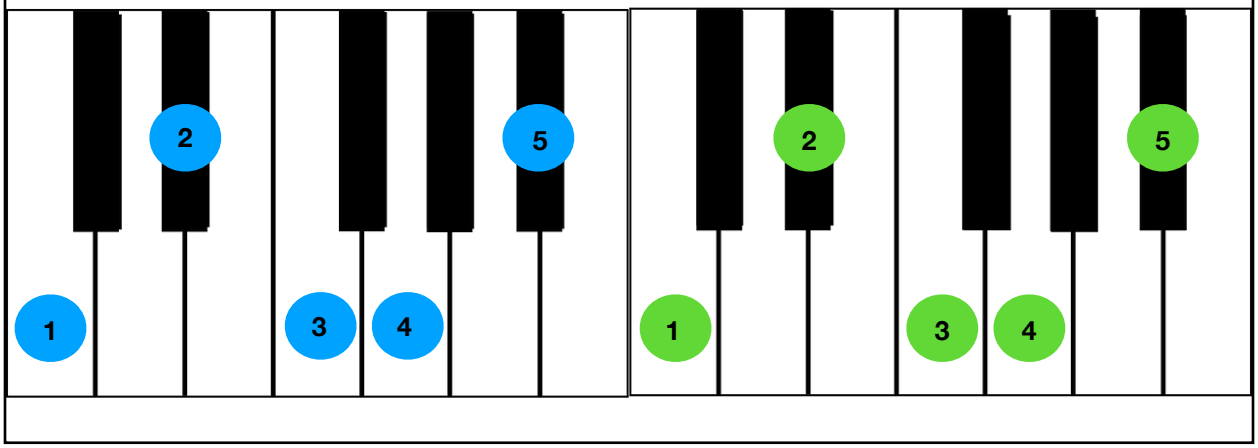
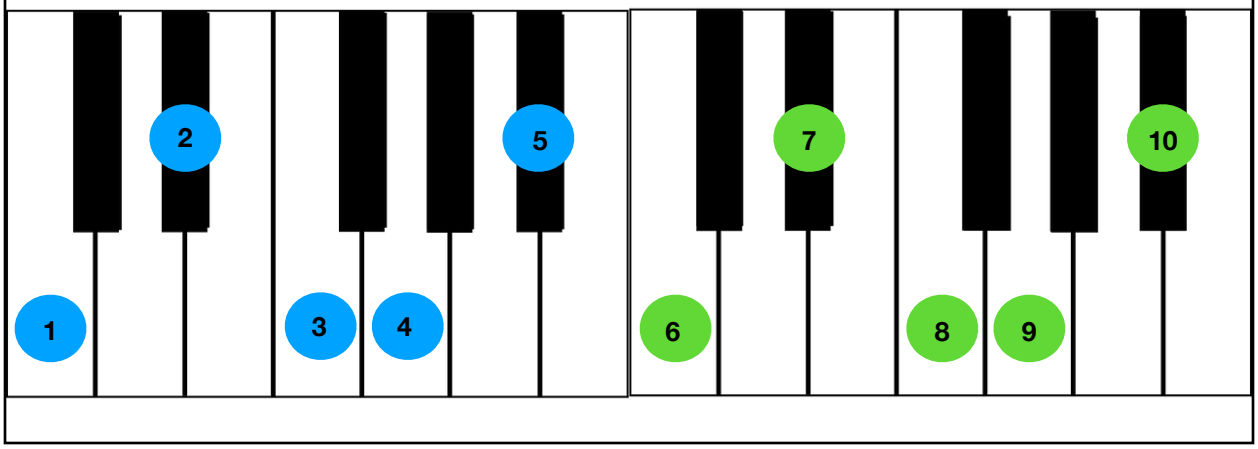


FIGURE 3.9 - THE KEY OF C MINOR PENTATONIC (PENTATONIC NUMBERING, EXPANDED)



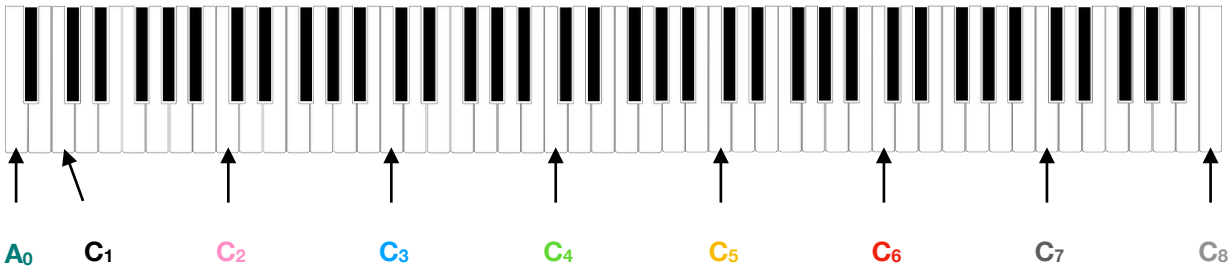
3.2.4 Absolute vs. Relative Numbering Systems

There is still one elephant in the room: how do we refer to other keys on the piano? Is there a way to refer to a specific key without comparing it to another? It turns out that these questions are answered by the fact that there are two ways to refer to keys on the keyboard: with **absolute** or with **relative positions**.

3.2.4.1 Absolute Numbering (Scientific Pitch Notation)

All we mean by absolute numbering in music is *how we refer to specific keys on the keyboard, regardless of their position in a scale*. Luckily for us, there has already been an entire system developed for this! It's called **scientific pitch notation (SPN)**. Remember the blue and green C's from our previous figures? Figure 3.10 shows what they look like on the whole piano:

FIGURE 3.10 - SCIENTIFIC PITCH NOTATION (ABSOLUTE POSITIONING)



If you're familiar with working in a **digital audio workstation (DAW)**, then you've definitely seen this notation before. It's exactly what is used in your piano roll (or MIDI editor window). That's because the piano roll is just Figure 3.10, but turned on its side to be vertical.

What scientific pitch notation does is assign each of the 88 keys on the keyboard a note name and an octave number. For historical reasons, it's based on the note C. So, the first C on the keyboard is C_1, and the first A is A_0. If you were to go to lower numbers in lower octaves, you would get into the sub range of frequencies.

Whenever we're writing music, we can refer to any specific note on the keyboard by its absolute numbering name in scientific pitch notation. Think of absolute positioning like a GPS coordinate or a personal ID number for each key on the piano.

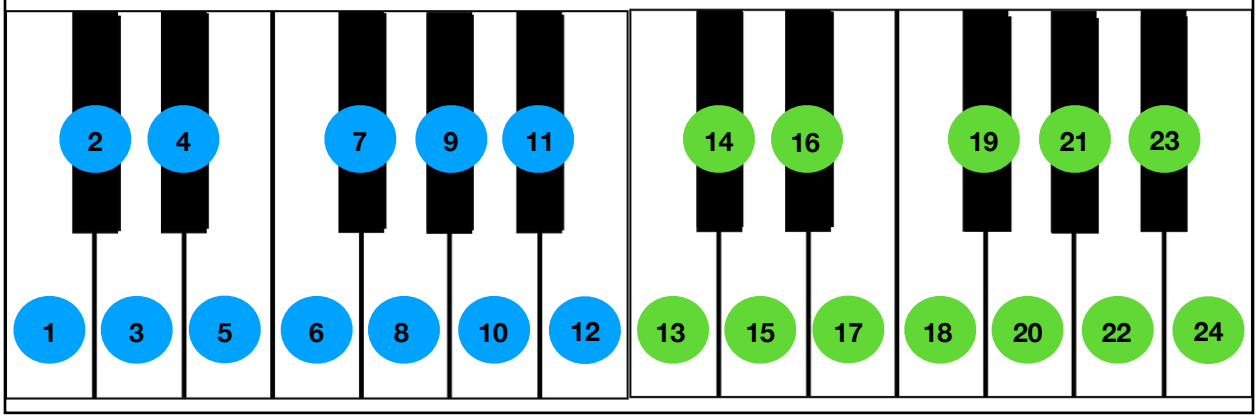
But you usually wouldn't refer to a person's location by their GPS coordinate, right? You'd probably say, for example, they're "at this coffee shop downtown." That's why we also use **relative numbering**.

3.2.4.2 Relative Numbering

Relative numbering is the method of locating keys that we've been using when talking about scales based around tonics. Whenever we choose to select a tonic note for a chromatic or diatonic scale, we are creating a relative positioning system. What this means is that we are choosing to base our numbers off of a single point of origin - the tonic. That's why we often refer to the **tonic** as the **root note** of the scale, because the entire scale revolves around the "root of the scale."

Looking below to Figure 3.11, it would be tedious to refer to all 24 notes in between C_4 and C_5 by their proper, absolute names in scientific pitch notation. So instead, we can refer to them by their relative positions within the scale.

FIGURE 3.11 - CHROMATIC NUMBERING (EXPANDED)



3.2.5 Musical Steps & Intervals

We would be remiss if in a book about making scales, we didn't at least briefly discuss intervals. Up until now, we've been assuming that the musical distance, or **interval**, between adjacent keys on the keyboard is "one key," and that we can calculate their interval by using simple arithmetic (subtraction).

Unfortunately, this is absolutely *not* how the classical system operates. Take another look at the C Chromatic scale in Figures 3.12 and 3.13 below:

FIGURE 3.12 - THE KEY OF C CHROMATIC (CLASSICAL)

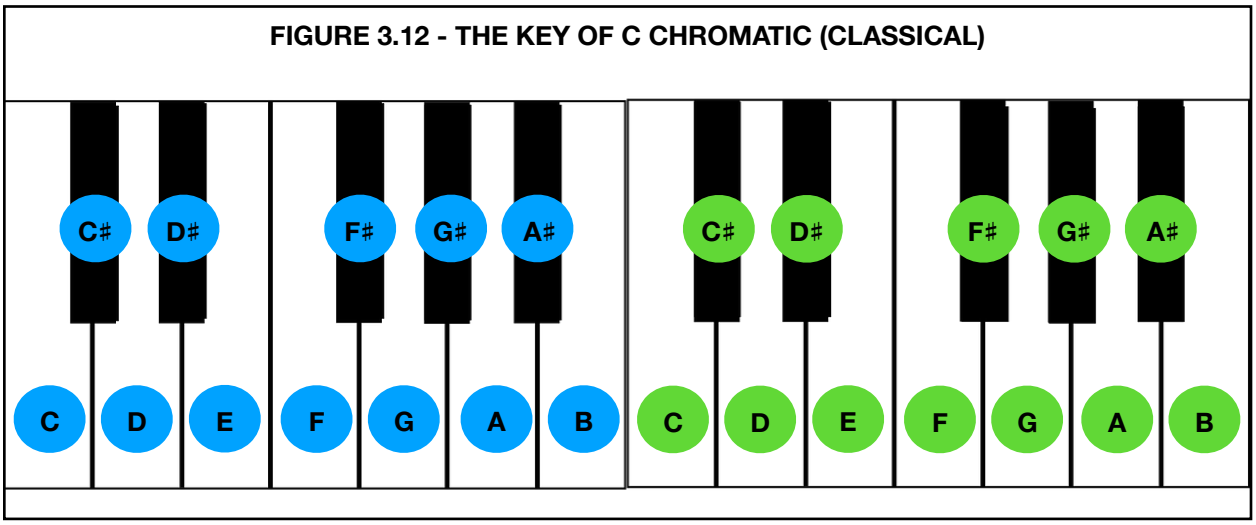
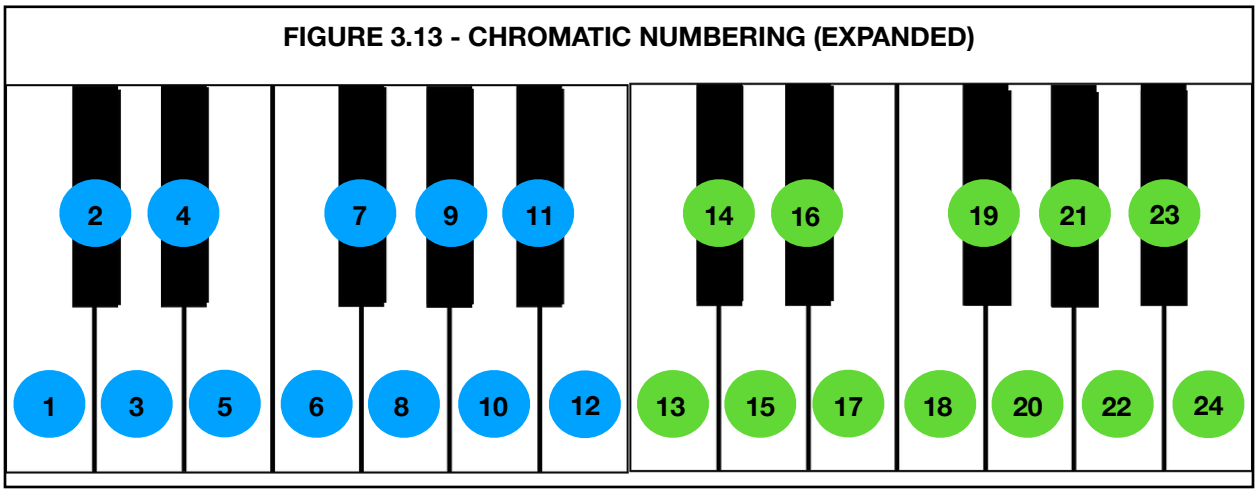


FIGURE 3.13 - CHROMATIC NUMBERING (EXPANDED)



Because the classical music theory defines, for example, G♯ as “halfway between G and A,” or, “a little bit higher than G,” this leads to an awkward situation. How do we define the *interval* between G and G♯?

The classical system defines two different basic **steps** for calculating intervals. The interval between G and A is called a **whole step** (also called a **tone**), and the interval between G and G♯ is called a **half-step** (or **semitone**).

3.2.5.1 Classical Names for Intervals

In the rest of this book, we’ll be referring to musical intervals in terms of “keys on the keyboard,” not in terms of half- and whole steps. We will provide classical terms in the reference charts, but we will stick to Simple Music Notation’s “keys”-based approach moving forward.

We’ve already established that the interval of 12 is called an octave. Now, we’ll lay out the names for the remaining intervals of 1 through 11 in Table 3.1, on the following page.

TABLE 3.1 - NAMES OF INTERVALS		
Interval Value	**Number of Tones**	**Classical Name**
1	0.5	Minor Second
2	1	Major Second
3	1.5	Minor Third
4	2	Major Third
5	2.5	Perfect Fourth
6	3	Diminished Fifth Augmented Fourth
7	3.5	Perfect Fifth
8	4	Minor Sixth
9	4.5	Major Sixth
10	5	Minor Seventh
11	5.5	Major Seventh
12	6	Perfect Octave

3.2.5.2 Major, Minor, & Perfect Intervals

To see why the names of the intervals in Table 3.1 exist, we'll need to examine the differences between the major and minor scales we originally presented in Chapter 1. You won't need to memorize all these names, since the major and minor intervals are the only ones essential to this book, as discussed in the following section.

Figures 3.14 and 3.15 below show C Major and C Minor in classical notation. You'll notice that the third, sixth, and seventh notes of the C Minor scale are all shifted down one key compared to the major scale.

FIGURE 3.14 - THE KEY OF C MAJOR (CLASSICAL NOTATION, EXPANDED)

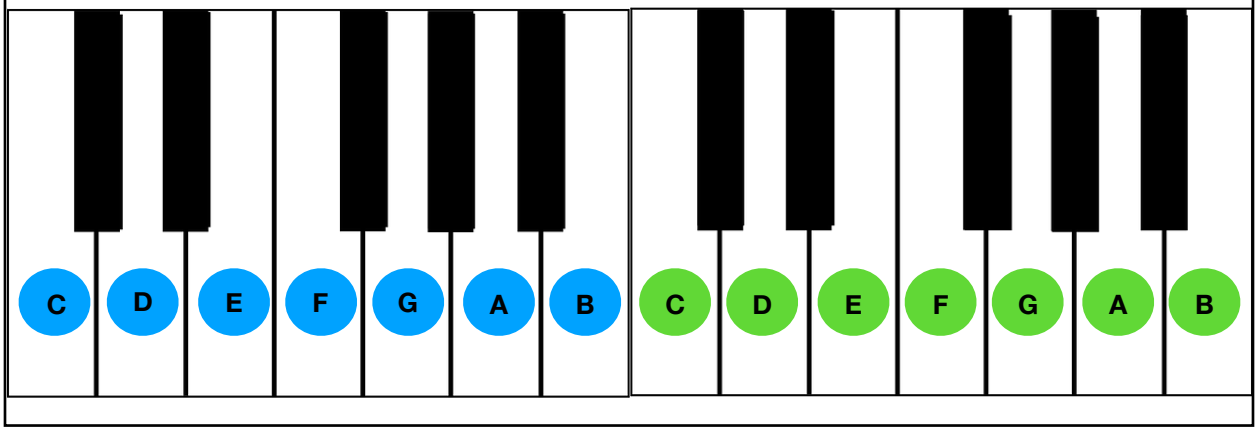
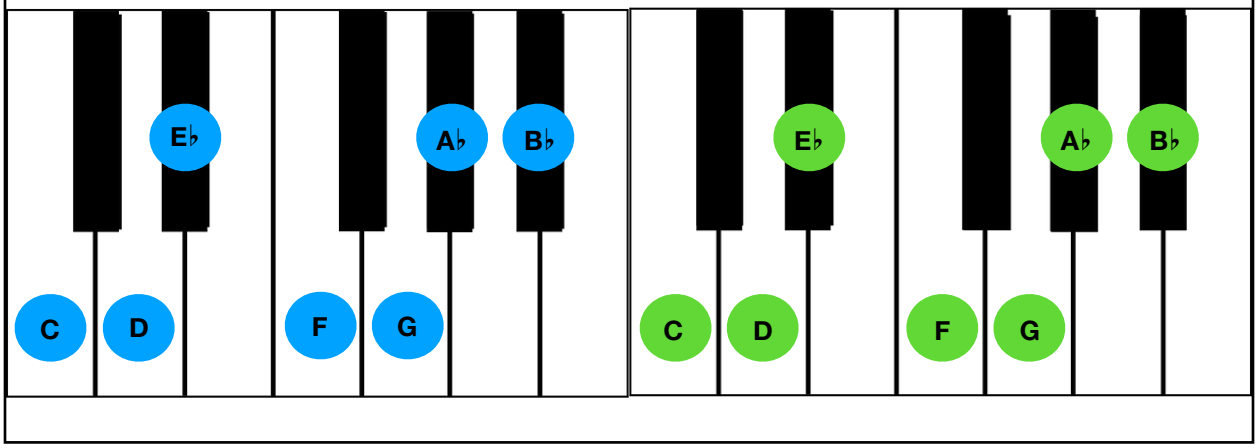


FIGURE 3.15 - THE KEY OF C MINOR (CLASSICAL NOTATION)



That's why we call them **minor**. The first, fourth, fifth, and octave locations did not change, so that's why we call them **perfect**.

We could go much deeper into intervals, how they are named, and their relation to chords, but a thorough discussion of intervals is better reserved for a book on harmony, which Jumpstart EDM will be publishing in the future.

For now, let's get into how we can actually use this stuff to create all the scales you'll ever need to make great music.

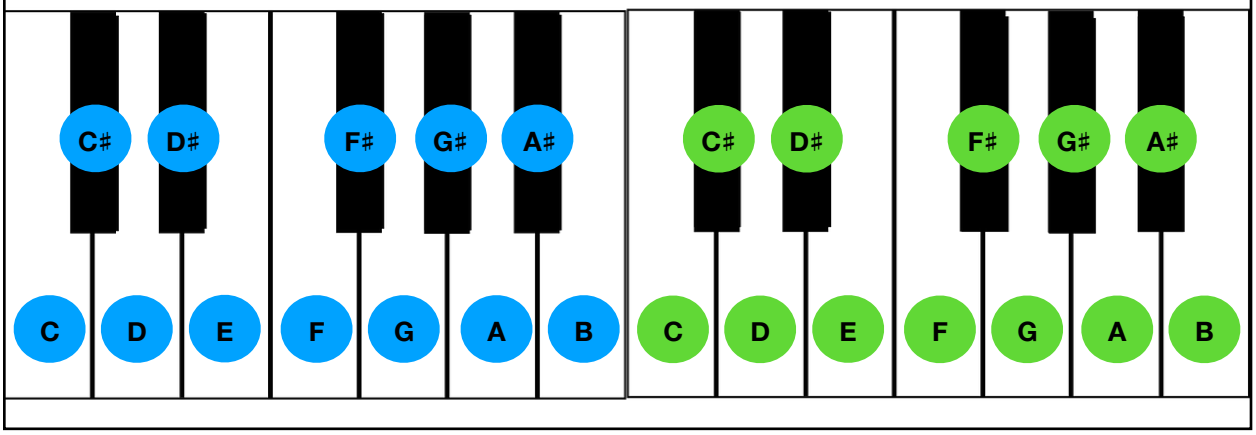
Chapter 4: How to Use This Book

The chapters in Part II will go in-depth into how to make the most common scales in electronic music. But before we get there, here is how to use this book. In this chapter specifically, we'll explain how to use **scale construction charts**.

4.1 Scale Construction Charts

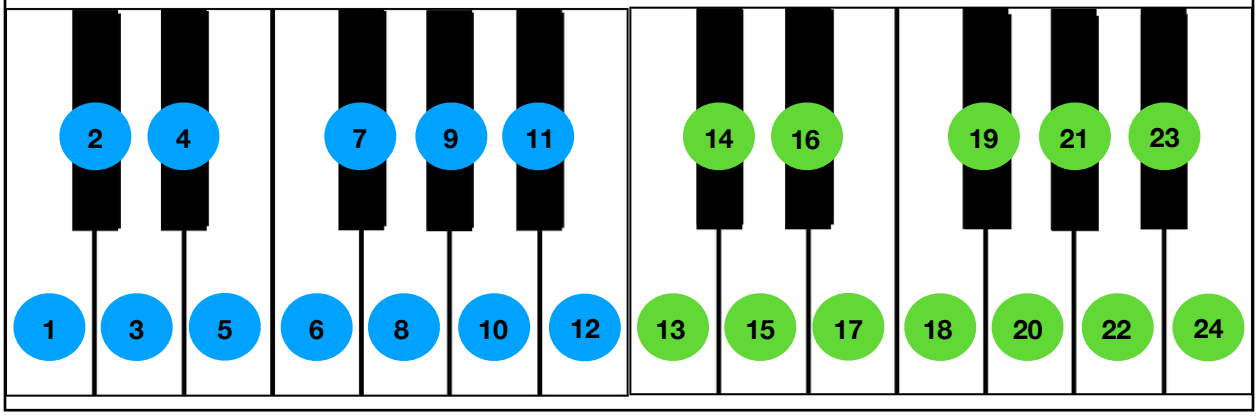
Simply put, a scale construction chart is a chart that tells you how to construct a scale. The most basic scale construction chart is one for a chromatic scale. Since we're familiar with the C Chromatic scale, let's start there. As we've seen before, here is the C Chromatic scale in classical notation in Figure 4.1:

FIGURE 4.1 - THE KEY OF C CHROMATIC (CLASSICAL)



And you can also see it in expanded chromatic numbering on the following page, in Figure 4.2.

FIGURE 4.2 - CHROMATIC NUMBERING (EXPANDED)



We can describe the positions of these keys in the following chart:

SCALE CONSTRUCTION CHART - C CHROMATIC												
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Chromatic Position	1	2	3	4	5	6	7	8	9	10	11	12
Relative Position	C	C+1	C+2	C+3	C+4	C+5	C+6	C+7	C+8	C+9	C+10	C+11
Keys Recursive	C	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
Classical Recursive	C	H	H	H	H	H	H	H	H	H	H	H

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
NAME	**C**	**C♯**	**D**	**D♯**	**E**	**F**	**F♯**	**G**	**G♯**	**A**	**A♯**	**B**

Let's go through each row of the chart to describe what's happening here.

POSITION - Each box in this row describes the position of a note *within the scale we are constructing*. Chromatic scales will contain the numbers 1 through 12, diatonic scales contain 1 through 7, and pentatonic scales contain 1 through 5.

Chromatic Position - Each box in this row describes the numbered position of a note *in relation to its analogous chromatic scale.* For chromatic scales, this row is identical to the POSITION row.

Relative Position - Each box in this row describes the numbered position of a note *in relation to its root note*. In this case, the 11th note in the C Chromatic scale is 10 keys away from its root note, C.

Keys Recursive - Each box in this row describes the position of a note *in relation to the note before it*. **Recursive** means is that each new note in the scale is determined by the note that came immediately before it, moving left to right. For the chromatic scales, the value for this is always 1 key. In other words, the next key in the scale is always the adjacent key on the keyboard.

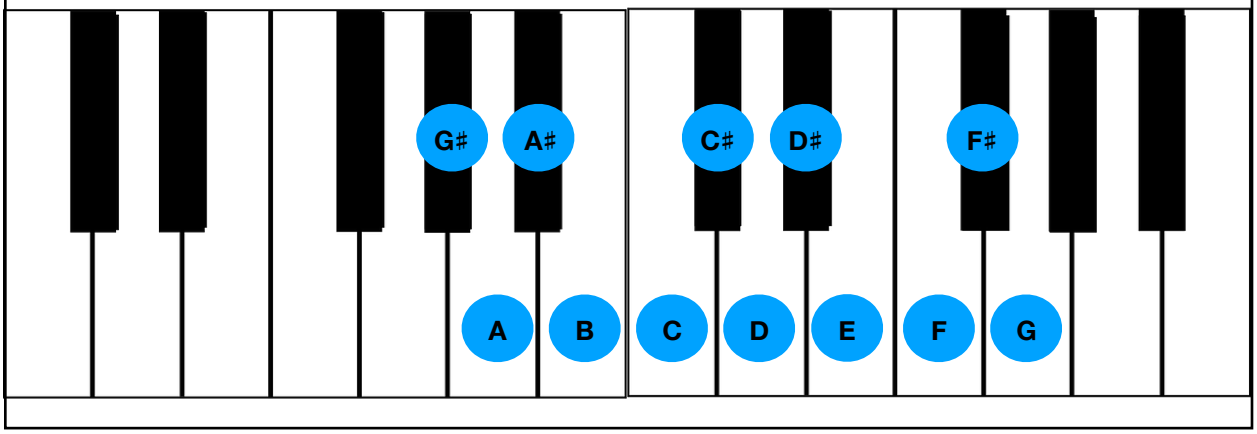
Classical Recursive - Each box in this row describes the position of a note *in relation to the note before it*, using the classical names: half-steps (H) and whole steps (W). Later, we'll also see tritones (T).

NAME - This is the classical name for the note described in the POSITION row.

4.2 Example: G♯ Chromatic Scale

Let's see an example of this in a different chromatic scale. To create the scale of G♯ Chromatic, we set G♯ as our root note. See Figure 4.3 for reference.

FIGURE 4.3 - THE KEY OF G♯ CHROMATIC (CLASSICAL)



Below is how we'll fill in the scale construction chart. We'll start out with a more generalized template for a scale construction chart.

SCALE CONSTRUCTION CHART - GENERAL TEMPLATE FOR CHROMATIC SCALES												
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Chromatic Position	1	2	3	4	5	6	7	8	9	10	11	12
Relative Position	R	R+1	R+2	R+3	R+4	R+5	R+6	R+7	R+8	R+9	R+10	R+11
Keys Recursive	R	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
Classical Recursive	R	H	H	H	H	H	H	H	H	H	H	H

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
NAME	**R**											

In this template, R stands for "root note." So to use the chart for G♯, we'll substitute G♯ in wherever we see R:

SCALE CONSTRUCTION CHART - GENERAL TEMPLATE FOR CHROMATIC SCALES												
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Chromatic Position	1	2	3	4	5	6	7	8	9	10	11	12
Relative Position	G#	G#+1	G#+2	G#+3	G#+4	G#+5	G#+6	G#+7	G#+8	G#+9	G# +10	G# +11
Keys Recursive	G#	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1
Classical Recursive	G#	H	H	H	H	H	H	H	H	H	H	H

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
NAME	**G#**	**A**	**A#**	**B**	**C**	**C#**	**D**	**D#**	**E**	**F**	**F#**	**G**

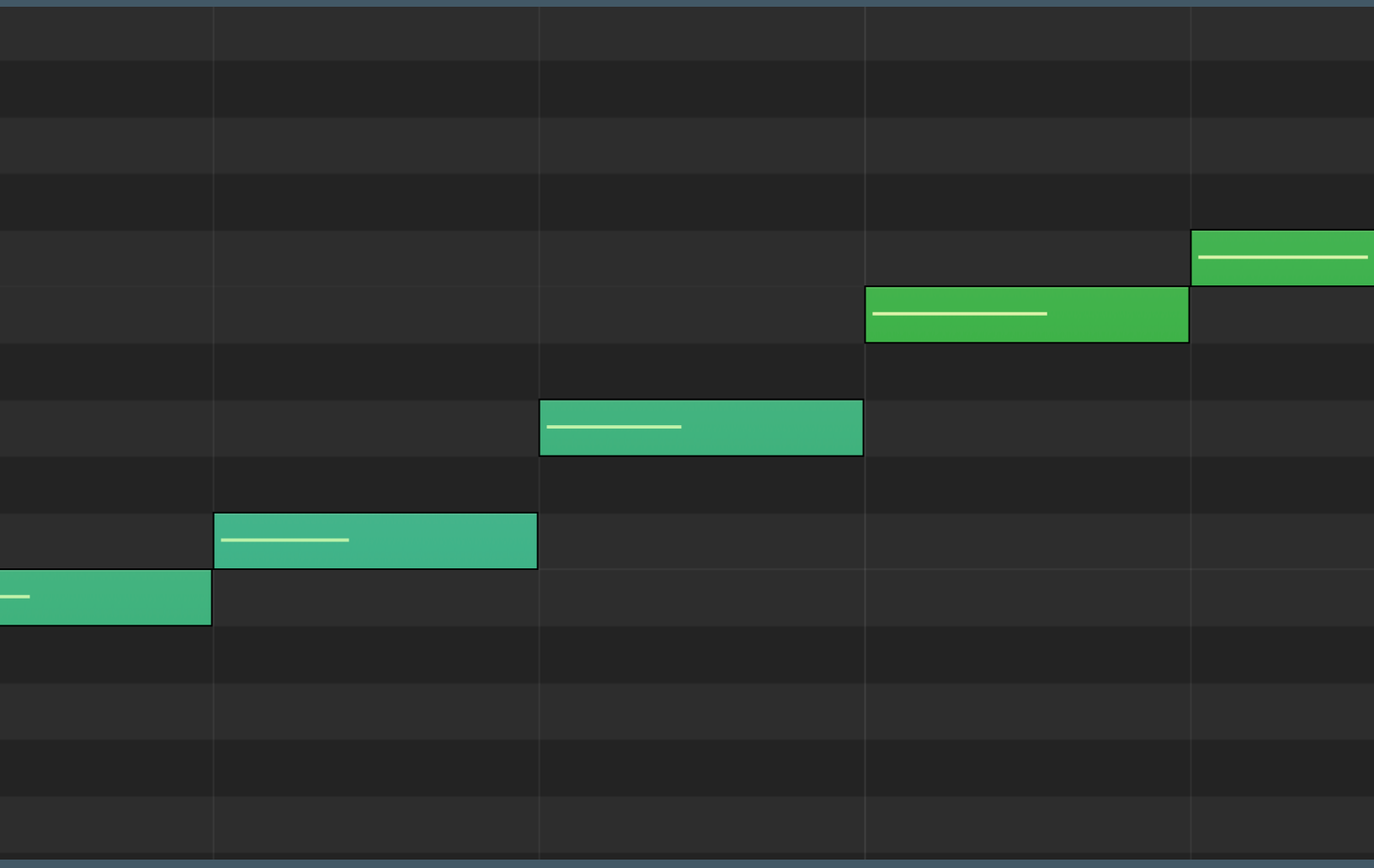
In order to fill in the NAME row at the bottom of the chart, all we have to do is just follow any of the methods established in the other rows. Whenever using any of the methods, always be sure to reference a piano keyboard, as shown in Figure 4.3. We'll walk you through how to use each of these methods for diatonic and pentatonic scales in the chapters that follow.

We'll close out this section by stating that there are three main ingredients to creating a scale construction chart:

1. The scale type (chromatic, diatonic, or pentatonic)
2. The tonic (root) note
3. The musical mode (chromatic, major, minor, etc.)

Now that we've lain out the foundational knowledge, let's get into the applications!

PART II - ESSENTIAL SCALES FOR EDM



Jumpstart EDM

Chapter 5: Explaining Musical Modes

In Chapter 2, we told you that a **musical mode** is an aspect of a scale that tells us the pattern of its notes. Now that you have an understanding of musical numbering and scale construction charts, we can fully explain what exactly modes are in this chapter.

5.1 Musical Patterns

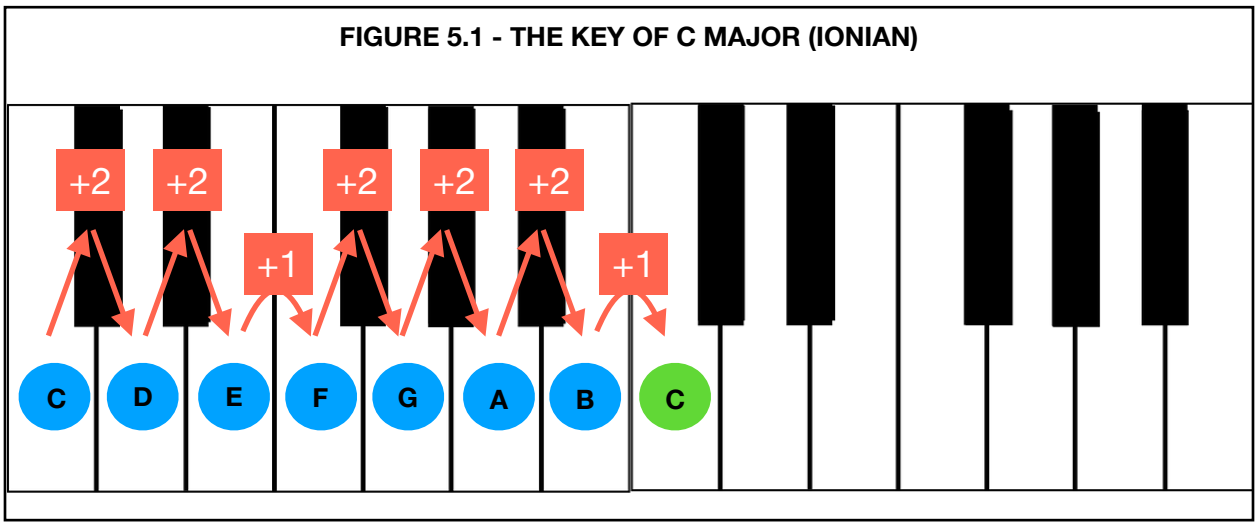
In Chapter 4, we explained how to use a scale construction chart for chromatic scales. Two of these rows utilized **recursive patterns**, which tell us how to form each new note in a scale based on the note preceding it. In chromatic scales, this pattern is simple: moving left to right, each new note in the scale is just the next key on the keyboard, for a total of 12 keys.

But in order to create a 7-note, diatonic scale, we need to have larger steps than just 1 key. We need to have a combination of 1-key and 2-key intervals. The general pattern that we will see in the diatonic scales is the following, where a POSITION of 8 means the first note in the scale in the adjacent, higher octave, and R is our root note.

SCALE CONSTRUCTION CHART - THE MAJOR (IONIAN) SCALE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Keys Recursive	R	+2	+2	+1	+2	+2	+2	+1
Classical Recursive	R	W	W	H	W	W	W	H

Figure 5.1 shows us what this looks like on the piano:

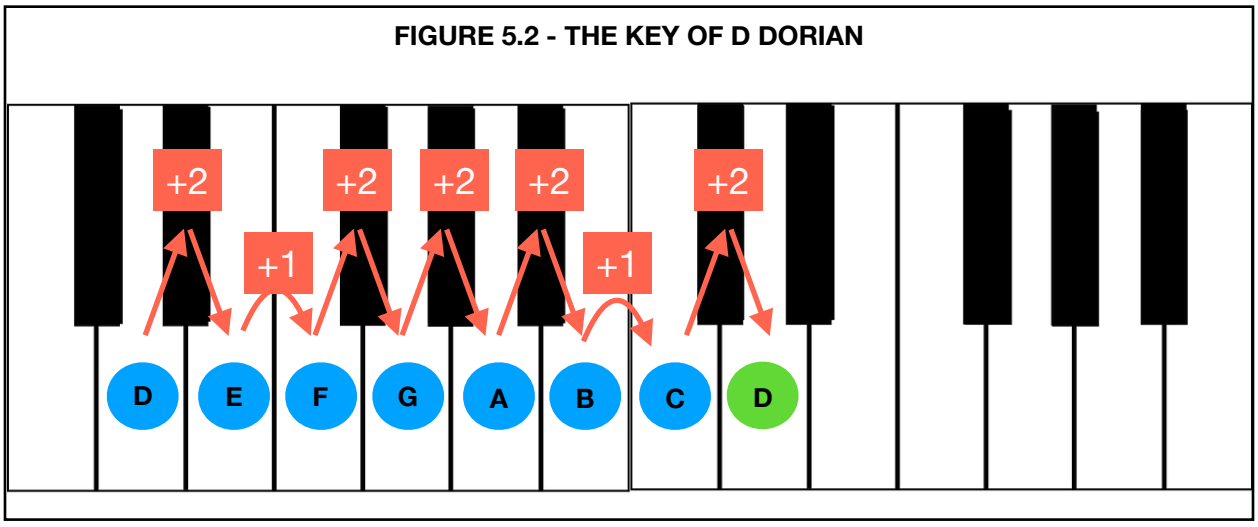
FIGURE 5.1 - THE KEY OF C MAJOR (IONIAN)



We will work through detailed examples of how to create this scale using multiple methods and choosing different root notes in the next chapter. You'll notice that our resultant keys are only white keys.

But what happens if we use only the white keys and choose our root note to be D instead of C? We end up with the following scale, in Figure 5.2:

FIGURE 5.2 - THE KEY OF D DORIAN



All that this is doing is shifting our pattern by one note to the left in the table, which is easy to see by comparing our two scale construction charts:

SCALE CONSTRUCTION CHART - THE MAJOR (IONIAN) MODE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Keys Recursive	R	+2	+2	+1	+2	+2	+2	+1

⇩ BECOMES ⇩

SCALE CONSTRUCTION CHART - THE DORIAN MODE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Keys Recursive	R	**+2**	**+1**	**+2**	**+2**	**+2**	**+1**	**+2**

Note that this pattern change occurs *regardless* of which root note we choose! An in fact, we can keep shifting our pattern like this, over and over, until we get back to our original pattern. This gives us *seven* total musical modes for diatonic scales.

5.2 The Seven Diatonic Modes

For any given root note R, we can create seven different 7-note scales that we call **modes**. Each of these scales contains the same pattern, just shifted in how it is applied. However, this small shift in pattern creates vastly different sounds when used to create music.

Almost all music you've heard has probably been written in the major and minor modes, especially for electronic music. As such, we will be focusing most of our efforts on those two modes moving forward.

Jumpstart EDM will be releasing another book detailing practical applications of each mode in-depth. For the purposes of this book, however, an advanced treatment of the subject is unwarranted. Almost all EDM is written in the Ionian or Aeolian modes and their variations, with only occasional use of the Dorian, Phrygian, and Mixolydian modes by adventurous producers wanting to experiment.

We will mention in this section, however, that major and minor keys that have the same root note are called **parallel keys**. For example, C Major, C Minor, C Dorian, etc. are *all* parallel keys. We can summarize the seven diatonic modes in Tables 5.1 and 5.2 below, with their associated patterns. The numbers are colored in Table 5.1 to illustrate the shifting patterns.

The "White Notes" columns are provided to help illustrate what this looks like on the keyboard, but we must emphasize that you can create *any* of the musical modes below by choosing to start your scale with *any* root note.

TABLE 5.1 - THE SEVEN DIATONIC MODES (KEYS RECURSIVE)									
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**White Notes**
Ionian (Major)	R	+2	+2	+1	+2	+2	+2	+1	C to C
Dorian	R	+2	+1	+2	+2	+2	+1	+2	D to D
Phrygian	R	+1	+2	+2	+2	+1	+2	+2	E to E
Lydian	R	+2	+2	+2	+1	+2	+2	+1	F to F
Mixolydian	R	+2	+2	+1	+2	+2	+1	+2	G to G
Aeolian (Minor)	R	+2	+1	+2	+2	+1	+2	+2	A to A
Locrian	R	+1	+2	+2	+1	+2	+2	+2	B to B

TABLE 5.2 - THE SEVEN DIATONIC MODES (CLASSICAL RECURSIVE)									
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**White Notes**
Ionian (Major)	R	W	W	H	W	W	W	H	C to C
Dorian	R	W	H	W	W	W	H	W	D to D
Phrygian	R	H	W	W	W	H	W	W	E to E
Lydian	R	W	W	W	H	W	W	H	F to F
Mixolydian	R	W	W	H	W	W	H	W	G to G
Aeolian (Minor)	R	W	H	W	W	H	W	W	A to A
Locrian	R	H	W	W	H	W	W	W	B to B

In the following chapters of Part II of this book, we'll provide detailed examples and walkthroughs of how to create the major and minor scales, and their variations.

Chapter 6: The Major Scale (The Ionian Mode)

6.1 Overview

Major scales are by far the most common scales used in classical and pop music, and they are also ubiquitous in EDM. Major scales tend to sound happy, joyous, and grand. They are also evocative of love, euphoria, piety, regality, and generally good vibes. Music written in major scales can sound incredibly beautiful, but it can also seem “cheesy” in certain songs due to their brightness of sound.

Major scales are very common in progressive house, electro-pop, electro-swing, nu-disco, progressive trance, downtempo, and chill-out.

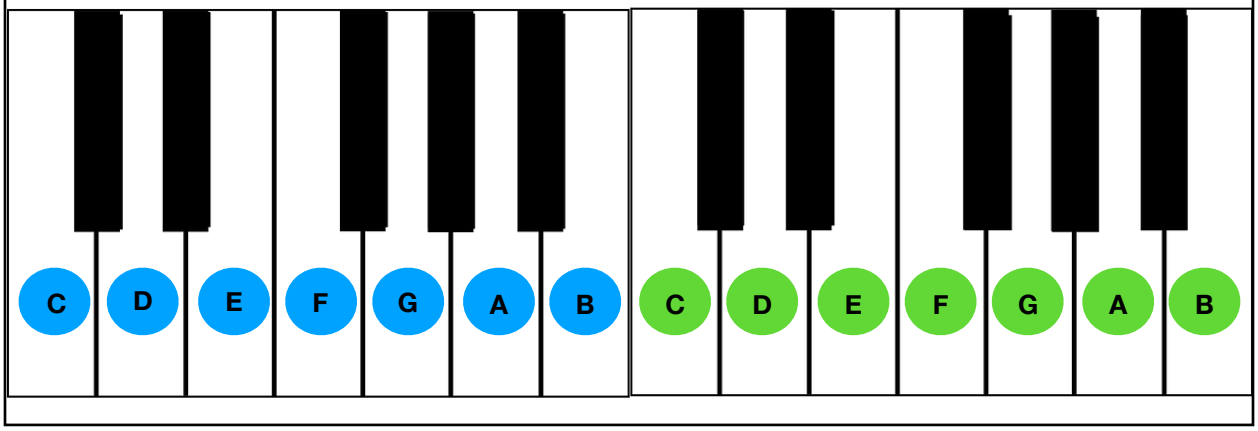
6.2 Scale Construction Chart

SCALE CONSTRUCTION CHART - THE MAJOR SCALE (THE IONIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	5	6	8	10	12	13
Relative Position	R	R+2	R+4	R+5	R+7	R+9	R+11	R+12
Keys Recursive	R	+2	+2	+1	+2	+2	+2	+1
Classical Recursive	R	W	W	H	W	W	W	H

6.3 Natural, Chromatic, and Recursive Positions

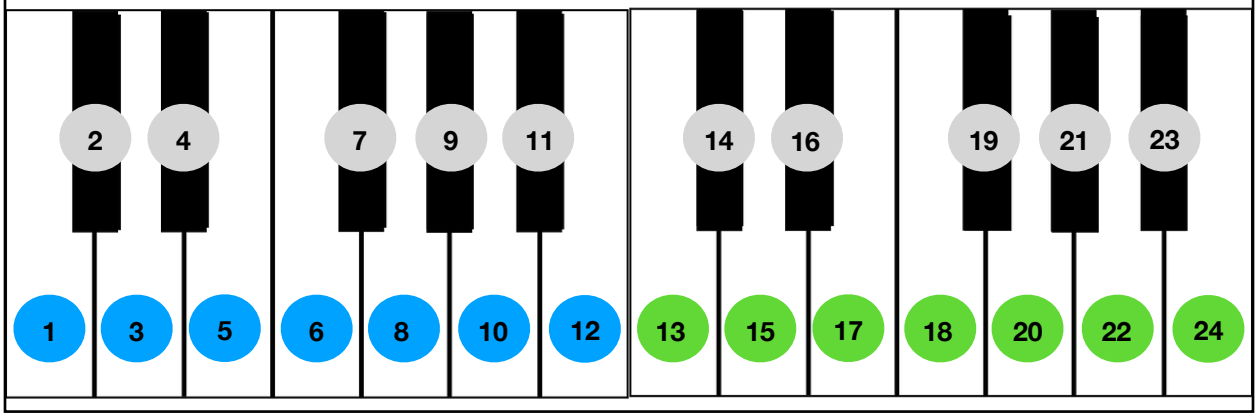
Natural keys are those without accidentals - the white keys. Thus, the "natural scale" for the Ionian mode is the set of seven white keys between C and C, as shown in Figure 6.1:

FIGURE 6.1 - THE MAJOR SCALE (IONIAN MODE) - NATURAL KEYS



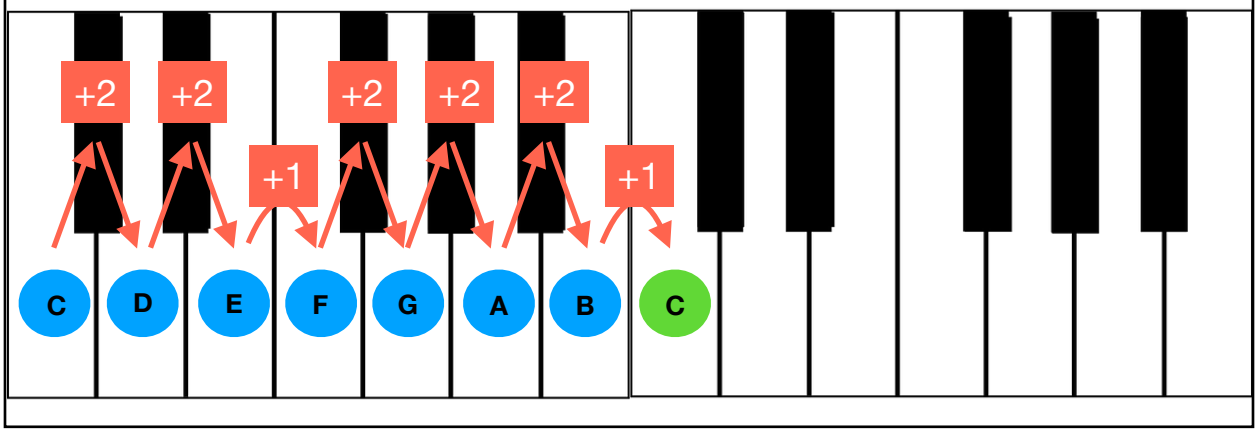
The chromatic positions for these keys, using C as our root note, are shown in Figure 6.2. The omitted chromatic keys are shown in light grey, for reference:

FIGURE 6.2 - THE MAJOR SCALE (IONIAN MODE) - CHROMATIC POSITIONS



And the recursive positions are shown in Figure 6.3:

FIGURE 6.3 - THE MAJOR SCALE (IONIAN MODE) - RECURSIVE POSITIONS



6.4 Worked Examples

6.4.1 Method 1: Chromatic Positions – E Major

Let's build the key of E Major using the Chromatic Positions method.

The formula for using the Chromatic Positions method is as follows:

- **Step 1:** Choose a root note.
- **Step 2:** Write out the chromatic positions of the scale based on the root note.
- **Step 3:** Use the scale construction chart to choose the correct chromatic positions to fill in the scale.
- **Step 4:** Write out the finished scale using proper classical names, referencing Appendix A.

STEP 1: CHOOSE A ROOT NOTE

We've chosen E to be our root note. We show this first step on the piano in Figures 6.4 and 6.5.

FIGURE 6.4 - REFERENCE PIANO WITH CLASSICAL NAMES (SEE APPENDIX A)

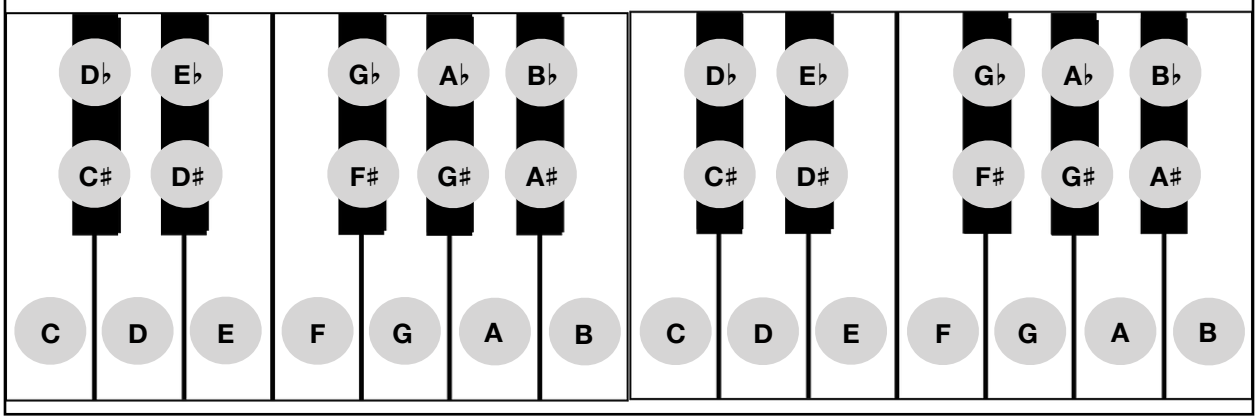
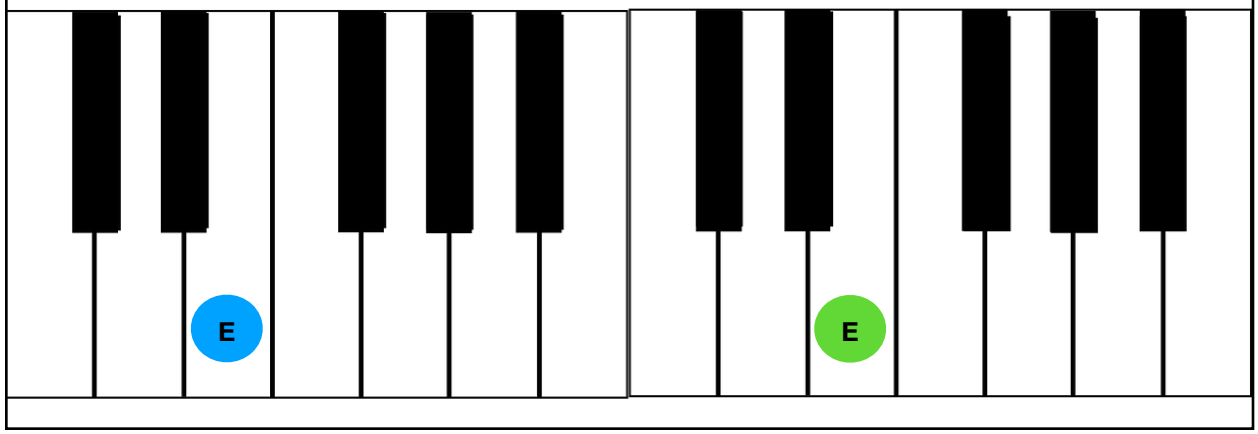


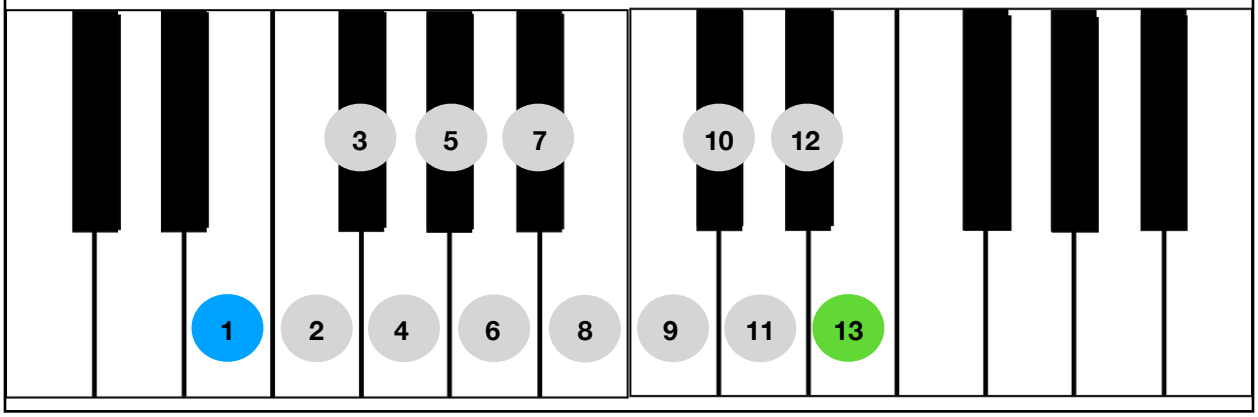
FIGURE 6.5 - CHROMATIC METHOD - STEP 1 - CHOOSE A ROOT NOTE



STEP 2: WRITE OUT THE CHROMATIC POSITIONS

In Figure 6.6, we write out the chromatic positions, based off our root note of E.

FIGURE 6.6 - CHROMATIC METHOD - STEP 2 - WRITE CHROMATIC POSITIONS



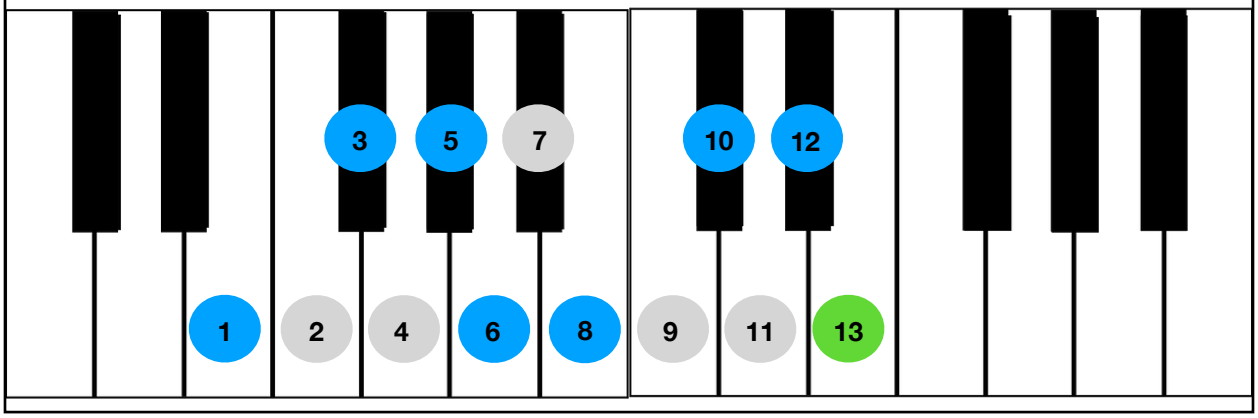
STEP 3: USE THE SCALE CONSTRUCTION CHART

The scale construction chart for the major scale shows the following:

SCALE CONSTRUCTION CHART - THE MAJOR SCALE (IONIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	**1**	**3**	**5**	**6**	**8**	**10**	**12**	**13**

Referencing this, we now select the keys whose chromatic positions on the piano match up with the chromatic positions shown in the scale construction chart, as shown in Figure 6.7:

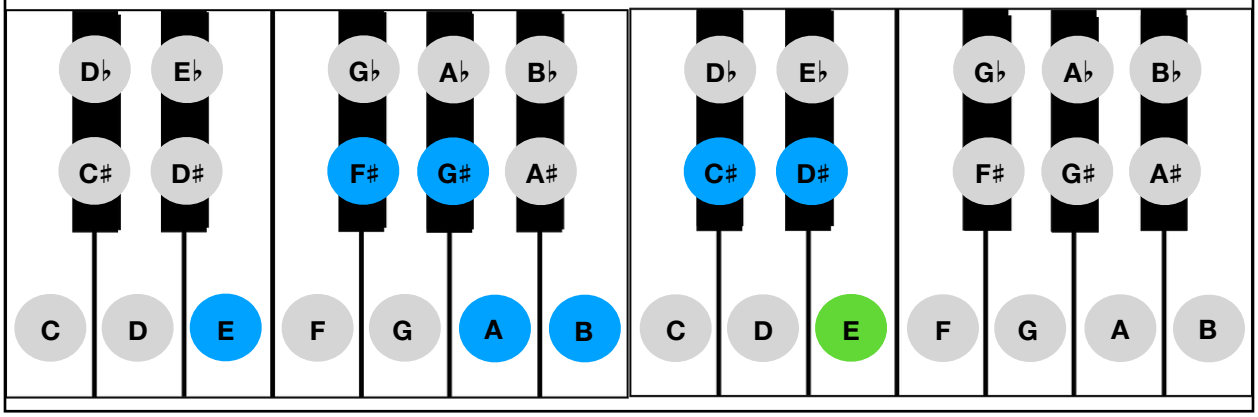
FIGURE 6.7 - CHROMATIC METHOD - STEP 3 - SELECT THE CORRECT NOTES



STEP 4: WRITE OUT THE FINISHED SCALE

In order to write out the correct names for the finished scale, we compare our figure from step 3 (Figure 6.7) with our classical chromatic scale, which shows both flats and sharps (Figure 6.8):

FIGURE 6.8 - FILLING IN E MAJOR



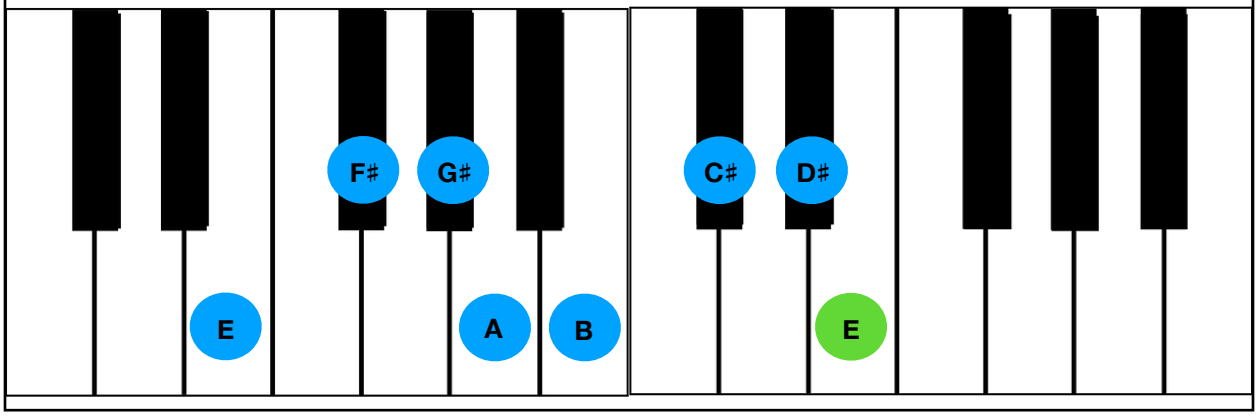
We choose to use the sharps names for the black keys so that we use every letter from A to G, with no duplicates. Also, we can't have flats and sharps in the same scale. Full explanations of why we do this are described in Appendix A.

Therefore, our final scale for E Major is the following:

E Major:

E F♯ G♯ A B C♯ D♯

FIGURE 6.9 - THE KEY OF E MAJOR (CLASSICAL)



6.4.2 Method 2: Relative Positions – A ♭ Major

In a similar manner to the Chromatic Positions method, to use the Relative Positions method, follow these steps:

- **Step 1:** Choose a root note.
- **Step 2:** Write out the chromatic positions of the scale based on the root note.
- **Step 3:** Use the scale construction chart to count the keys relative to the root note in order to fill in the other notes of the scale.
- **Step 4:** Write out the finished scale using proper classical names, referencing Appendix A.

STEP 1: CHOOSE A ROOT NOTE

FIGURE 6.4 - REFERENCE PIANO WITH CLASSICAL NAMES

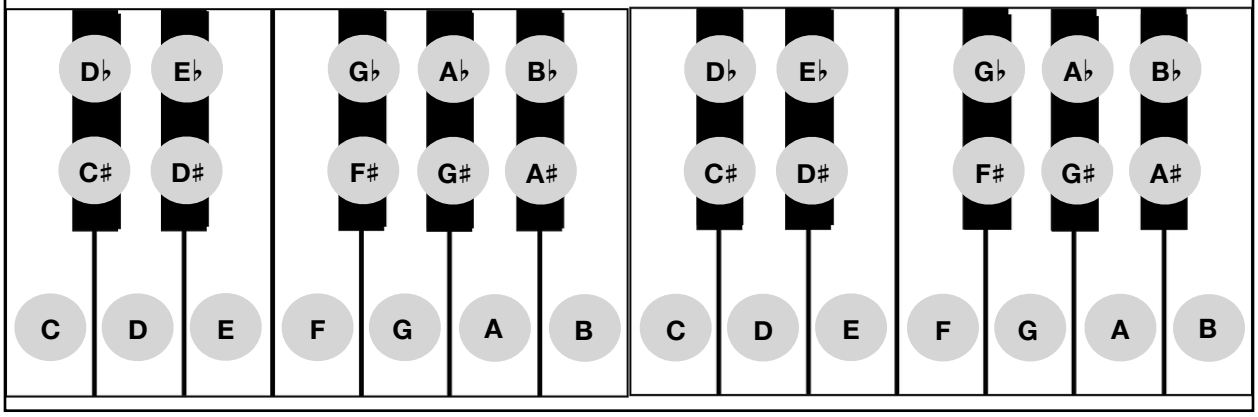
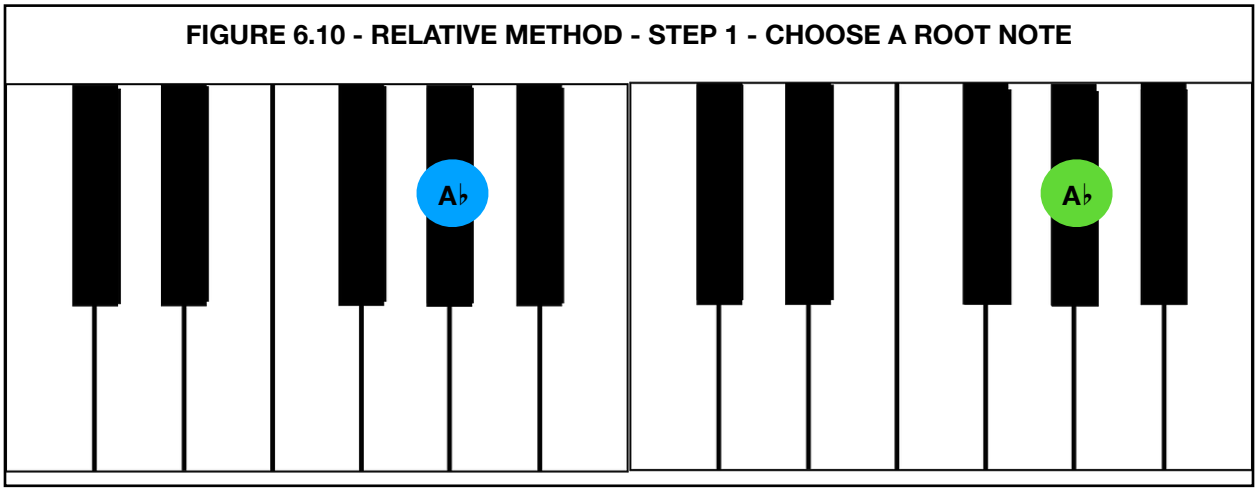
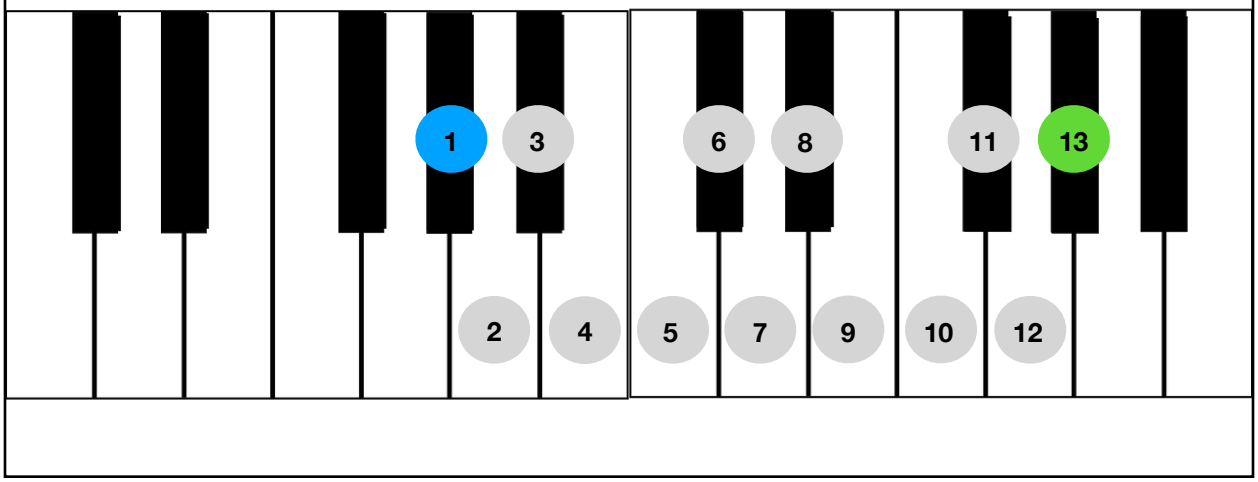


FIGURE 6.10 - RELATIVE METHOD - STEP 1 - CHOOSE A ROOT NOTE



STEP 2: WRITE OUT THE CHROMATIC POSITIONS

FIGURE 6.11 - RELATIVE METHOD - STEP 2 - WRITE CHROMATIC POSITIONS



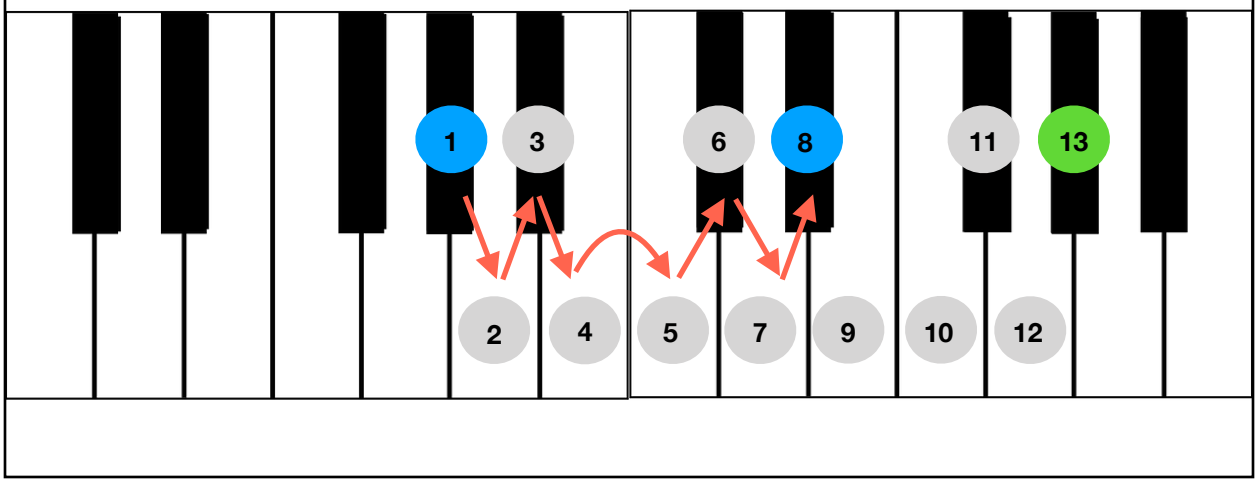
STEP 3: COUNT THE STEPS

Let's reference the scale construction chart:

SCALE CONSTRUCTION CHART - THE MAJOR SCALE (IONIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Relative Position	R	R+2	R+4	R+5	R+7	R+9	R+11	R+12

The way to use this row of the chart is to identify the relative position for each diatonic position in the scale. For example, to find the fifth note, we start with our root note. Then, we count 7 steps to the right to find the fifth note in the scale, which has chromatic position 8, as shown in Figure 6.12:

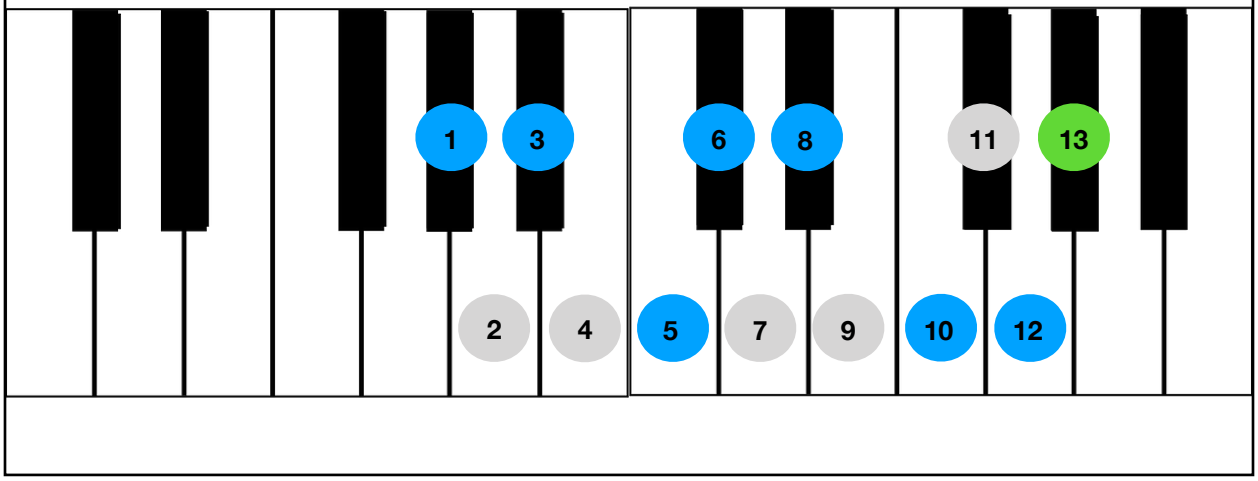
FIGURE 6.12 - RELATIVE METHOD - STEP 3 - COUNTING TO SCALE NOTE #5



You can see that there are seven arrows counting the steps to reach note number 5 in the scale. We then repeat this process with the rest of the notes.

After completing the process, here is our resultant scale:

FIGURE 6.13 - RELATIVE METHOD - STEP 3 - COUNT THE STEPS



STEP 4: COMPLETE THE SCALE

Since we chose A♭ as our root note, we know that all of the rest of the notes in the scale can only be a combination of natural numbers (white keys) and flats. We compare the notes from Figure 6.13 with the classical equivalents and are able to fill in Figure 6.14 with the proper note names:

FIGURE 6.13 - RELATIVE METHOD - STEP 3 - FINDING THE NOTES

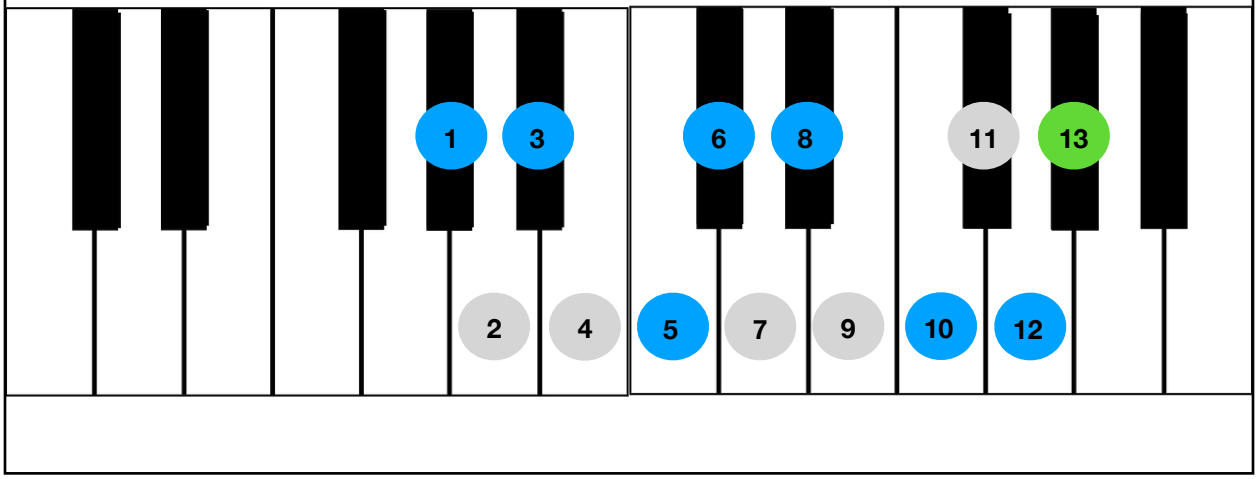
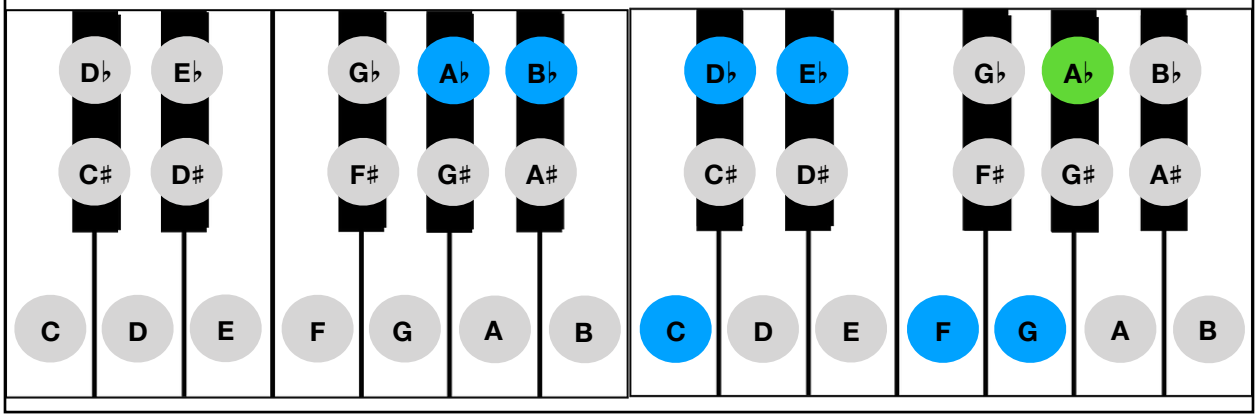


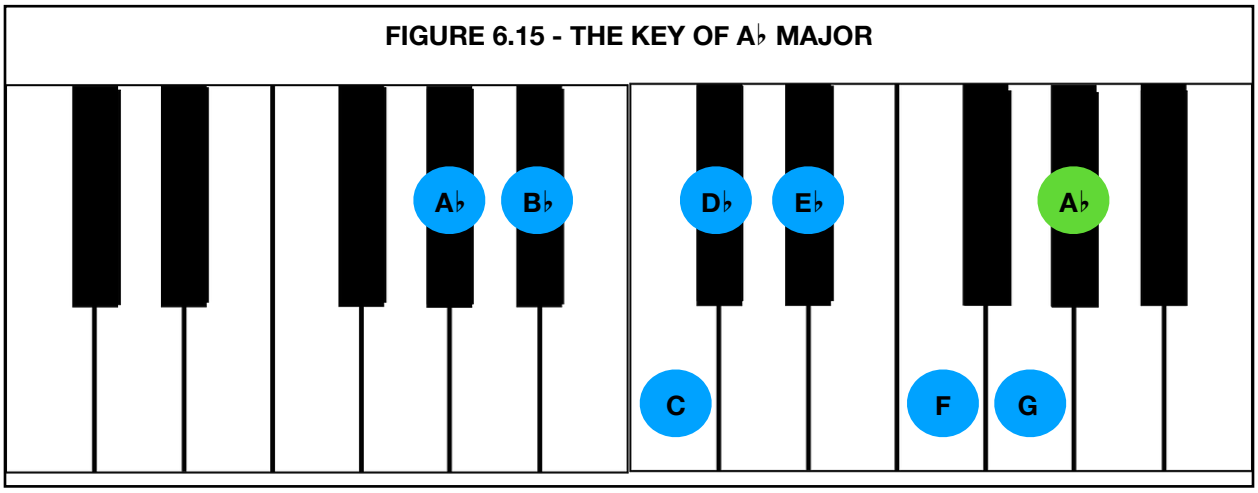
FIGURE 6.14 - FILLING IN A♭ MAJOR



Therefore, our final scale for A♭ Major is the following:

A♭ Major:

A♭ B♭ C D♭ E♭ F G



6.4.3 Method 3: Keys Recursive – D♯ Major

Let's build the key of D♯ Major using the Keys Recursive method.

The formula for using the Keys Recursive method is as follows:

- **Step 1:** Choose a root note
- **Step 2:** Use the recursive method to count the keys. Start with the root note, then each new note follows the pattern in the scale construction chart.
- **Step 3:** Write out the finished scale using proper classical names, referencing Appendix A.

STEP 1: CHOOSE A ROOT NOTE

FIGURE 6.4 - REFERENCE PIANO WITH CLASSICAL NAMES

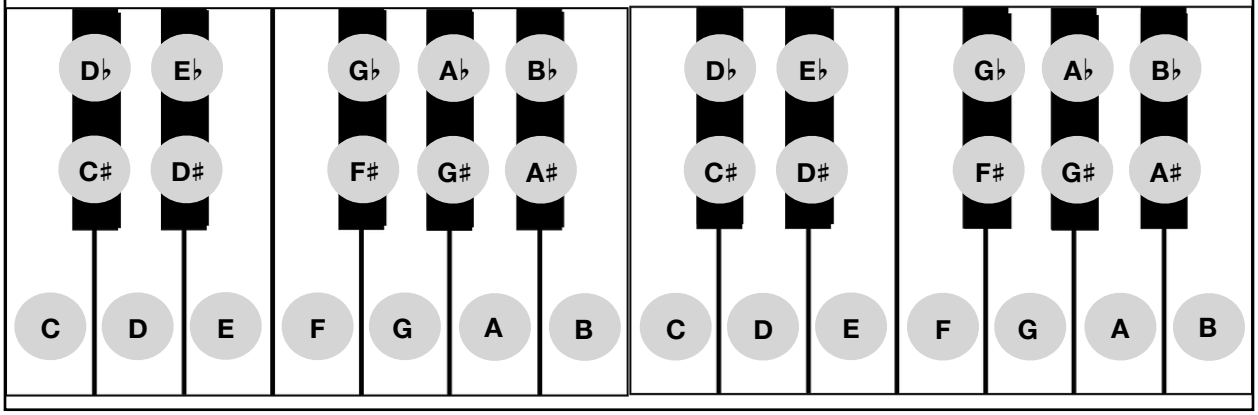
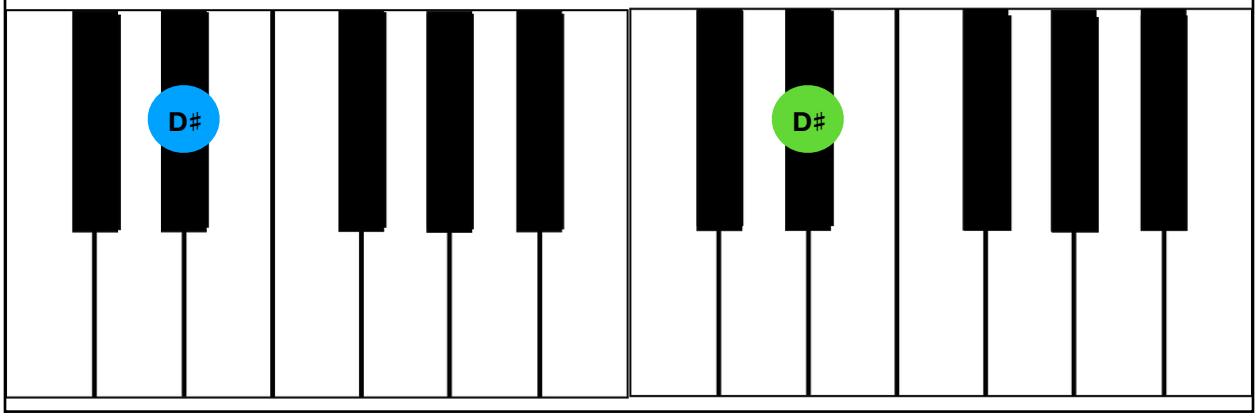


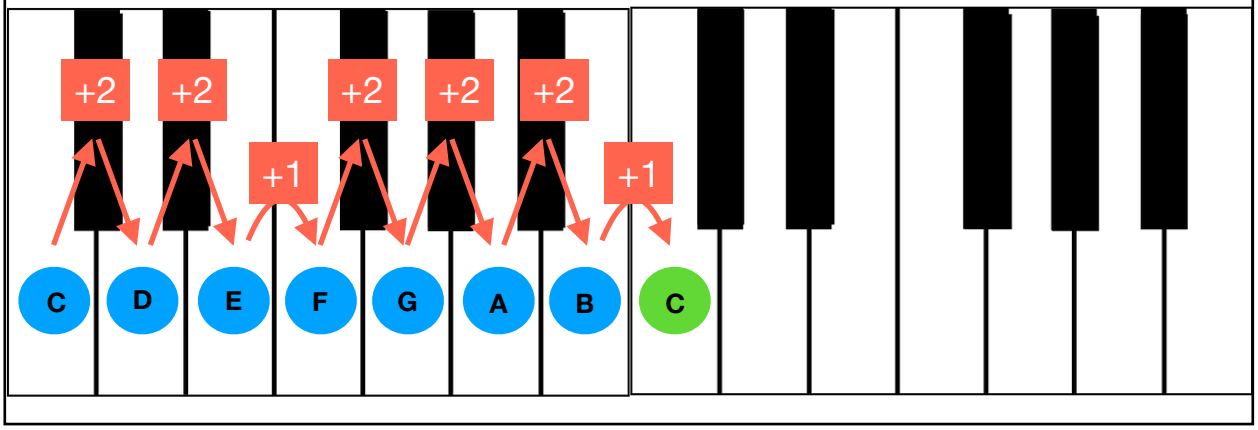
FIGURE 6.16 - KEYS RECURSIVE METHOD - STEP 1 - CHOOSE A ROOT NOTE



STEP 2: FOLLOW THE KEYS RECURSIVE PATTERN

The scale construction chart shows us the following recursive pattern using our keys notation:

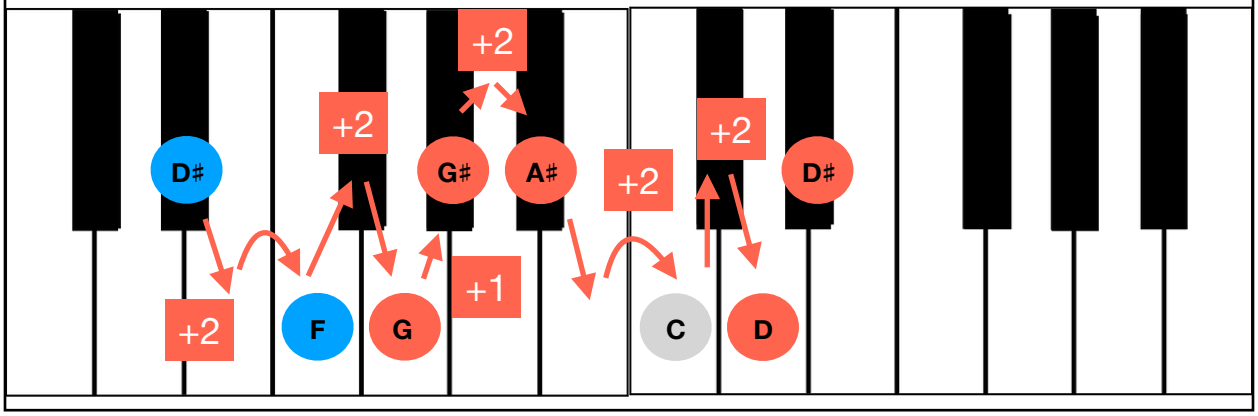
FIGURE 6.3 - THE MAJOR SCALE (IONIAN MODE) - RECURSIVE POSITIONS



POSITION	1	2	3	4	5	6	7	8
Keys Recursive	R	+2	+2	+1	+2	+2	+2	+1

Having chosen our root note to be D♯, we now follow the pattern to construct the scale, as shown in Figure 6.17 on the following page.

FIGURE 6.17 - KEYS RECURSIVE METHOD - STEP 3 - FOLLOW THE PATTERN



6.4.3.1 Enharmonic Keys (D♯ vs. E♭ Major)

STEP 3: WRITE OUT THE FINISHED SCALE

We were able to find the right keys on the piano for the D♯ Major scale, but something isn't quite right with the names. We know that since we started on D♯, the scale can only contain names for natural and sharp notes. But when we used the recursive method, we came up with the following:

D♯ F G G♯ A♯ C D

There are two thing wrong with this:

1. We are missing the letters E and B
2. The letters D and G appear twice

This is why the notes were shown in red in Figure 6.17, because their names are not "technically" correct. So how do we rectify this awkward situation? The answer takes us all the way back to Section 1.2, when we first encountered **accidentals** and **enharmonic equivalency**. These are just the unfortunate quirks of the classical system that we have to deal with if we want to give the keys their "proper" names.

Let's convert the note names we have now into what they "should" be, using their enharmonic equivalents:

D♯	**F**	**G**	**G♯**	**A♯**	**C**	**D**
⇩	⇩	⇩	⇩	⇩	⇩	⇩
D♯	**E♯**	**F𝄪**	**G♯**	**A♯**	**B♯**	**C𝄪**

So we have an **E♯**, a **B♯**, and two double-sharps in a single scale. While *technically* correct, this makes for an exotic and extremely impractical set of notes. Fortunately, we can use enharmonic equivalents again to turn this scale into something more usable when we rewrite it using *flats* instead of sharps.

Rewriting the notes to their enharmonically equivalent forms, we have:

D♯	E♯	F𝄪	G♯	A♯	B♯	C𝄪
⇩	⇩	⇩	⇩	⇩	⇩	⇩
E♭	F	G	A♭	B♭	C	D

Thus, we now have the much more manageable E♭ Major scale:

E♭ Major:

E♭	F	G	A♭	B♭	C	D

We call D♯ Major and E♭ Major **enharmonically equivalent keys** (or just "enharmonic keys," for short) because they sound exactly the same but have different note names.

Yep - the keys used to play D♯ Major are *identical* to the ones we use to play E♭ Major. We can see this in Figures 6.18 and 6.19. This strange similarity is of course entirely avoided when we use scientific pitch notation and the chromatic and diatonic numbering systems.

But this begs the question: how will you know if choosing a root note will generate a scale with strange notations like double-sharps? Well, you won't, until you try it! Luckily, Jumpstart EDM has already put in the work

FIGURE 6.18 - THE KEY OF D♯ MAJOR

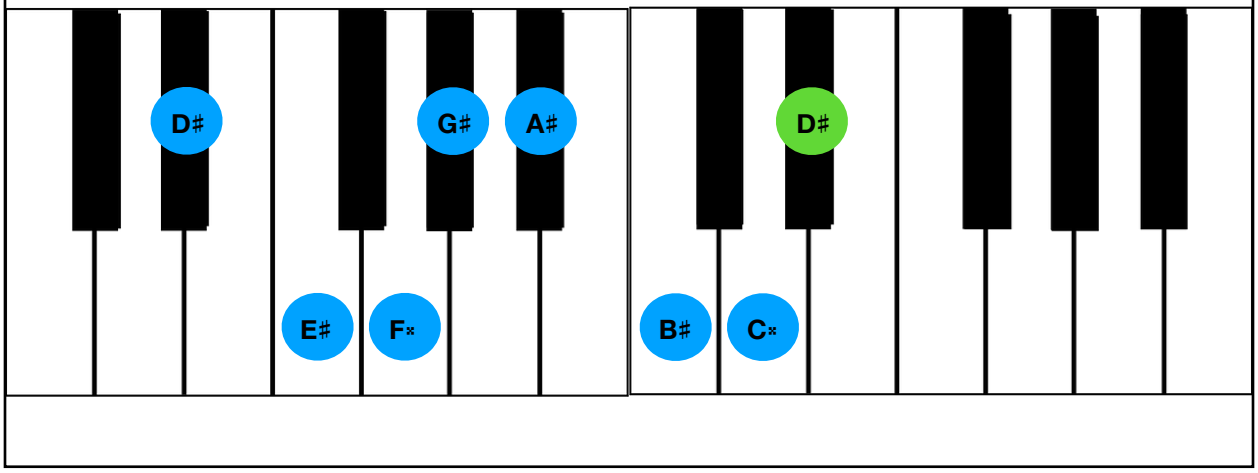
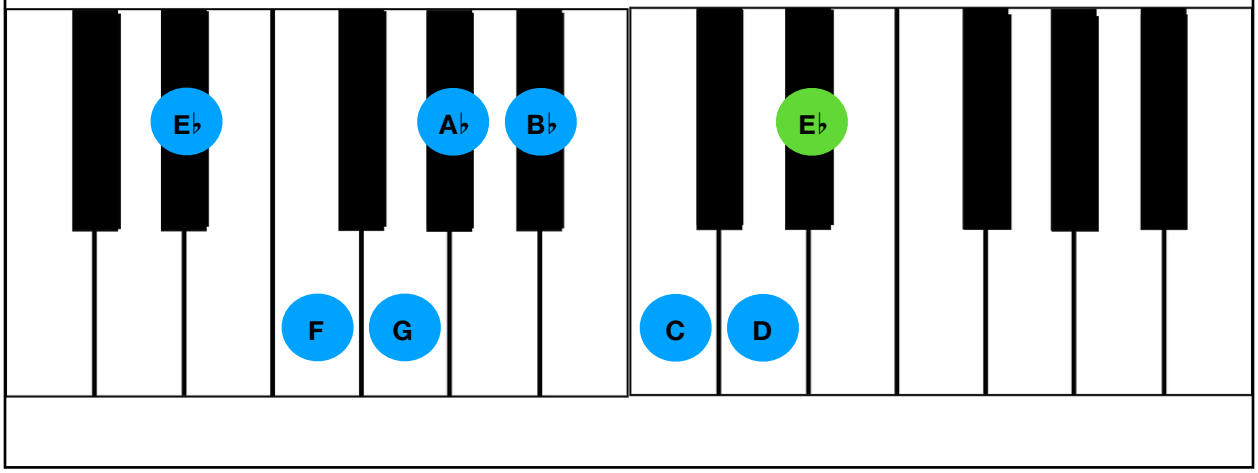


FIGURE 6.19 - THE KEY OF E♭ MAJOR



for you by tabulating all 12 of the major scales in Appendix D.1, listed by their most practical names (e.g. E♭ Major instead of D♯ Major).

There is actually a much larger discussion to be had here concerning the number of flats and sharps in a scale, and it has to do with a concept called the **circle of fifths**. We have saved the topic of the circle of fifths for its own chapter (Chapter11), however, so we won't dive into it right now.

Chapter 7: The Natural Minor Scale (The Aeolian Mode)

7.1 Overview

Minor scales tend to feel sad, serious, dark, or tragic. They are evocative of grief, anxiety, loss of love, fear, and pain, but they can also evoke love, euphoria, escapism, and beauty. They can feel grand, dark, epic, and intense. It is their ability to create serious, moving emotions that makes them so effective on the dance floor.

Minor scales are part of what make the genres of deep house, euphoric trance, dubstep, hard techno, and the psychedelic subgenres so powerful.

7.2 Natural, Harmonic, and Melodic Variations

In this chapter, we will be focusing solely on the **natural minor scale**, also known as the Aeolian mode. It is called the “natural” minor because it is the scale that arises from the natural creation of the seven modes. “Natural” also distinguishes this scale from the **harmonic** and **melodic minor** scales, which are covered in Chapters 8 and 9.

The harmonic and melodic minors are variations of the natural minor that are used, as one might guess, for harmonic and melodic purposes. All three variations may be used in a single song, and the classical composers

often would use them interchangeably, depending on the context of their compositions.

Today, we see EDM artists use all three variations as well. While the natural minor scale is essential, don't feel obliged to adhere to it strictly. Experimentation with the harmonic and melodic minors is encouraged, as it helps to create interest and variation in your music.

7.3 Scale Construction Chart

SCALE CONSTRUCTION CHART - THE NATURAL MINOR SCALE (THE AEOLIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	9	11	13
Relative Position	R	R+2	R+3	R+5	R+7	R+8	R+10	R+12
Keys Recursive	R	+2	+1	+2	+2	+1	+2	+2
Classical Recursive	R	W	H	W	W	H	W	W

7.4 Transposition Chart

TRANSPOSITION CHART - MAJOR → NATURAL MINOR, SAME ROOT NOTE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Major → Natural Minor	0	0	-1	0	0	-1	-1	0

7.5 Natural, Chromatic, and Recursive Positions

FIGURE 7.1 - THE MINOR SCALE (THE AEOLIAN MODE) - NATURAL KEYS

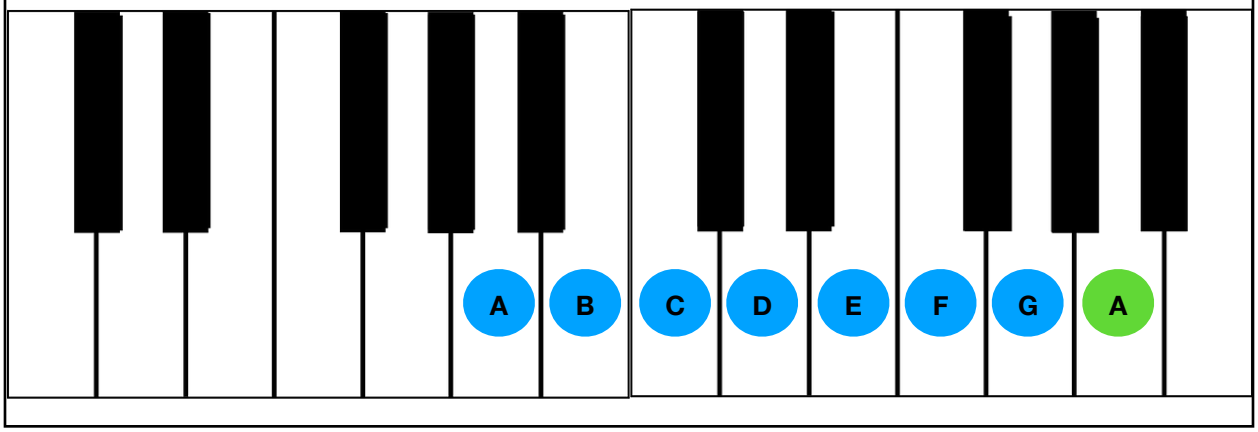


FIGURE 7.2 - THE NATURAL MINOR SCALE (THE AEOLIAN MODE) - CHROMATIC POSITIONS

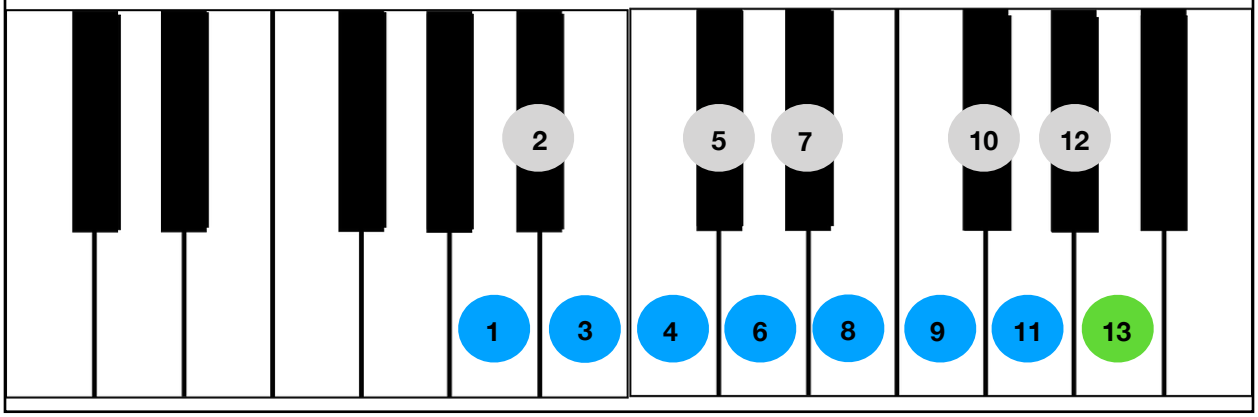
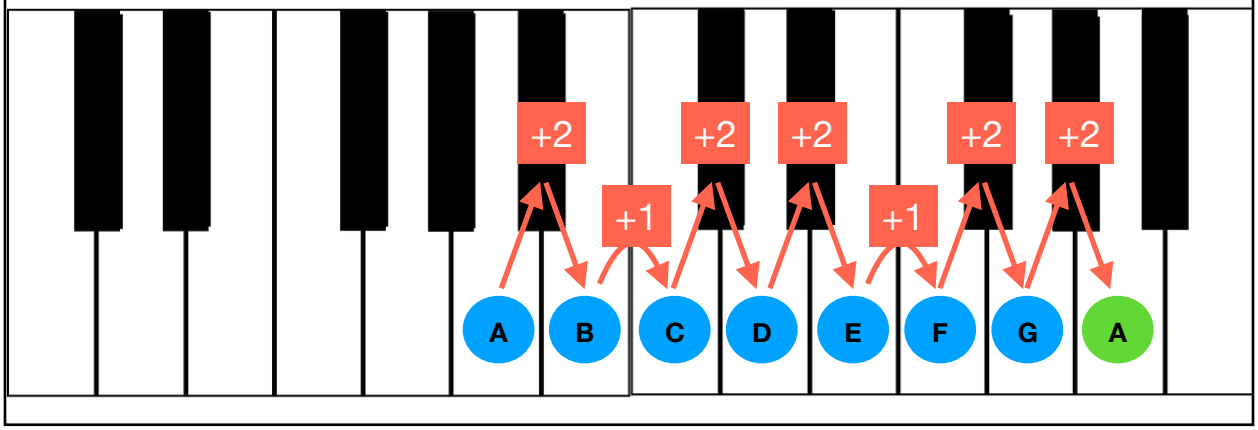


FIGURE 7.3 - THE NATURAL MINOR SCALE (THE AEOLIAN MODE) - RECURSIVE POSITIONS



7.6 Worked Examples

In this chapter, we provide worked examples for the chromatic positions method as well as a method called **transposition**. Notice that there is a new chart in Section 7.3. We provide a brief example of transposition in this chapter, but we will provide a thorough treatment of the concept in Chapter 10. For examples of how to use the relative and keys recursive method, please see Sections 6.3.2 and 6.3.3.

7.6.1 Method 1: Chromatic Positions – F Minor

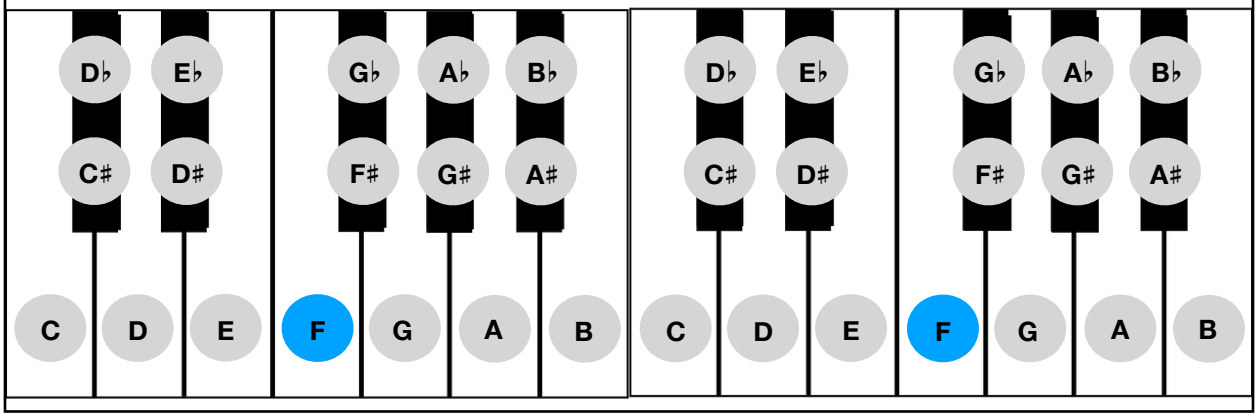
Let's build the key of F Minor using the Chromatic Positions method. The formula for using the Chromatic Positions method is as follows:

- **Step 1:** Choose a root note.
- **Step 2:** Write out the chromatic positions of the scale based on the root note.
- **Step 3:** Use the scale construction chart to choose the correct chromatic positions to fill in the scale.
- **Step 4:** Write out the finished scale using proper classical names, referencing Appendix A.

STEP 1: CHOOSE A ROOT NOTE

We've chosen F to be our root note, in Figure 7.4.

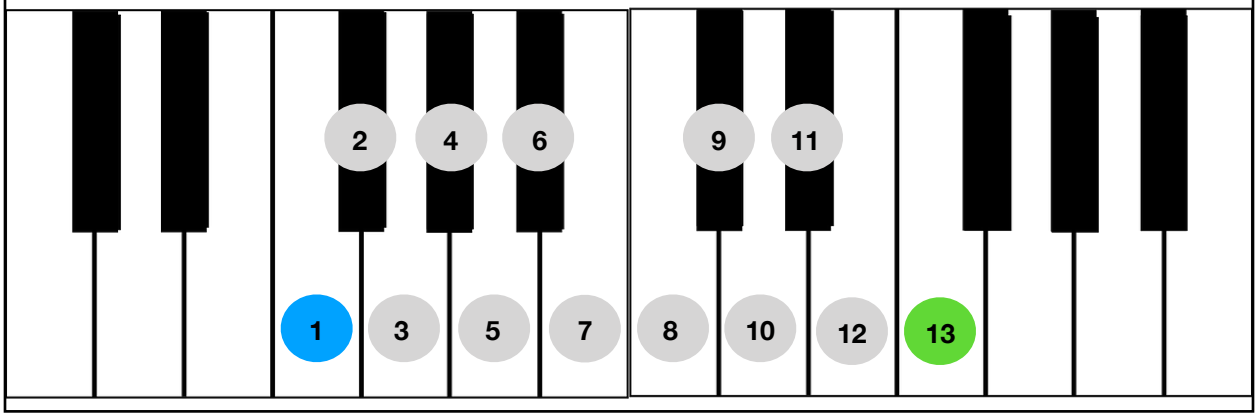
FIGURE 7.4 - CHROMATIC METHOD - STEP 1 - CHOOSING A ROOT NOTE



STEP 2: WRITE OUT THE CHROMATIC POSITIONS

In Figure 7.5, we write out the chromatic positions:

FIGURE 7.5 - CHROMATIC METHOD - STEP 2 - WRITE THE NUMBERS



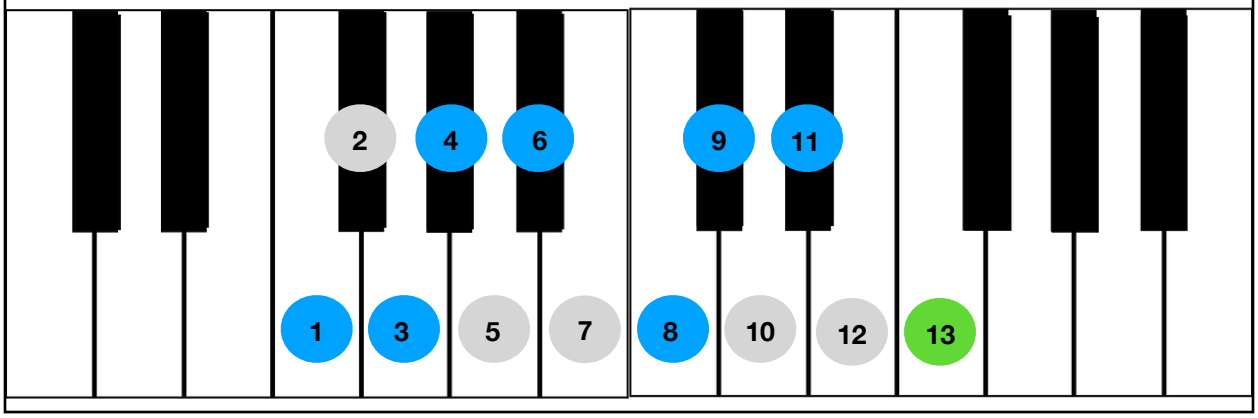
STEP 3: USE THE SCALE CONSTRUCTION CHART

The scale construction chart for the minor scale shows the following:

SCALE CONSTRUCTION CHART - THE NATURAL MINOR SCALE (THE AEOLIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	9	11	13

Referencing this, we now select the keys whose chromatic positions on the piano match up with the chromatic positions shown in the scale construction chart, as shown in Figure 7.6:

FIGURE 7.6 - CHROMATIC METHOD - STEP 3 - SELECT THE CORRECT NOTES



STEP 4: WRITE OUT THE FINISHED SCALE

In order to write out the correct names for the finished scale, we reference the classical keyboard, in Figures 7.7 and 7.8:

FIGURE 7.7 - CHROMATIC METHOD - STEP 4 - NAMING THE SCALE

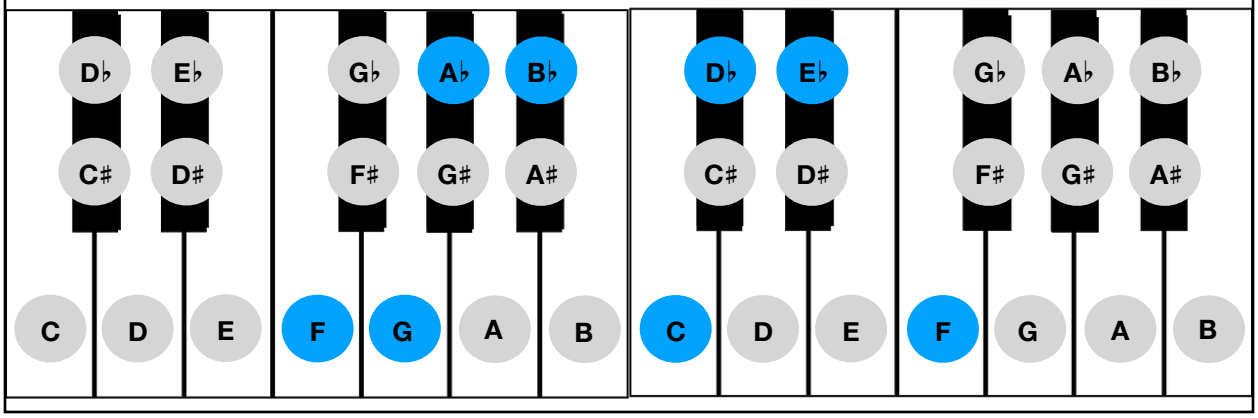
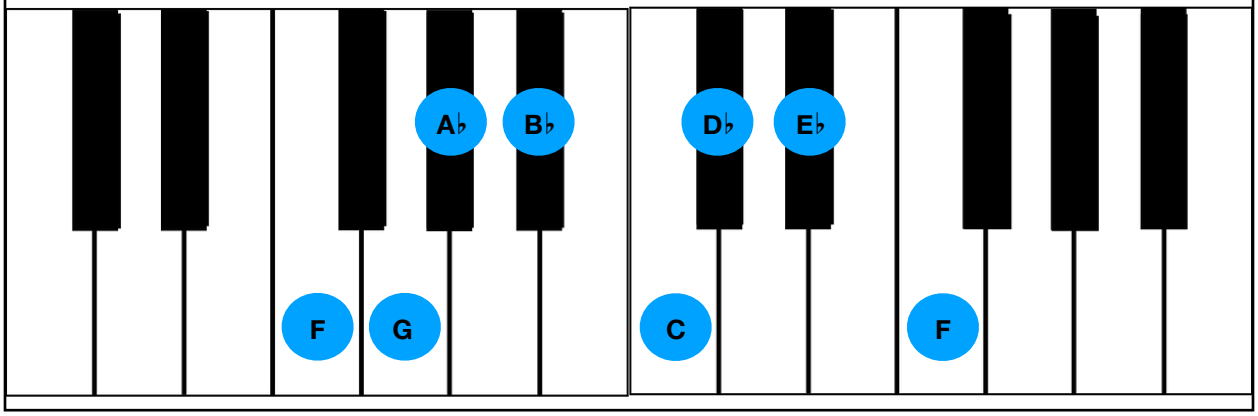


FIGURE 7.8 - THE KEY OF F MINOR



We choose to use the flats names for the black keys so that we use every letter from A to G. Therefore, our final scale for F Minor is the following:

F Minor:

F G A♭ B♭ C D♭ E♭

7.6.2 Method 4: Transposition – E ♭ Minor

We now introduce a fourth method for creating scales - construction by transposition. What **transposition** means is that we are taking a previously made scale and shifting the notes to create another.

We mentioned back in Section 3.2.5 that the difference between the major and minor (more accurately, the *natural* minor) scales is that the third, sixth, and seventh notes of the minor scale are shifted down one key compared to their major equivalents. This is noted in the **transposition chart** seen in Section 7.4.

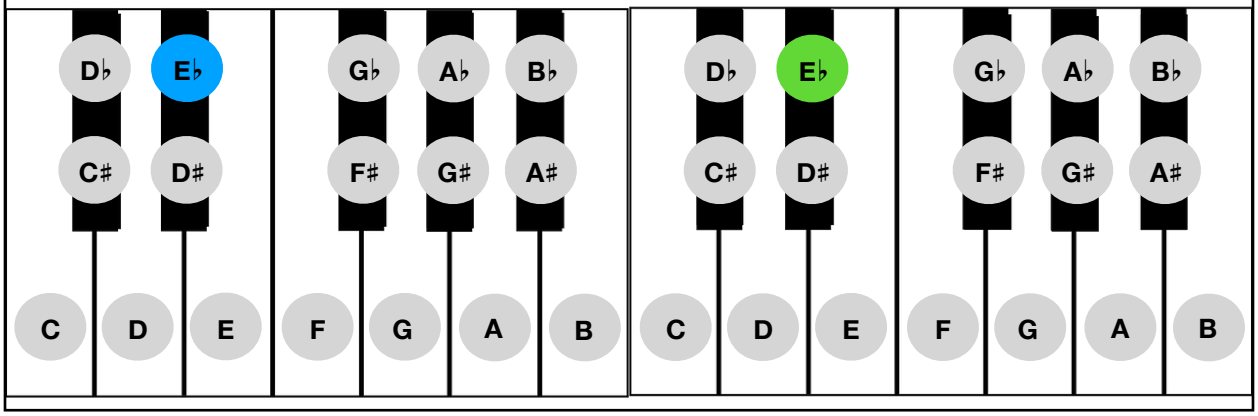
Therefore, for a given root note, in order to create a natural minor scale by transposition, follow these steps:

1. **Step 1:** Choose the root note of your desired minor scale, R.
2. **Step 2:** Create a major scale based on R.
3. **Step 3:** Lower the third, sixth, and seventh notes of the major scale by 1 key.
4. **Step 4:** Correctly name the notes of the minor scale.

STEP 1: CHOOSE A ROOT NOTE

Let's create the scale of E♭ Minor. Our root note is E♭, as seen below:

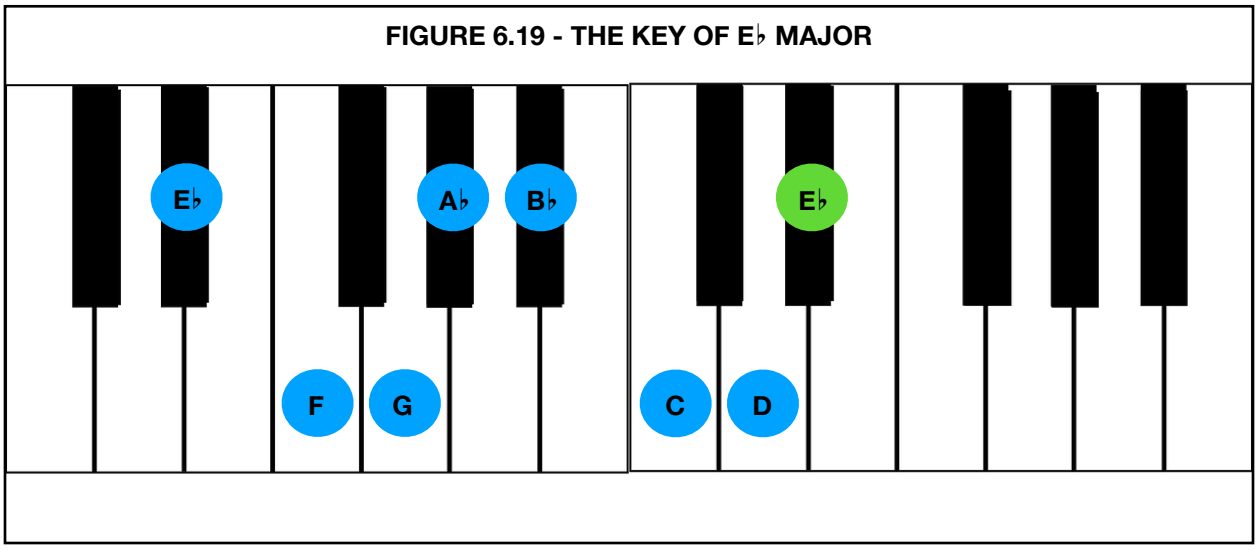
FIGURE 7.9 - TRANSPOSITION METHOD - STEP 1 - CHOOSE A ROOT NOTE



STEP 2: CREATE THE MAJOR SCALE

We already created the E♭ Major scale in Section 6.3.3.1:

FIGURE 6.19 - THE KEY OF E♭ MAJOR



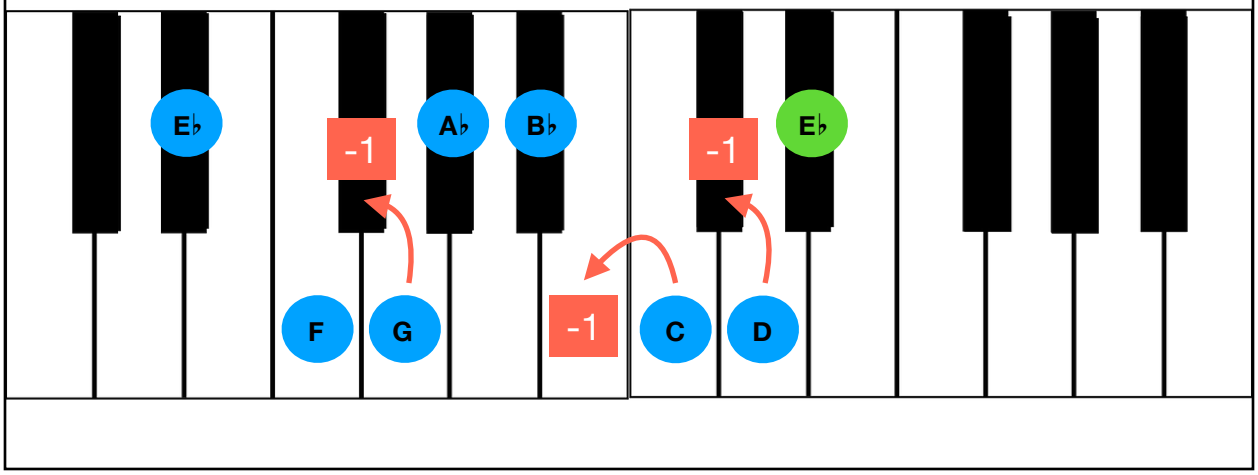
STEP 3: PERFORM THE TRANSPOSITION

For step three, we lower the third, sixth, and seventh notes of the major scale by one key each. This description can be shown with numbers in our transposition chart from Section 7.4, where zeroes mean that no change occurs on those notes:

TRANSPOSITION CHART - MAJOR → NATURAL MINOR, SAME ROOT NOTE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Major → Natural Minor	0	0	-1	0	0	-1	-1	0

We can do this by listing out the chromatic numbers and doing it that way (as derived in detail in Chapter 10), or we can just reference the keyboard, as shown in Figure 7.10:

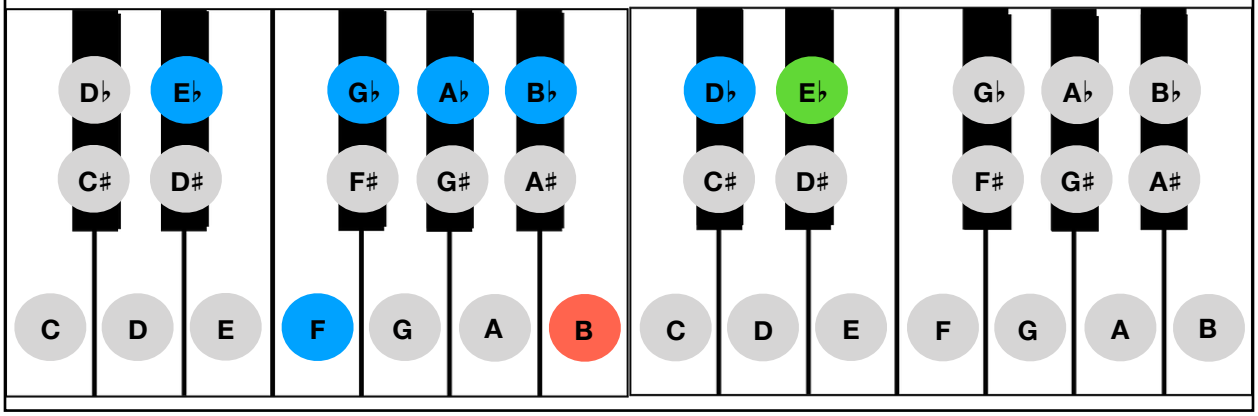
FIGURE 7.10 - TRANSPOSITION METHOD - STEP 3 - PERFORM THE TRANSPOSITION



STEP 4: NAME THE NOTES

After having shifted the third, sixth, and seventh notes of the major scale, as shown in Figure 7.10, we now name the new notes, referencing our classical keyboard in Figure 7.11:

FIGURE 7.11 - TRANSPOSITION METHOD - STEP 4 - NAME THE NOTES



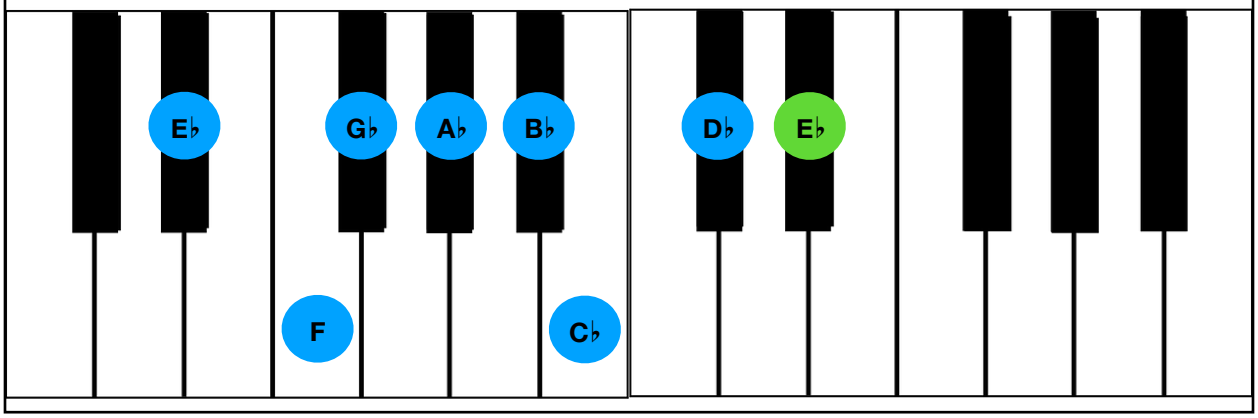
Since we started with flats, we know that we can only choose natural or flat keys from the keyboard. G♭ and D♭ are acceptable, but now we have both B and B♭ in the scale. We rectify this by calling B "C♭". Therefore, our scale becomes:

E♭ Minor:

E♭ F G♭ A♭ B♭ C♭ D♭

This is shown on the piano in Figure 7.12, on the following page.

FIGURE 7.12 - THE KEY OF E♭ MINOR



7.6.2.1 Enharmonic Keys, Revisited (D♯ vs. E♭ Minor)

If you recall from Section 6.3.3.1, E♭ Major was enharmonically equivalent to D♯ Major, and we chose to write the scale as E♭ Major because it was simpler.

But does this same idea hold true with the minor keys as well? Let's convert the notes of E♭ Minor to their enharmonic equivalents:

E♭	F	G♭	A♭	B♭	C♭	D♭
⇩	⇩	⇩	⇩	⇩	⇩	⇩
D♯	E♯	F♯	G♯	A♯	B	C♯

The two enharmonic keys are shown on keyboards in Figures 7.12 and 7.13 on the following page.

FIGURE 7.12 - THE KEY OF E♭ MINOR

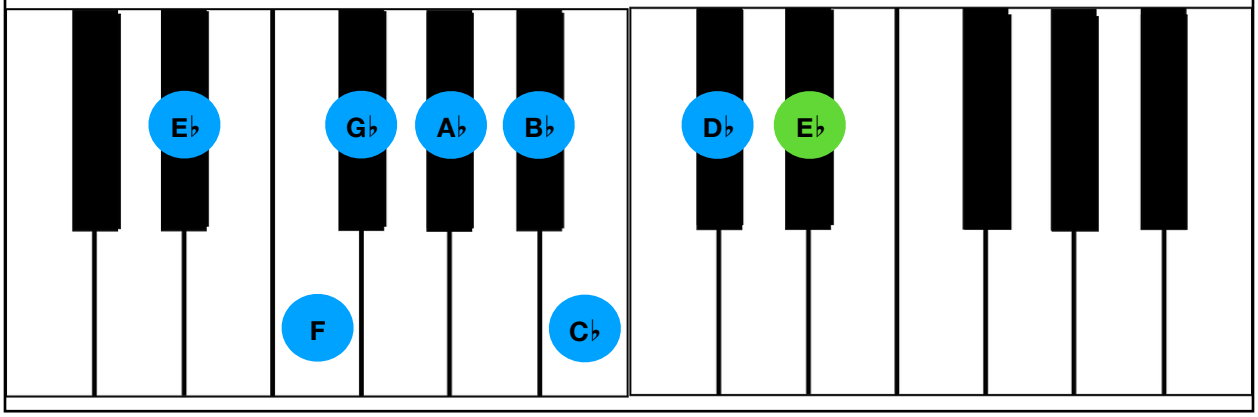
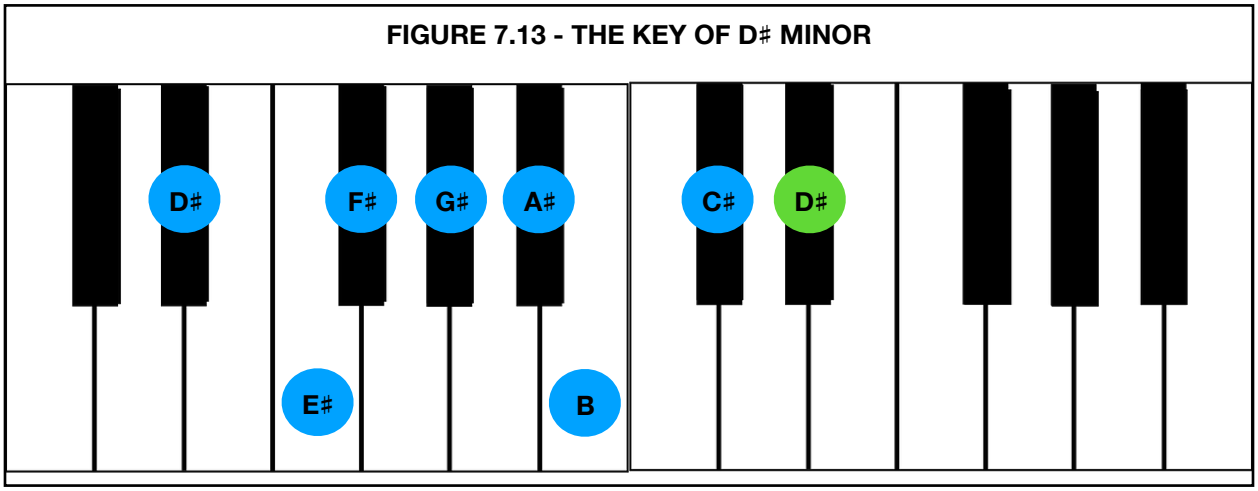


FIGURE 7.13 - THE KEY OF D♯ MINOR



We see that the key of D♯ Minor contains an E♯, and the key of E♭ Minor contains a C♭. Both of these keys have 6 accidentals, so it doesn't appear that one is more simple to write or is easier to work with than the other. As a result, we can choose to use either of them when writing music:

E♭ Minor:

E♭ F G♭ A♭ B♭ C♭ D♭

D♯ Minor:

D♯ E♯ F♯ G♯ A♯ B C♯

The reason why neither notation is easier to use for the minor keys, but it is for the major keys, is that the major and minor scales have different modal patterns (see Chapter 5). To see a detailed walkthrough of how parallel, relative, and enharmonic keys are related, see Chapter 12: The Circle of Fifths.

Chapter 8: The Harmonic Minor Scale

8.1 Overview

The **harmonic minor** is primarily used in harmonic structures, i.e. when writing chords and chord progressions. It can strengthen otherwise mundane progressions and add interest and variance to your music.

8.2 Scale Construction Chart

SCALE CONSTRUCTION CHART - THE HARMONIC MINOR SCALE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	9	12	13
Relative Position	R	R+2	R+3	R+5	R+7	R+8	R+11	R+12
Keys Recursive	R	+2	+1	+2	+2	+1	+3	+1
Classical Recursive	R	W	H	W	W	H	T	H

8.3 Transposition Chart

TRANSPOSITION CHART - THE HARMONIC MINOR SCALE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Natural Minor → Harmonic Minor	0	0	0	0	0	0	+1	0
Major → Harmonic Minor	0	0	-1	0	0	-1	0	0

8.4 Natural, Chromatic, and Recursive Positions

FIGURE 8.1 - THE HARMONIC MINOR SCALE - NATURAL KEYS

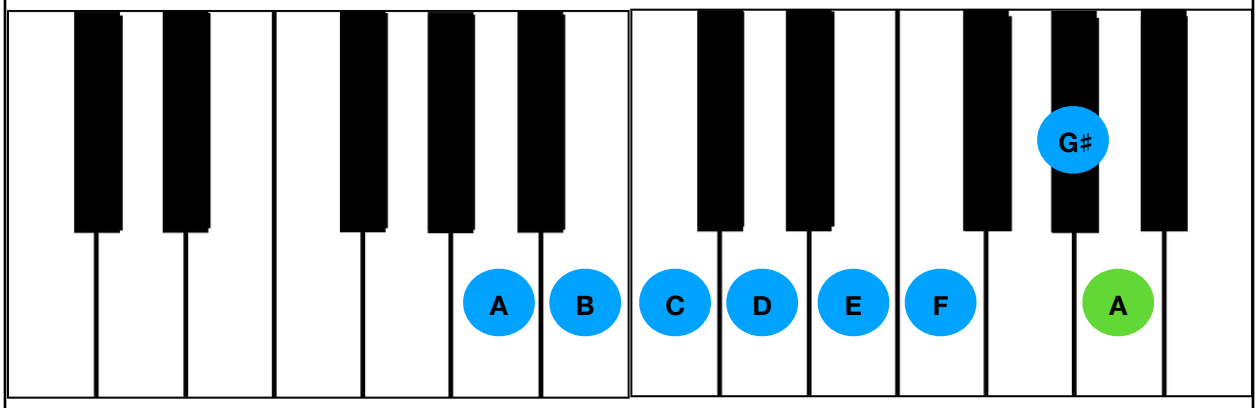


FIGURE 8.2 - THE HARMONIC MINOR SCALE - CHROMATIC POSITIONS

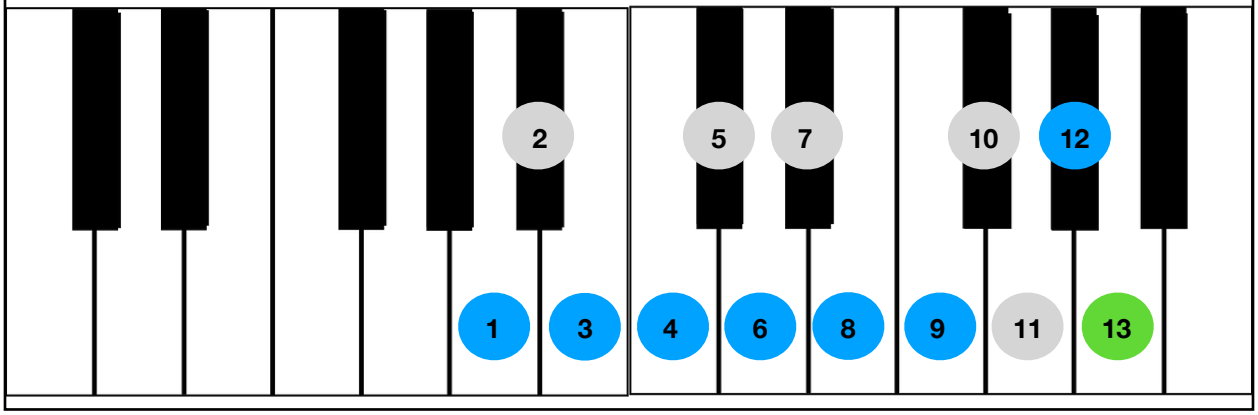
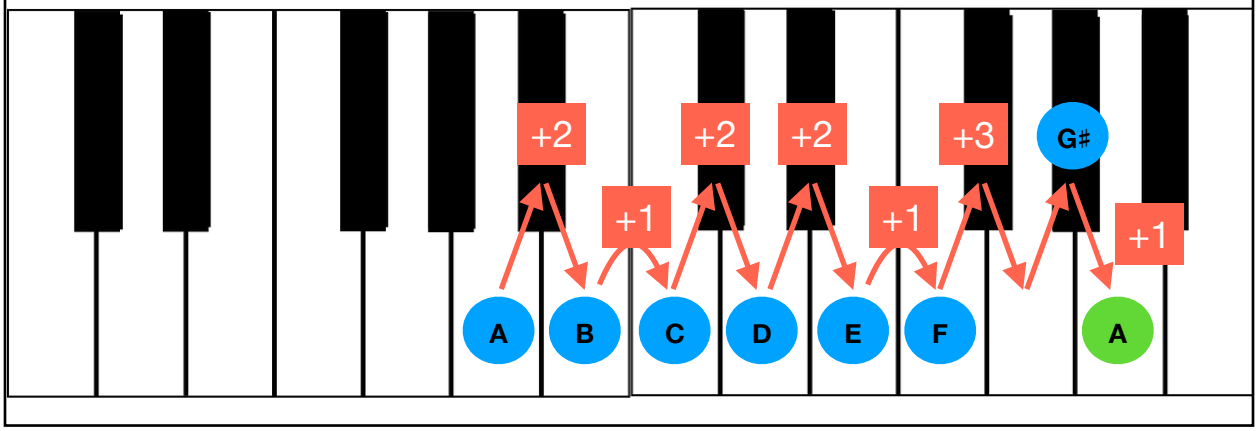


FIGURE 8.3 - THE HARMONIC MINOR SCALE - RECURSIVE POSITIONS



8.5 A Note on Tritones

Taking a look at the scale construction chart and reference figures, you likely noticed something we haven't discussed before. The interval between the sixth and seventh notes of the harmonic minor scale is 3 keys, which we call a **tritone**. Since the major and natural minor scales only contain patterns of 1 and 2, this insertion of a 3-key interval can sound strange, awkward, or dissonant to some.[3] In fact, the Catholic Church reportedly banned the use of certain tritone chords in the middle ages because it thought they were "the sound of the Devil"!

Music, especially electronic music, is not typically written exclusively in a harmonic minor scale. Instead, the harmonic minor is weaved into the chords in such a way that the tritone characteristic of the scale helps to amplify the emotion or flow of the progression, instead of interrupt it. Feel free to experiment!

[3] But the harmonic minor is actually one of our favorite scales for this very reason!

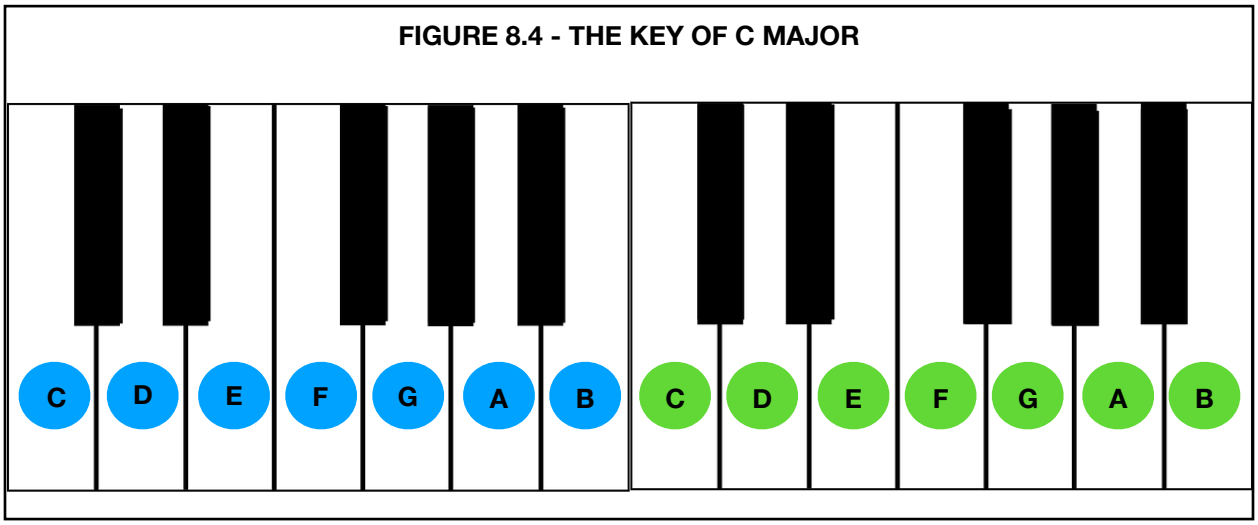
8.6 Worked Examples

8.6.1 Method 4: Transposition – C Harmonic Minor

Since the harmonic and melodic minor (see Chapter 9) scales are really just variants of the natural minor, we'll only be showing transposition-based examples.

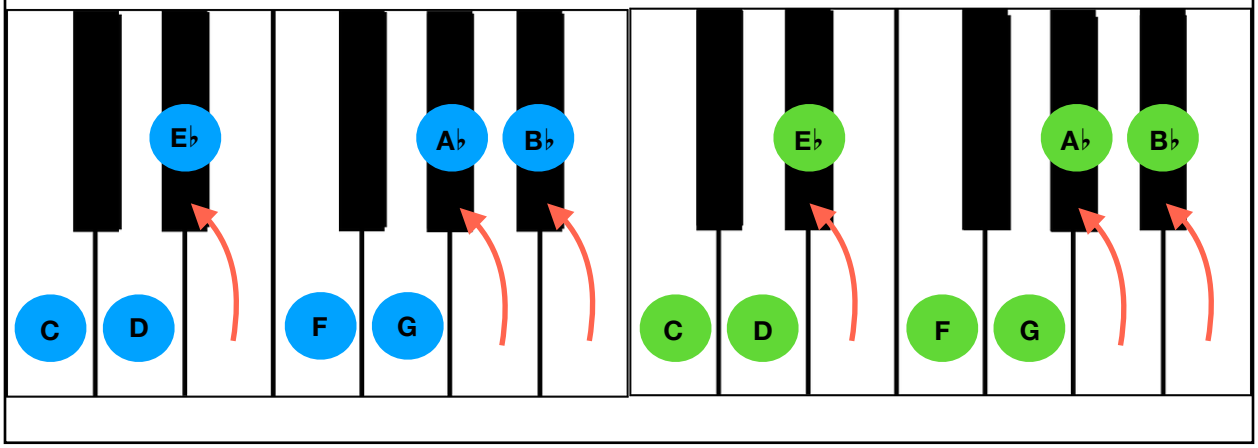
Let's say we want to use C Harmonic minor in our next track. We start out by remembering that C Major contains only the white notes from C to C, as shown in Figure 8.4:

FIGURE 8.4 - THE KEY OF C MAJOR



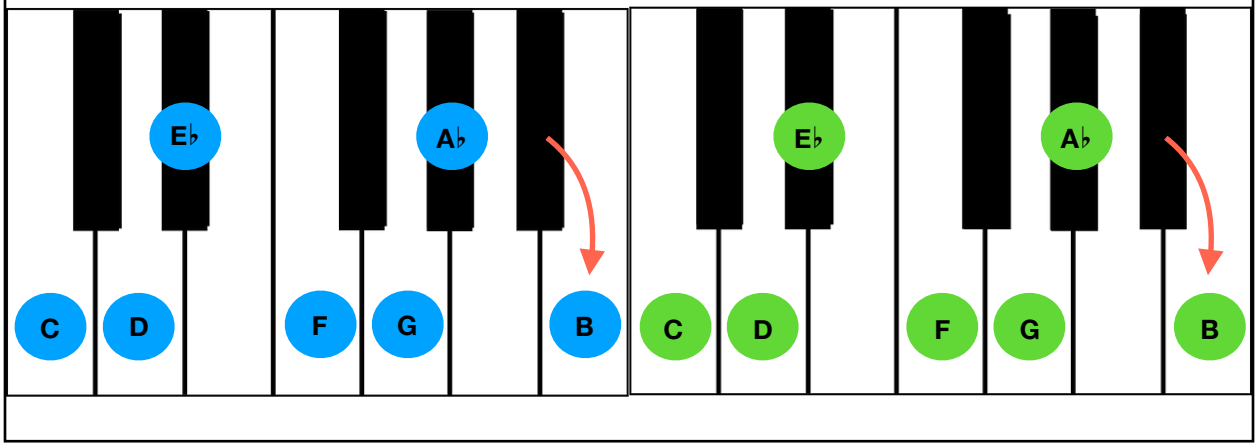
We then recall that to convert between major and natural minor, we lower the third, sixth, and seventh notes of the scale by one key, as shown in Figure 8.5 on the following page.

FIGURE 8.5 - CONVERTING FROM C MAJOR TO C MINOR (NATURAL)



Then, knowing that the only difference between the natural and the harmonic minor scale is that the harmonic minor has a raised seventh note, we simply shift the B♭ back to a B, as shown in Figure 8.6:

FIGURE 8.6 - CONVERTING FROM C MINOR (NATURAL) TO C MINOR (HARMONIC)



Therefore, we have:

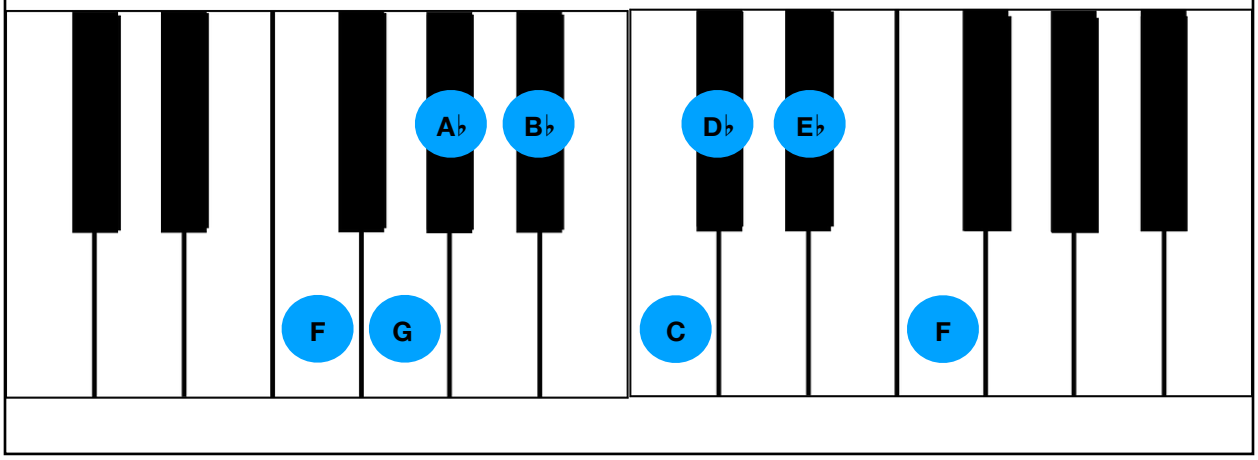
C Minor (Harmonic):

C D E♭ F G A♭ B

8.6.2 Method 4: Transposition – F Harmonic Minor

Let's take a look at F Minor (Natural), which we made using the chromatic positions method in 7.6.1 (Figure 8.7):

FIGURE 8.7 - THE KEY OF F MINOR (NATURAL)



All we have to do to convert this scale from the natural to the harmonic minor is to raise the seventh note by one key, as shown in Figure 8.8:

Therefore, the harmonic scale is:

F Minor (Harmonic):

F G A♭ B♭ C D♭ E

Jumpstart EDM will be releasing a separate book on harmony, where applications of the harmonic minor will be described more in-depth. For more discussion on the minor scales, see Section 7.2.

Chapter 9: The Melodic Minor Scale

9.1 Overview

The **melodic minor** was born when classical composers found that creating melodies with the harmonic minor didn't flow quite as well as they wanted them to. So, they decided to raise the sixth note of the harmonic minor scale to smoothen out the tritone interval into a normal whole tone (see Section 8.5).

When you raise both the sixth and seventh notes of the natural minor scale, it creates a sequence of whole notes from the second through to the seventh notes in the scale. This accentuates the rising feel of the scale when creating a **melody**, which is commonly defined as a "sequence of single notes that sounds pleasing." You can think of a melody as a "tune," "hook," or "theme." For example, an iconic theme song is the opening title music in the *Star Wars* films. It is generally advisable to experiment with using the harmonic minor when creating chords and the melodic minor when writing melodies.

The unique thing about the melodic minor is that the ascending scale (i.e. playing the scale from low to high notes) is different from the descending scale (moving from high to low notes). When playing the descending scale, the melodic minor is *identical* to the natural minor scale. When constructing melodies with the melodic minor, playing up and down the scale tends to sound more dramatic and flowing than using the evenly-distributed natural minor scale. This is because the **6** and **7** notes of the ascending scale are major, and the descending **6** and **7** notes are minor (see Section 3.2.5.1 and transposition charts below).

The melodic minor is used extensively in EDM, especially in genres that depend heavily on extended melodic passages and breakdowns, or any genres that incorporate aspects of jazz, blues, or funk. Common genre examples include progressive house, progressive trance, uplifting/euphoric trance, melodic dubstep, electronica, nu-disco, electro-swing, electro-funk, and downtempo.

9.2 Scale Construction Chart

SCALE CONSTRUCTION CHART - THE MELODIC MINOR SCALE (ASCENDING)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	10	12	13
Relative Position	R	R+2	R+3	R+5	R+7	R+9	R+11	R+12
Keys Recursive	R	+2	+1	+2	+2	+2	+2	+1
Classical Recursive	R	W	H	W	W	W	W	H

9.3 Transposition Chart

TRANSPOSITION CHART - THE MELODIC MINOR SCALE (ASCENDING)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Natural Minor → Melodic Minor	0	0	0	0	0	+1	+1	0
Harmonic Minor → Melodic Minor	0	0	0	0	0	+1	0	0
Major → Melodic Minor	0	0	-1	0	0	0	0	0

9.4 Natural, Chromatic, and Recursive Positions

FIGURE 9.1 - THE MELODIC MINOR SCALE (ASCENDING) - NATURAL KEYS

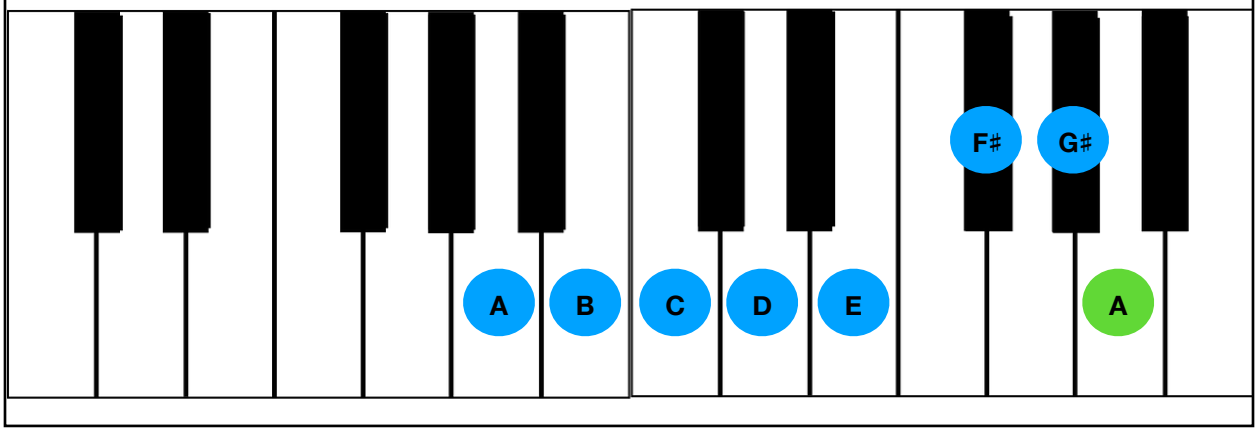


FIGURE 9.2 - THE MELODIC MINOR SCALE (ASCENDING) - CHROMATIC POSITIONS

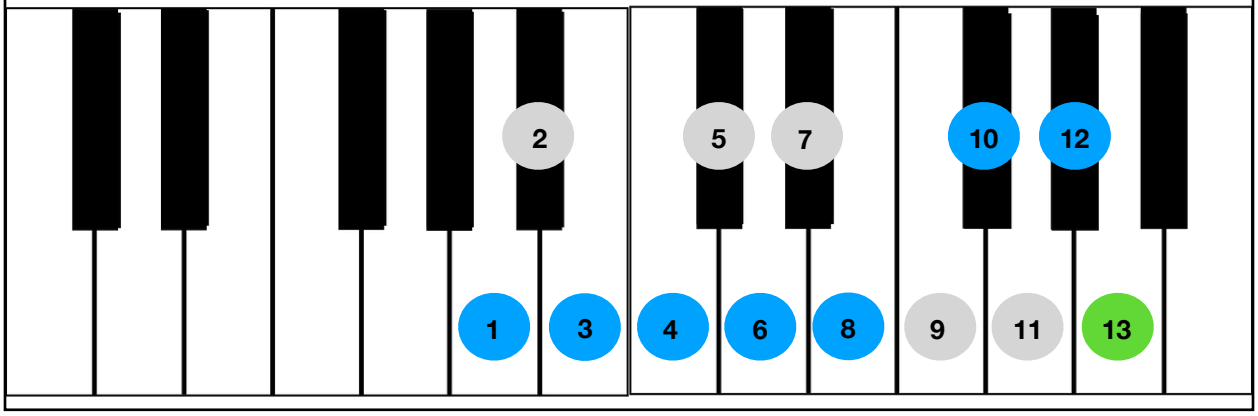


FIGURE 9.3 - THE MELODIC MINOR SCALE (ASCENDING) - KEYS RECURSIVE

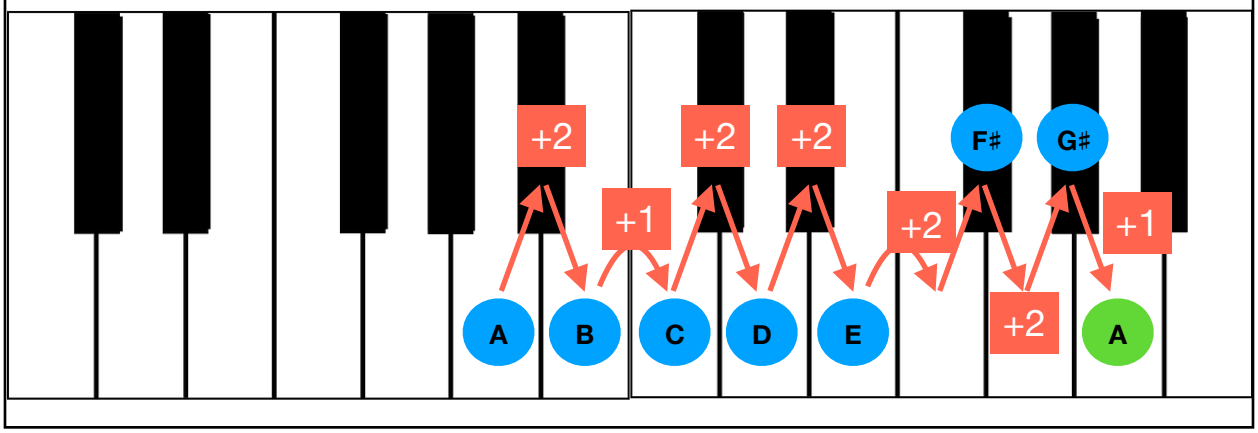


FIGURE 9.4 - THE MELODIC MINOR SCALE (DESCENDING) - NATURAL KEYS

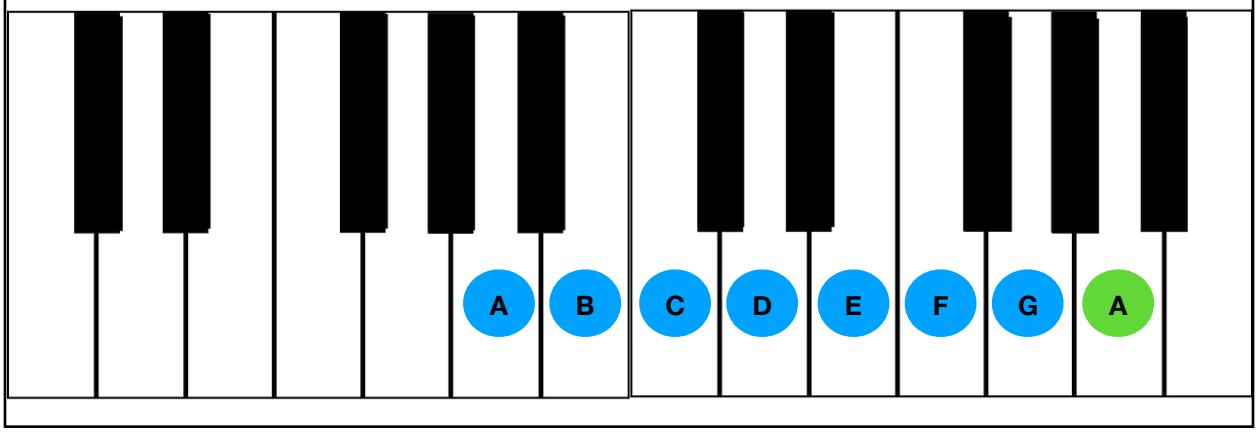


FIGURE 9.5 - THE MELODIC MINOR SCALE (DESCENDING) - CHROMATIC POSITIONS

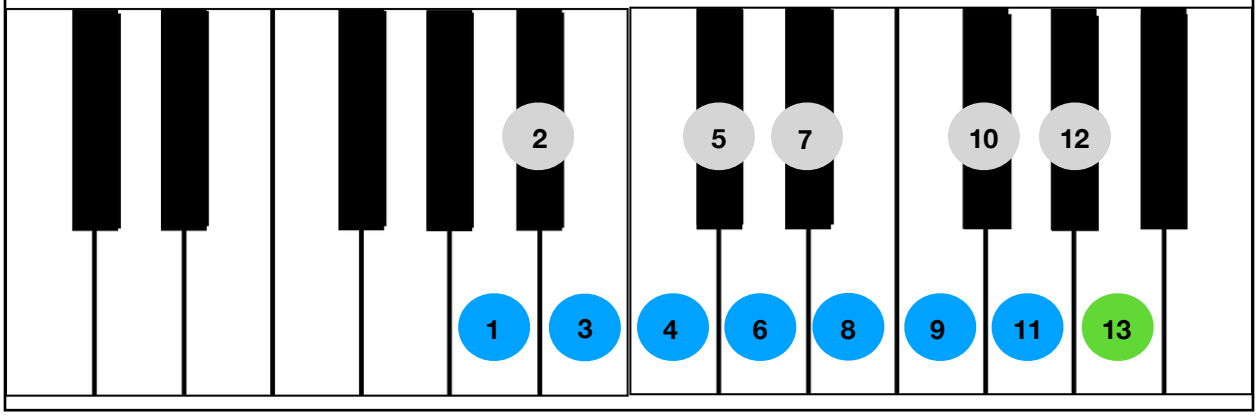
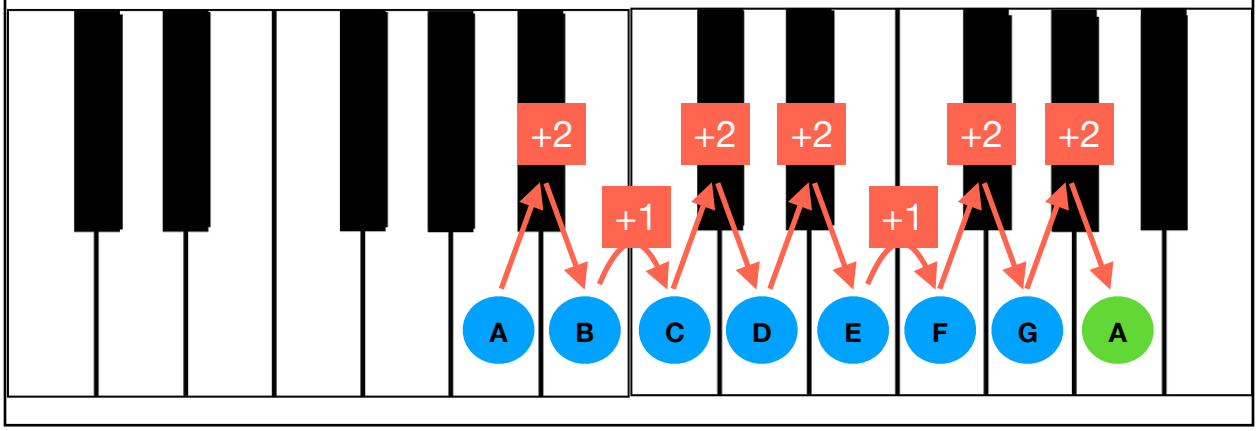


FIGURE 9.6 - THE MELODIC MINOR SCALE (DESCENDING) - RECURSIVE POSITIONS

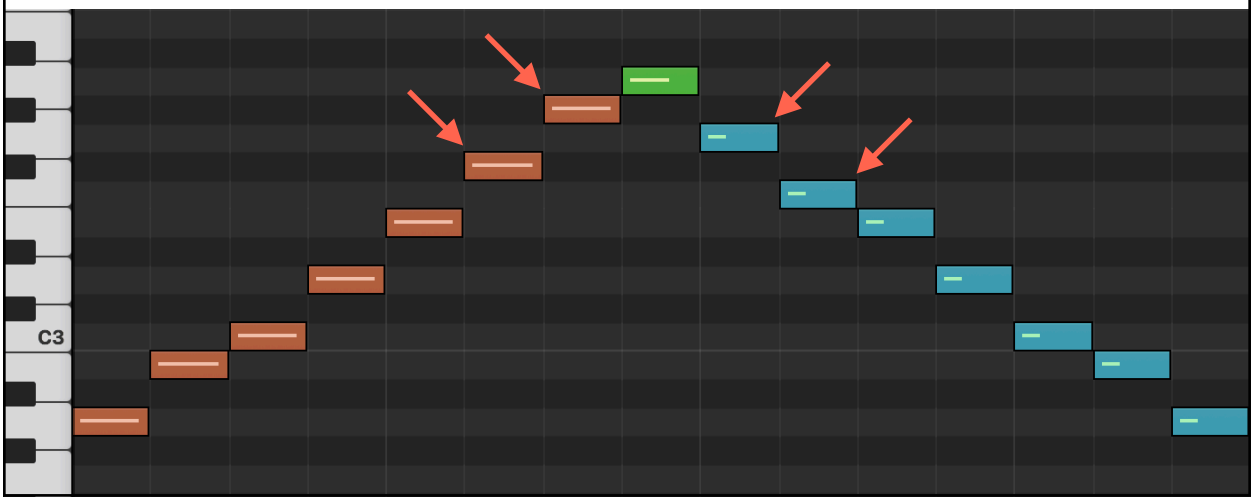


9.5 Visualizing the Melodic Minor in the DAW

Building and using the melodic minor is often a source of confusion for students because it is the one scale in this book whose structure is dependent upon how it is used.

To help illustrate the ascending/descending duality, in Figure 9.7, we provide the A Melodic Minor scale in the MIDI editor of a popular DAW:

FIGURE 9.7 - A MINOR (MELODIC) IN A DAW



Left to right, notice that the first five notes are identical to the last. The only difference is that the approach of the ascending scale (reddish brown notes) “lifts” or “rises” up to meet the tonic (green). The descending scale (blue notes) then “falls” immediately after passing the tonic.

Given the extensive discussion in this section and Section 9.1, we will not provide worked examples of the melodic minor in this chapter.

Chapter 10: The Pentatonic Scales

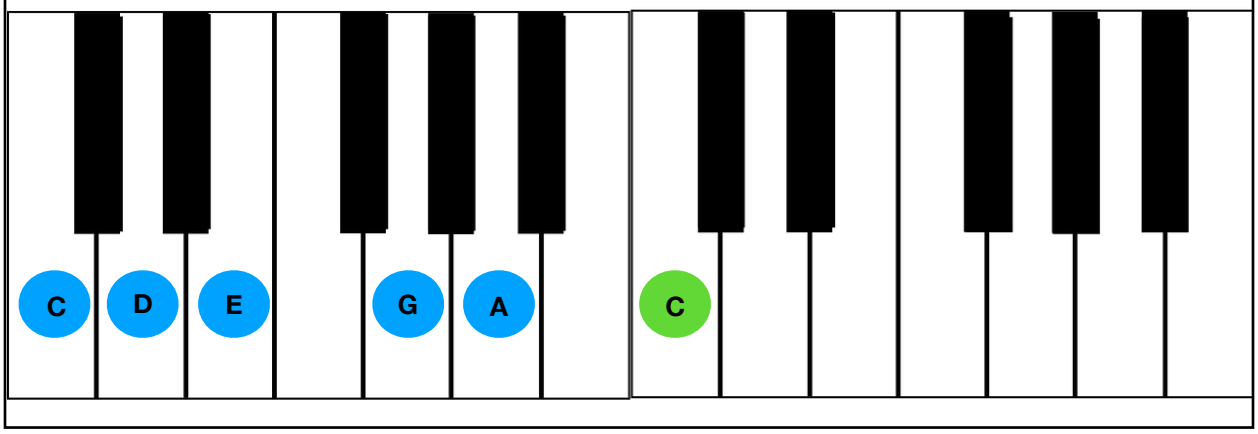
10.1 Overview

Pentatonic scales contain five notes, instead of the seven-note scales we have primarily discussed in this book so far. Because we only select 5 of the 12 chromatic notes possible when creating pentatonic scales, there are many ways to create them. We will only be providing examples of the two most popular in this book: the major pentatonic scale, and the minor pentatonic scale.

10.2 The Major Pentatonic Scale

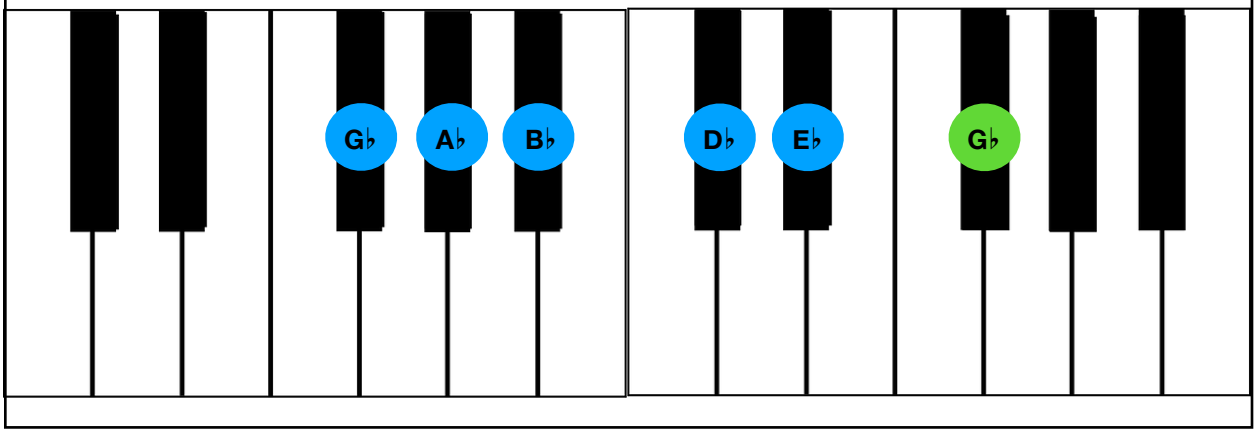
To create the major pentatonic scale, we remove the fourth and seventh notes of any normal, diatonic major scale. This is easy to see with the C Major scale in Figure 10.1:

FIGURE 10.1 - THE KEY OF C MAJOR PENTATONIC



Looking at Figure 10.2, we see that it is possible to have pentatonic scales that consist solely of black notes, which is not possible for diatonic scales:

FIGURE 10.2 - THE KEY OF G♭ MAJOR PENTATONIC



Here is the scale construction chart for major pentatonic scales, for reference, where Position 6 signifies the root note in the next (higher) octave:

SCALE CONSTRUCTION CHART - THE MAJOR PENTATONIC SCALE						
POSITION	**1**	**2**	**3**	**4**	**5**	**6**
Chromatic Position	1	3	5	8	10	13
Relative Position	R	R+2	R+4	R+7	R+9	R+12
Keys Recursive	R	+2	+2	+3	+2	+3
Classical Recursive	R	W	W	T	W	T

10.3 The Minor Pentatonic Scale

To create the minor pentatonic scale, we remove the second and sixth notes of a natural minor scale. Figures 10.3 and 10.4 provide examples of A and C Minor Pentatonic, respectively.

FIGURE 10.3 - THE KEY OF A MINOR PENTATONIC

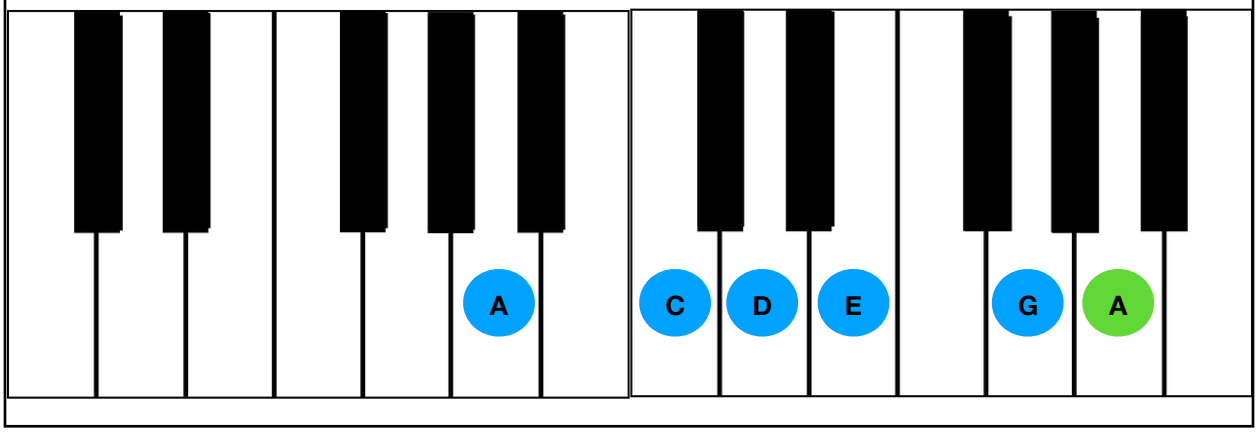
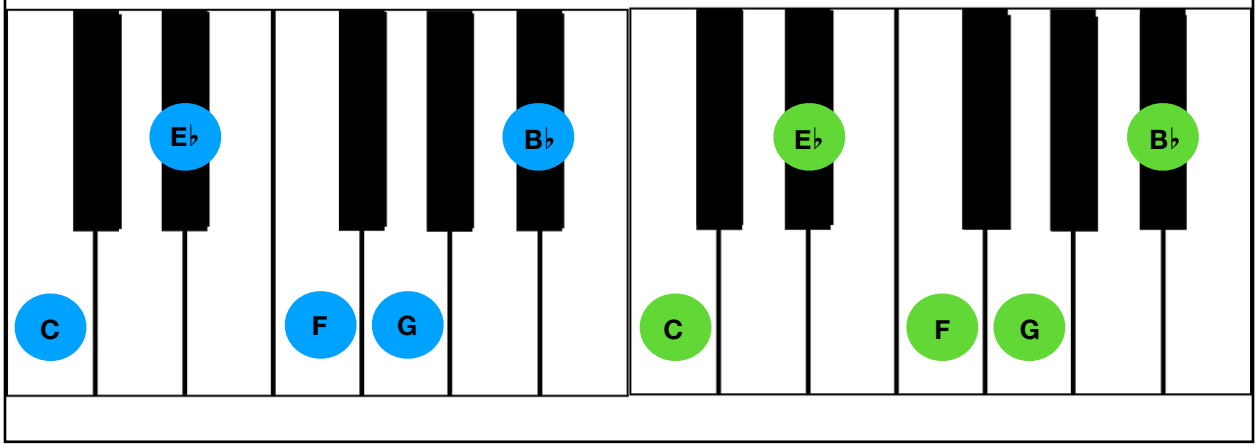


FIGURE 10.4 - THE KEY OF C MINOR PENTATONIC



The scale construction chart for minor pentatonic scales is:

SCALE CONSTRUCTION CHART - THE MINOR PENTATONIC SCALE						
POSITION	**1**	**2**	**3**	**4**	**5**	**6**
Chromatic Position	1	4	6	8	11	13
Relative Position	R	R+3	R+5	R+7	R+10	R+12
Keys Recursive	R	+3	+2	+2	+3	+2
Classical Recursive	R	T	W	W	T	W

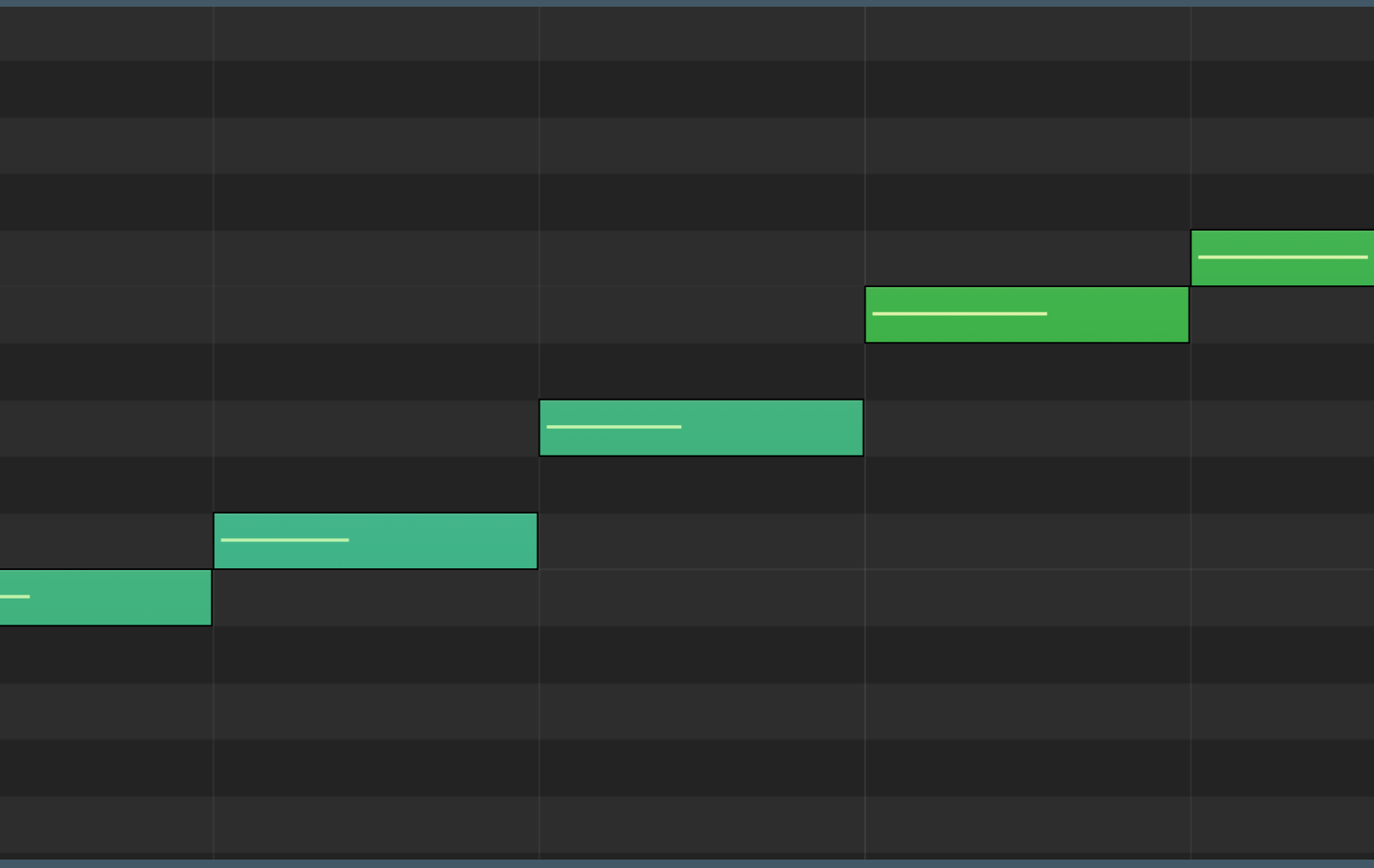
10.4 Pentatonic Modes

If you read Chapter 5 on modes before reading this chapter, you'll notice that a similar musical phenomenon occurs in pentatonic scales regarding recursive patterns. As you might guess, just as there are seven diatonic modes, there are five pentatonic modes.

They are listed below with their common associated names in Table 10.1. Jumpstart EDM will be publishing additional content explaining applications for diatonic and pentatonic modes in the future.

TABLE 10.1 - THE FIVE PENTATONIC MODES (KEYS RECURSIVE)						
POSITION	**1**	**2**	**3**	**4**	**5**	**6**
Minor Pentatonic	R	+3	+2	+2	+3	+2
Major Pentatonic	R	+2	+2	+3	+2	+3
Egyptian Suspended	R	+2	+3	+2	+3	+2
Blues Minor / Mang Gong	R	+3	+2	+3	+2	+2
Blues Major / Ritsusen / Yo Scale	R	+2	+3	+2	+2	+3

PART III - ADVANCED THEORY



Jumpstart EDM

Chapter 11: The Circle of Fifths

11.1 Overview

We've so far discussed how to create many types of scales from scratch. We've discussed major and minor scales and briefly discussed intervals and the seven diatonic modes. But is there a way to tie all of this information together?

As it turns out, yes. We are now going to discuss a topic called the **circle of fifths**, which is a device used to illuminate how major and (natural) minor scales with different root notes are all related to each other.

11.2 Parallel and Relative Keys

Let's start out with reexamining the component notes of C Major:

C Major:

C D E F G A B

As mentioned in Section 5.2, there are parallel and relative keys associated with C Major.

Parallel keys are keys that share the same root note but have different modes. The parallel key to C Major is C Minor.

C Minor:

C D E♭ F G A♭ B♭

Relative keys are keys that share the same note names but have different modes. The relative key to C Major is A Minor.

A Minor:

A B C D E F G

If we take the component notes of C Major and A Minor and align their notes to their shared positions, we'll see exactly where the two scales deviate. Here, C Major is in **blue**, and A Minor is in **green**.

		C	D	E	F	G	A	B	C
A	B	C	D	E	F	G	A		

The reason for this offset, of course, is that the two scales have different modes. In Chapter 5, we discussed the patterns that create the seven modes.

But what happens if, instead of comparing two relative scales of different modes, we examine scales of the same mode? For example, if all major scales have the same Ionian pattern, are there any patterns to see *within* the set of all major scales?

11.3 Recognizing Patterns

11.3.1 The Major Keys

Let's say we went about creating every major scale, starting with all 12 possible root notes. Using any of the methods for constructing scales, we end up with Table 11.1 (next page). The **key signature** column tells us how many sharps or flats are involved in the scale's component notes. In

classical staff notation, these would be marked on the sheet music so that the musicians playing the music know which musical key they are using.

TABLE 11.1: THE 12 MAJOR KEYS (ORDERED BY ROOT NOTE)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
A	A	B	C♯	D	E	F♯	G♯	3♯
A♭	A♭	B♭	C	D♭	E♭	F	G	4♭
B	B	C♯	D♯	E	F♯	G♯	A♯	5♯
B♭	B♭	C	D	E♭	F	G	A	2♭
C	C	D	E	F	G	A	B	0
D	D	E	F♯	G	A	B	C♯	2♯
D♭ / C♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C B♯	5♭ or 5♯
E	E	F♯	G♯	A	B	C♯	D♯	4♯
E♭	E♭	F	G	A♭	B♭	C	D	3♭
F	F	G	A	B♭	C	D	E	1♭
G	G	A	B	C	D	E	F♯	1♯
G♭ / F♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	E♭ D♯	F E♯	6♭ or 6♯

As a thought experiment, what happens if instead of ordering our keys based on root note, we order them by the number of sharps or flats in their key signature? We then arrive at Table 11.2 (next page).

Notice how, if we color code the shared notes of adjacent scales, an interesting series of patterns emerges. The last three notes of C Major, for example, are the same first three notes of G Major.

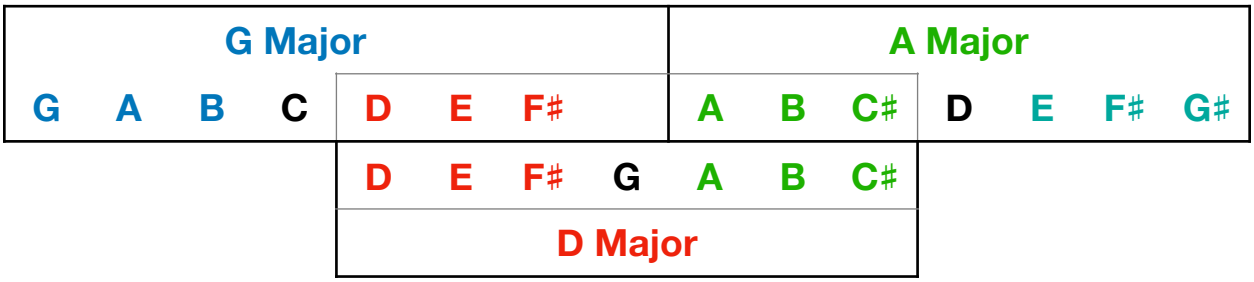
TABLE 11.2: THE 12 MAJOR KEYS (ORDERED BY KEY SIGNATURE)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
C	C	D	E	F	G	A	B	0
F	F	G	A	B♭	C	D	E	1♭
G	G	A	B	C	D	E	F♯	1♯
B♭	B♭	C	D	E♭	F	G	A	2♭
D	D	E	F♯	G	A	B	C♯	2♯
E♭	E♭	F	G	A♭	B♭	C	D	3♭
A	A	B	C♯	D	E	F♯	G♯	3♯
A♭	A♭	B♭	C	D♭	E♭	F	G	4♭
E	E	F♯	G♯	A	B	C♯	D♯	4♯
B / C♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	G♯ A♭	A♯ B♭	5♯ or 7♭
G♭ / F♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	E♭ D♯	F E♯	6♭ or 6♯
D♭ / C♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C B♯	7♯ or 5♭

The last three notes of A Major are the first three notes of E Major. So it appears that the pattern here has to do with a relation between offsets of 5 notes, or fifths, between scales.

If we rearrange the table based on these sets of repeating notes, keeping the sharps next to sharps and flats next to flats, and start it on C Major, we come to Table 11.3 (next page).

TABLE 11.3: THE 12 MAJOR KEYS (ORDERED BY THE CIRCLE OF FIFTHS)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
C	C	D	E	F	G	A	B	0
G	G	A	B	C	D	E	F♯	1♯
D	D	E	F♯	G	A	B	C♯	2♯
A	A	B	C♯	D	E	F♯	G♯	3♯
E	E	F♯	G♯	A	B	C♯	D♯	4♯
B / C♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	G♯ A♭	A♯ B♭	5♯ or 7♭
G♭ / F♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	E♭ D♯	F E♯	6♭ or 6♯
D♭ / C♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C B♯	7♯ or 5♭
A♭	A♭	B♭	C	D♭	E♭	F	G	4♭
E♭	E♭	F	G	A♭	B♭	C	D	3♭
B♭	B♭	C	D	E♭	F	G	A	2♭
F	F	G	A	B♭	C	D	E	1♭
C	C	D	E	F	G	A	B	0

As shown in Section 7.2, we have sections of overlapping note names between entirely different musical keys of the same mode. For example, here are the overlapping notes between G, D, and A Major:



11.3.2 The Minor Keys

But what about the minor keys? Well, if you recall from our discussion of modes in Chapter 5 and relative keys in Section 7.2, we have established that the natural minor mode is just the major mode but shifted. Therefore, it is only natural that we will see a similar pattern emerge from the minor keys, in Table 11.4:

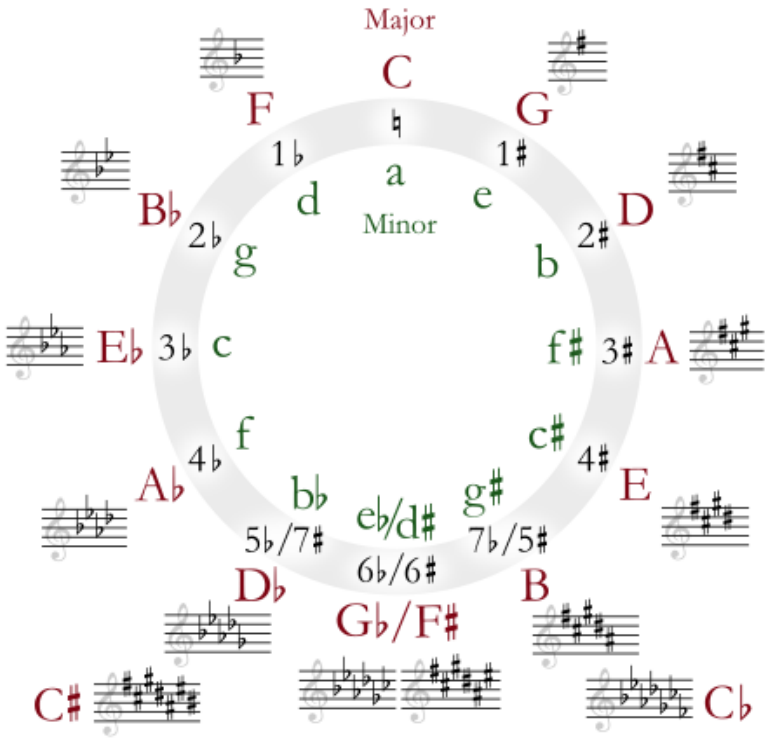
TABLE 11.4: THE 12 MINOR SCALES (ORDERED BY THE CIRCLE OF FIFTHS)

TONIC	1	2	3	4	5	6	7	Key Signature
A	A	B	C	D	E	F	G	0
E	E	F♯	G	A	B	C	D	1♯
B	B	C♯	D	E	F♯	G	A	2♯
F♯	F♯	G♯	A	B	C♯	D	E	3♯
C♯	C♯	D♯	E	F♯	G♯	A	B	4♯
G♯ A♭	G♯ A♭	A♯ B♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	5♯ or 7♭
E♭ D♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	6♭ or 6♯
B♭ A♯	B♭ A♯	C B♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	7♯ or 5♭
F	F	G	A♭	B♭	C	D♭	E♭	4♭
C	C	D	E♭	F	G	A♭	B♭	3♭
G	G	A	B♭	C	D	E♭	F	2♭
D	D	E	F	G	A	B♭	C	1♭
A	A	B	C	D	E	F	G	0

The interesting thing about the minor scales is that they work *in reverse* compared to the major scales. In this case, the last four notes of the scale become the first four notes of the next scale with flats, instead of sharps. What's even more incredible is that if we rearrange this table back to a sharps-to-flats ordering, we see that this is the *exact* order of the relative keys of Table 8!

11.4 The Circle of Fifths

Looking to the tables described above, we can see that a repeating pattern, or loop, occurs among the scales. We can formalize this loop by representing it as an actual circle, which we call the **circle of fifths**:[4]

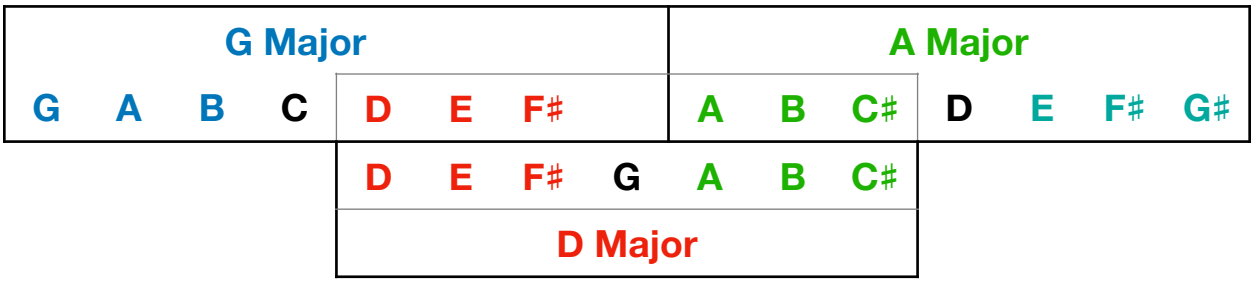


[4] Retrieved from Wikipedia.org on 06/25/2019. By Just plain Bill - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=4463183

The key signatures are also shown in classical **staff notation** next to the scale names, which illustrate how many accidentals are attributed to each scale. We will not cover how to read staff notation in this book.

11.5 Application: Modulation

To see an example of how to apply the circle of fifths, let's consider the example of overlapping notes as mentioned in Section 7.3.1 between G, D, and A Major:



We can use the fact that these three scales share notes to our advantage when writing music. What if, say, we're writing a piece of music in G Major but want to switch to A Major in the middle of the song?

We can approach this in a variety of methods. Since A, B, D, and E are shared between G Major and A Major, we could create a chord from those notes and then suddenly switch to A Major. Or, we can do a long melodic run through the notes of G Major, then through D Major, then through A Major.

This idea of switching keys in the same piece of music is called **modulation**. Jumpstart EDM will be publishing a dedicated guide to modulation in the future.

Chapter 12: Key Transposition

We mentioned in Sections 3.2.5 and 7.4.2 that the difference between the major and minor scales is that the third, sixth, and seventh notes of the minor scale are one key lower than those of the major scale.

Since we know that this relationship doesn't change, we can create a **key conversion chart** (or **key transposition chart**) that tells us how to convert from one key to the other. Transposition means "shifting notes" or "converting musical keys."

12.1 Transposition Charts

Let's look back at the chromatic positions for the major and natural minor scales, as shown in Sections 6.2 and 7.2:

SCALE CONSTRUCTION CHART - THE MAJOR SCALE (THE IONIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	**5**	6	8	**10**	**12**	13

SCALE CONSTRUCTION CHART - THE NATURAL MINOR SCALE (THE AEOLIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	**4**	6	8	**9**	**11**	13

We see from the highlighted notes in **red** that the third, sixth, and seventh notes of the natural minor scale are in fact one key lower than those in the major scale. We can summarize this relationship with the following table:

KEY TRANSPOSITION CHART - MAJOR TO NATURAL MINOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Major Chromatic Positions	1	3	5	6	8	10	12
Major → Natural Minor	↓	↓	**-1**	↓	↓	**-1**	**-1**
Minor Chromatic Positions	1	3	4	6	8	9	11

For each note in the scale, reading from top to bottom in each column, we see a sequence of events:

1. Know the chromatic position of the note in the major scale
2. Do something to change the position
3. End up with a note in the natural minor scale

We can generalize this process to describe the entire chart with more precise language:

1. List the chromatic positions of the major scale
2. Perform the major-to-natural minor transposition
3. List the chromatic positions of the natural minor scale

In the table, down arrows signify that the notes do not change. The row labeled “Major → Natural Minor” is our **transposition factor**.

In order to use this transposition chart practically, let’s add rows to list the note names for specific scales, as shown below:

KEY TRANSPOSITION CHART - MAJOR TO NATURAL MINOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MAJOR NOTES							
Major Chromatic Positions	1	3	5	6	8	10	12
Major → Natural Minor	↓	↓	**-1**	↓	↓	**-1**	**-1**
Minor Chromatic Positions	1	3	4	6	8	9	11
NATURAL MINOR NOTES							

We can now follow this system to convert any major key into any minor key instantly!

12.2 Example: Major–to–Minor Transposition

Let's work through a major-to-minor transposition, where the two scales have the same root note, beginning with the template chart below:

SCALE TRANSPOSITION CHART - MAJOR DIATONIC TO MINOR DIATONIC, SAME ROOT NOTE							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Major Names							
Major → Minor Transposition	0	0	-1	0	0	-1	-1
Show Your Work							

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MINOR SCALE	**R**						

To convert from C Major to C Minor, we start out by plugging in the names of C Major into the MAJOR SCALE row of the chart:

SCALE TRANSPOSITION CHART - C MAJOR TO C MINOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MAJOR SCALE	C	D	E	F	G	A	B
Major → Minor Transposition	0	0	-1	0	0	-1	-1
Show Your Work							

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MINOR SCALE							

Now, we perform the major-to-minor transposition as described, moving down each column. We show our work for the transposition being performed, just like a math problem. If the major-to-minor row contains a "0," then the original major scale note stays the same when converting to the minor scale (**perfect intervals**, see Section 4.4):

SCALE TRANSPOSITION CHART - C MAJOR TO C MINOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MAJOR SCALE	C	D	E	F	G	A	B
Major → Minor Transposition	0	0	-1 key	0	0	-1 key	-1 key
Show Your Work	C	D	E - 1 key	F	G	A - 1 key	B - 1 key

And finally, making reference to our chromatic piano keyboard (Figure 5.6, which uses flats instead of sharps), we are able to fill in the names for the MINOR SCALE row:

SCALE TRANSPOSITION CHART - C MAJOR TO C MINOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Major Names	C	D	E	F	G	A	B
Major → Minor Transposition	0	0	-1 key	0	0	-1 key	-1 key
Show Your Work	C	D	E - 1	F	G	A - 1	B - 1

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MINOR SCALE	**C**	**D**	**E♭**	**F**	**G**	**A♭**	**B♭**

You may be wondering why we're going to all this trouble to make a table to describe something as simple as adjusting 3 notes between major and minor scales. And yes, we could also replace the -1 with a flat symbol (♭). But using keys notation will make things simpler when we take this one step further and work with *any* two modes.

12.3 Transposition Between Any Two Modes

What if we want to convert *any* scale into *any* other scale of *any* other mode? This is where the transposition charts really come in handy. Instead of having to memorize all of the relationships between all the modes, we can use the chromatic positions unique to each to create a transposition chart to convert between them.

Looking back to the major-to-natural minor conversion factor, we see that we can derive that by subtracting our original key (major scale) from the key we want (natural minor), as seen below:

DERIVING THE MAJOR-TO-NATURAL MINOR TRANSPOSITION FACTOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Minor Chromatic Positions	1	3	4	6	8	9	11
Major Chromatic Positions	-1	-3	-5	-6	-8	-10	-12
Major → Natural Minor Transposition Factor	0	0	**-1**	0	0	**-1**	**-1**

Where zeroes mean that no change occurred. Thus, to calculate the transposition factor for converting between scales of any musical mode, use the following procedure:

1. Create a table like the one above.

2. List the chromatic positions for your desired mode.
3. Subtract the chromatic positions of your original mode.
4. Now you have your key conversion factor.

Let's see an example of this. Let's say we've written a song in C Major and want to transpose the entire song into C Dorian. How do we do it? First, we derive the conversion factor for the major-to-Dorian transposition, referencing Table 5.1 from Section 5.2:

DERIVING THE MAJOR-TO-DORIAN CONVERSION FACTOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Dorian Chromatic Positions	1	3	4	6	8	10	11
Major Chromatic Positions	-1	-3	-5	-6	-8	-10	-12
Major → Dorian Conversion Factor	0	0	**-1**	0	0	0	**-1**

Now, we can use the template from above to perform the transposition:

C MAJOR TO C DORIAN TRANSPOSITION CHART							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Major Names	C	D	E	F	G	A	B
Major → Minor Transposition	0	0	-1	0	0	0	-1
Show Your Work	C	D	E-1	F	G	A	B-1

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
MINOR SCALE	**C**	**D**	**E♭**	**F**	**G**	**A**	**B♭**

12.4 Transposition with Any Root Note

The process explained above in Section 12.3 works well when transposing keys of the same root note, but what if we want to convert, say from A Minor (Natural) to D Mixolydian? Our first step is to identify the transposition factor that converts from the Aeolian to the Mixolydian mode. Our chromatic positions, derived from Table 5.1, are:

DERIVING THE AEOLIAN-TO-MIXOLYDIAN TRANSPOSITION FACTOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Mixolydian Chromatic Positions	1	3	5	6	8	10	11
Aeolian Chromatic Positions	-1	-3	-4	-6	-8	-9	-11
Aeolian → Mixolydian Transposition Factor	0	0	**+1**	0	0	**+1**	0

We now need to determine the root note transposition in order to successfully complete the scale conversion. Since D is five keys above A on the keyboard, we simply add +5 to our conversion factor:

A MINOR TO D MIXOLYDIAN TRANSPOSITION FACTOR							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Aeolian → Mixolydian Transposition Factor	0	0	+1	0	0	+1	0
Root Note Transposition A → D	+5	+5	+5	+5	+5	+5	+5
A Minor to D Mixolydian Transposition Factor	**+5**	**+5**	**+6**	**+5**	**+5**	**+6**	**+5**

Therefore, we now have a complete transposition from A Minor to D Mixolydian that takes the change in root note into consideration in addition

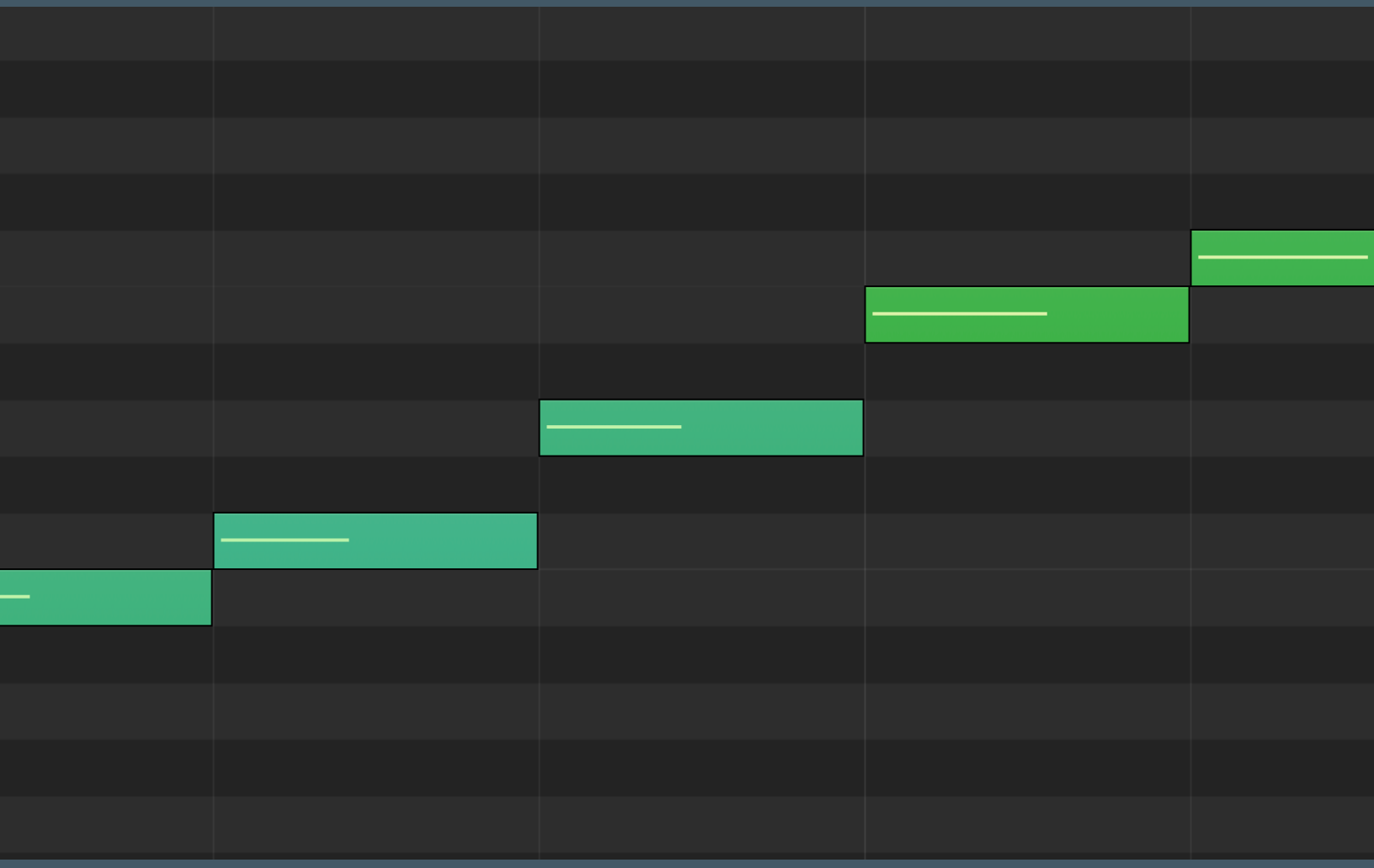
to the change in mode! This results in a generalized transposition chart, in Section 12.5 (next page).

12.5 Generalized Transposition Chart

GENERALIZED TRANSPOSITION CHART FOR ANY MODE, ANY ROOT NOTE							
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Original Scale Note Names							
Original Scale Chromatic Positions							
Mode Transposition Factor							
Root Note Transposition Factor							
New Scale Chromatic Positions							

POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**
New Scale Note Names							

PART IV - APPENDICES



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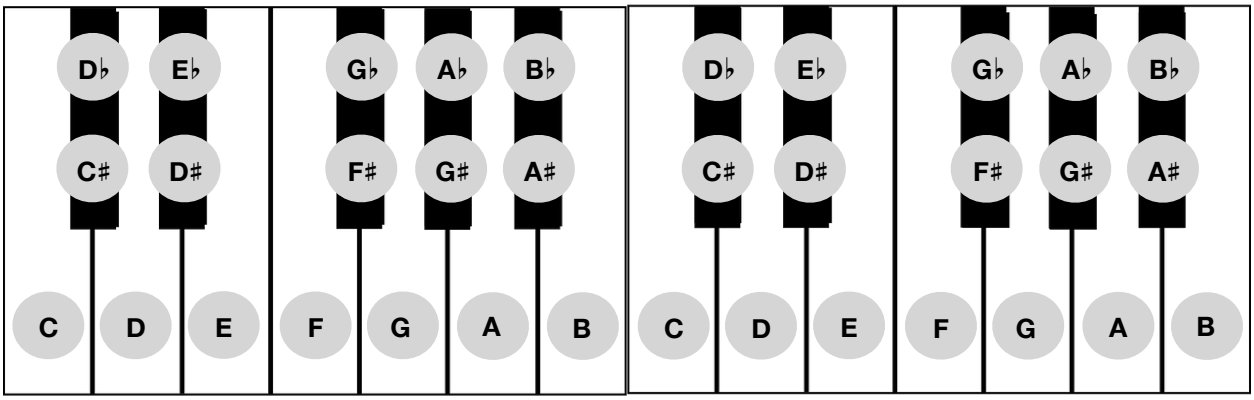
Appendix A – Classical Naming Conventions

A.1 Reference Piano Keyboard

The following should be used for reference for the classical naming of keys on a keyboard:



A.2 Accidentals & Enharmonic Equivalency

Classical theory includes the concept of **enharmonic equivalency** (or **enharmonics**) - the idea that a single key on the keyboard can have multiple names. In classical notation, whether we refer to the key in between C and D as C♯ or D♭ differs, depending on which scale we are using. This is true even though C♯ and D♭ are technically the same key on the keyboard. Similarly, we can refer to B as C♭ and C as B♯.

The symbols for **sharp (♯)** and **flat (♭)** are called **accidentals**. The rules for how we choose to write these accidentals in a given scale are provided in Section A.3.

Table A.1 shows what action each accidental mark performs when affixed to a note name:

TABLE A.1 - TABLE OF ACCIDENTALS			
Accidental Name	**Accidental Symbol**	**Keys Operation**	**Classical Operation**
Sharp	♯	+1 key	+semitone
Double Sharp	𝄪	+2 keys	+tone
Flat	♭	-1 key	-semitone
Double Flat	𝄫	-2 keys	-tone
Natural	♮	natural note	natural note

The **natural (♮)** accidental is not used in this book. It is only used in classical score notation in order to cancel a previous accidental mark, or to clarify that the natural note and not an accidental is being played.

An important caveat to enharmonic equivalency is that it only applies to our *modern Western* system of music notation, more specifically called “12-tone equal temperament,” or 12-TET. Throughout history, there have been other systems of tuning that did not treat each note equally. 12-TET divides the space of an octave into 12 equally-spaced tones, such that the ratio between each of them is the twelfth root of 2, approximately 1.05. Other systems of tuning existed before this, for example, the Pythagorean tuning system, which based everything off of perfect fifths having a ratio of 3:2 for their frequencies.

While 12-TET is the standard for Western music, there are many other cultures that use different tuning systems. For example, Balinese gamelan music may sound disorienting to the Western ear, but it has its own set of unique rules and its own rich cultural history as well.

A.3 Classical Conventions for Naming Scales

When constructing a scale with any of the methods in this book, we need to choose the correct classical name for each note after determining the correct keys.

There are three steps to naming scales:

1. Start the scale with your root note. Write out the six letters following that note to have 7 unique note names.
2. Add accidentals to each note such that:
   (a) No two notes have the same letter name.
   (b) The scale is a combination of only natural notes and sharps; or a combination of only natural notes and flats. That is, there should never be sharps and flats in the same scale.

Rules 1 and 2(a) should never be violated, but some harmonic and minor scales *do* violate Rule 2(b). For example, G Harmonic Minor contains both E♭ and F♯ (see Appendix D.3). This is acceptable because the above naming conventions were developed for normal modes, and the harmonic and melodic minors are *variations* of one of them (the Aeolian mode).

Discussions of common questions of how to use the rules for major and natural minor scales are elaborated upon in Sections 6.4.3.1 and 7.6.2.1, respectively.

Appendix B – Methods for Scale Construction

B.1 Method 1: The Chromatic Positions Method

The formula for using The Chromatic Positions method is as follows:

- **Step 1:** Choose a root note.
- **Step 2:** Write out the chromatic positions of the scale based on the root note.
- **Step 3:** Use the scale construction chart to choose the correct chromatic positions to fill in the scale.
- **Step 4:** Write out the finished scale using proper classical names, referencing Appendix A.

B.2 Method 2: The Relative Positions Method

The formula for using the Relative Positions method is as follows:

- **Step 1:** Choose a root note.
- **Step 2:** Write out the chromatic positions of the scale based on the root note.

- **Step 3:** Use the scale construction chart to count the keys relative to the root note in order to fill in the other notes of the scale.
- **Step 4:** Write out the finished scale using proper classical names, referencing Appendix A.

B.3 Method 3: The Recursive Methods

The formula for using the Keys Recursive and Classical Recursive methods is as follows:

- **Step 1:** Choose a root note
- **Step 2:** Use the recursive method to count the keys. Start with the root note, then each new note follows the pattern in the scale construction chart.
- **Step 3:** Write out the finished scale using proper classical names, referencing Appendix A.

Note that these steps work the same for the Keys Recursive and Classical Recursive methods. They only differ in terminology (keys vs tones).

B.4 Method 4: The Transposition Method

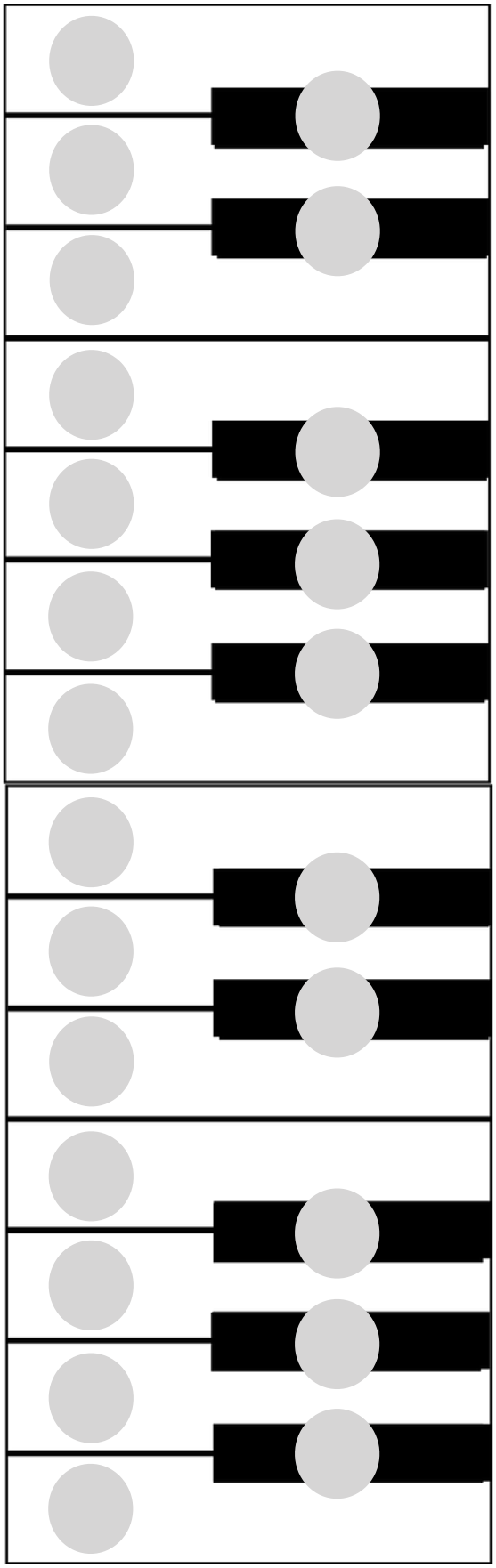
The formula for using the Transposition method is as follows:

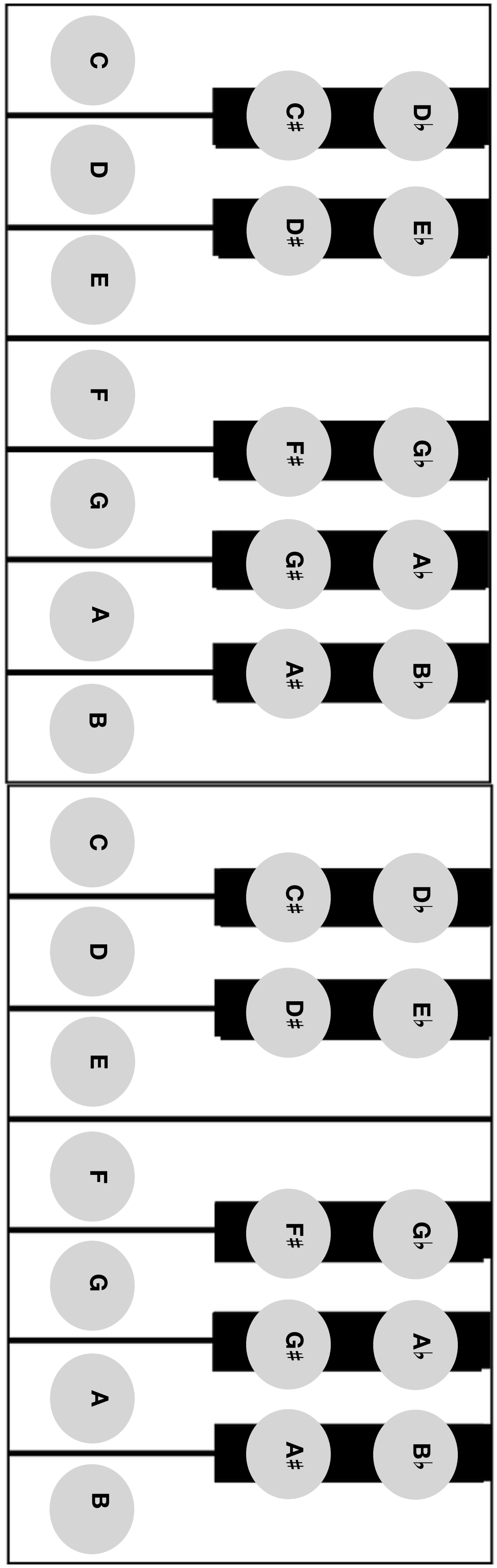
- **Step 1:** Create a transposition chart for your given transposition, or reference the charts provided in Appendix F.
- **Step 2:** Use the the transposition chart to transform your original scale into your desired scale.

- **Step 3:** Write out the finished scale using proper classical names, referencing Appendix A.

Appendix C –
Blank Piano Worksheets

The following four pages contain worksheets to use when practicing scale construction.




C
C#
D♭
D
D#
E♭
E
F
F#
G♭
G
G#
A♭
A
A#
B♭
B
C
C#
D♭
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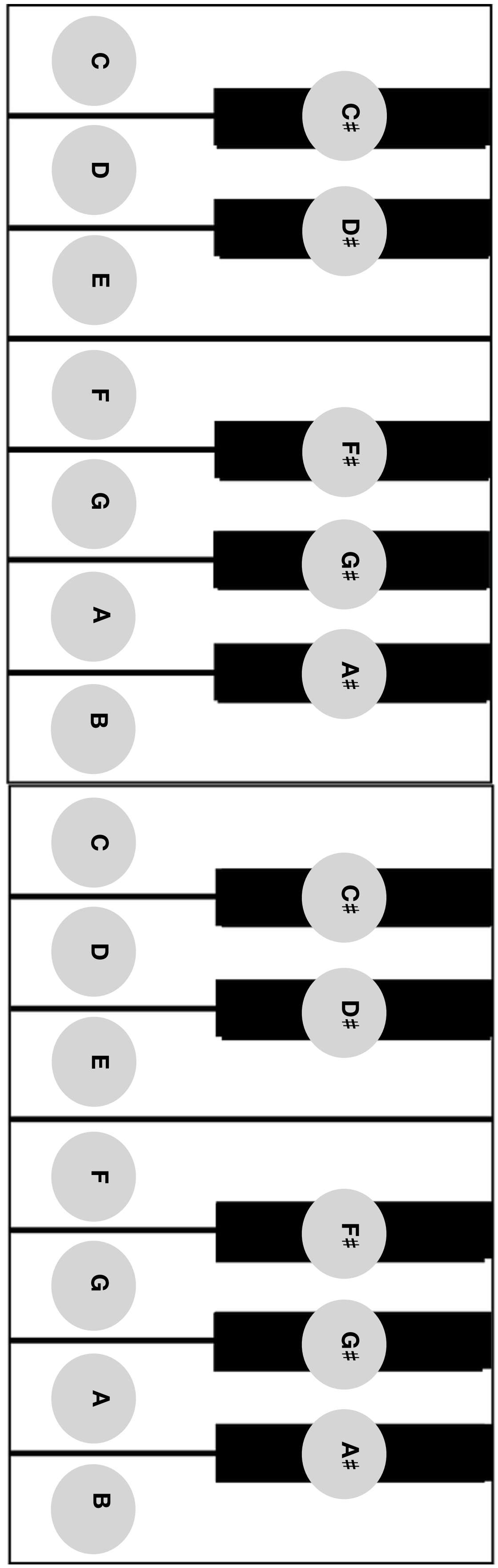
G#
A♭
A
A#
B♭
B


C
C#
D
D#
E
F
F#
G
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C
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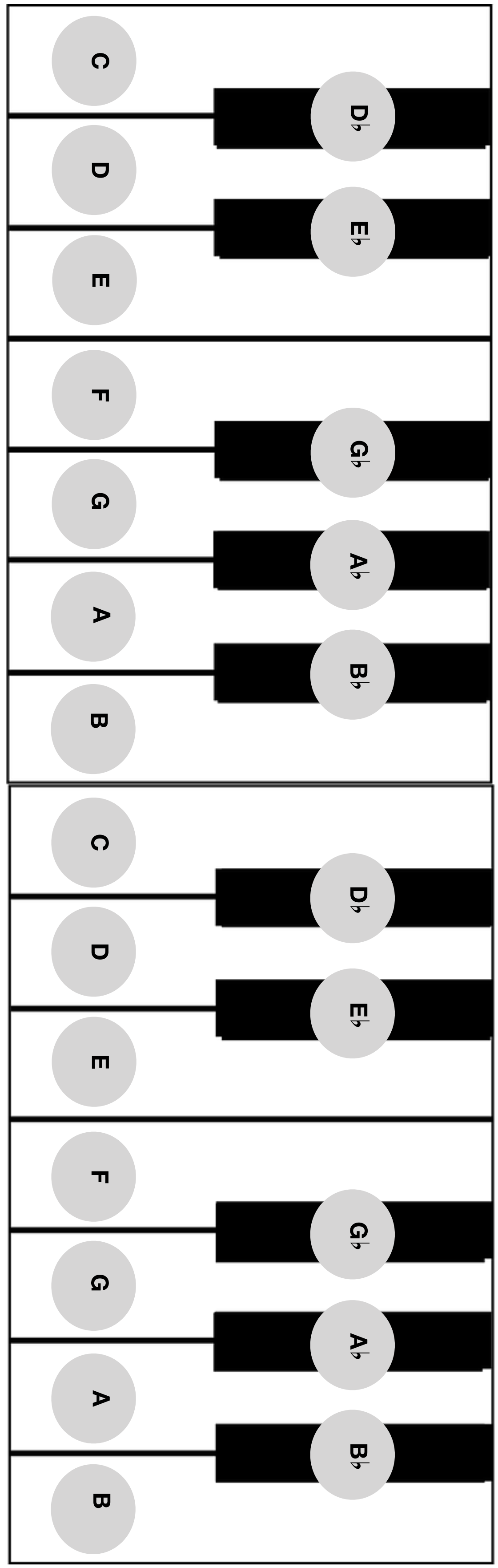
B


C
D♭
D
E♭
E
F
G♭
G
A♭
A
B♭
B
C
D♭
D
E♭
E
F
G♭
G
A♭
A
B♭
B

Appendix D – List of Major and Minor Scales[5]

D.1 The 12 Major Keys (Ionian Mode)

TABLE D.1: THE 12 MAJOR KEYS (ORDERED BY ROOT NOTE)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
A	A	B	C♯	D	E	F♯	G♯	3♯
A♭	A♭	B♭	C	D♭	E♭	F	G	4♭
B / C♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	G♯ A♭	A♯ B♭	5♯ or 7♭
B♭	B♭	C	D	E♭	F	G	A	2♭
C	C	D	E	F	G	A	B	0
D	D	E	F♯	G	A	B	C♯	2♯
D♭ / C♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C B♯	5♭ or 7♯
E	E	F♯	G♯	A	B	C♯	D♯	4♯
E♭	E♭	F	G	A♭	B♭	C	D	3♭
F	F	G	A	B♭	C	D	E	1♭
G	G	A	B	C	D	E	F♯	1♯
G♭ / F♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	E♭ D♯	F E♯	6♭ or 6♯

[5] Enharmonically equivalent keys are listed in the same row for all charts in this appendix. For the purposes of this appendix, they are considered "the same." One could say that there are "technically" 14 major scales, etc., but by that logic, we could consider E♭ Major a separate scale from D♯ Major, etc. The truth is that there are actually *dozens* of ways to write the same scale depending on how many accidentals you use. So let's not get pedantic.

TABLE D.2: THE 12 MAJOR KEYS (ORDERED BY THE CIRCLE OF FIFTHS)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
C	C	D	E	F	G	A	B	0
G	G	A	B	C	D	E	F♯	1♯
D	D	E	F♯	G	A	B	C♯	2♯
A	A	B	C♯	D	E	F♯	G♯	3♯
E	E	F♯	G♯	A	B	C♯	D♯	4♯
B / C♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	G♯ A♭	A♯ B♭	5♯ or 7♭
G♭ / F♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	E♭ D♯	F E♯	6♭ or 6♯
D♭ / C♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C B♯	7♯ or 5♭
A♭	A♭	B♭	C	D♭	E♭	F	G	4♭
E♭	E♭	F	G	A♭	B♭	C	D	3♭
B♭	B♭	C	D	E♭	F	G	A	2♭
F	F	G	A	B♭	C	D	E	1♭

D.2 The 12 Natural Minor Keys (Aeolian Mode)

TABLE D.3: THE 12 NATURAL MINOR KEYS (ORDERED BY ROOT NOTE)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
A	A	B	C	D	E	F	G	0
B♭ **A♯**	B♭ A♯	C B♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	7♯ or 5♭
B	B	C♯	D	E	F♯	G	A	2♯
C	C	D	E♭	F	G	A♭	B♭	3♭
C♯	C♯	D♯	E	F♯	G♯	A	B	4♯
D	D	E	F	G	A	B♭	C	1♭
E♭ **D♯**	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	6♭ or 6♯
E	E	F♯	G	A	B	C	D	1♯
F	F	G	A♭	B♭	C	D♭	E♭	4♭
F♯	F♯	G♯	A	B	C♯	D	E	3♯
G	G	A	B♭	C	D	E♭	F	2♭
G♯ **A♭**	G♯ A♭	A♯ B♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	5♯ or 7♭

TABLE D.4: THE 12 NATURAL MINOR KEYS (ORDERED BY THE CIRCLE OF FIFTHS)								
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Key Signature**
A	A	B	C	D	E	F	G	0
E	E	F♯	G	A	B	C	D	1♯
B	B	C♯	D	E	F♯	G	A	2♯
F♯	F♯	G♯	A	B	C♯	D	E	3♯
C♯	C♯	D♯	E	F♯	G♯	A	B	4♯
G♯ **A♭**	G♯ A♭	A♯ B♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F♯ G♭	5♯ or 7♭
E♭ **D♯**	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D♭ C♯	6♭ or 6♯
B♭ **A♯**	B♭ A♯	C B♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	7♯ or 5♭
F	F	G	A♭	B♭	C	D♭	E♭	4♭
C	C	D	E♭	F	G	A♭	B♭	3♭
G	G	A	B♭	C	D	E♭	F	2♭
D	D	E	F	G	A	B♭	C	1♭

D.3 The 12 Harmonic Minor Scales

Note that the circle of fifths no longer exactly applies to the harmonic minor due to the raised seventh note. Therefore, we only list the scales here by root note.

TABLE D.5: THE 12 HARMONIC MINOR SCALES (ORDERED BY ROOT NOTE)							
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A	A	B	C	D	E	F	G♯
B♭ **A♯**	B♭ A♯	C B♯	D♭ C♯	E♭ D♯	F E♯	G♭ F♯	A G𝄪
B	B	C♯	D	E	F♯	G	A♯
C	C	D	E♭	F	G	A♭	B
C♯	C♯	D♯	E	F♯	G♯	A	B♯
D	D	E	F	G	A	B♭	C♯
E♭ **D♯**	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C♭ B	D C𝄪
E	E	F♯	G	A	B	C	D♯
F	F	G	A♭	B♭	C	D♭	E
F♯	F♯	G♯	A	B	C♯	D	E♯
G	G	A	B♭	C	D	E♭	F♯
G♯ **A♭**	G♯ A♭	A♯ B♭	B C♭	C♯ D♭	D♯ E♭	E F♭	F𝄪 G

D.4 The 12 Melodic Minor Scales (Ascending)

The following are the notes for the ascending melodic minor scales. Note that the descending scale for the melodic minor is identical to the descending natural minor scale (see Appendix D.2). Note also that the circle of fifths does not exactly apply to the ascending melodic minor due to the raised sixth and seventh notes. Therefore, we only list the scales here by root note.

TABLE D.6: THE 12 ASCENDING MELODIC MINOR SCALES (ORDERED BY ROOT NOTE)							
TONIC	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A	A	B	C	D	E	F♯	G♯
B♭ **A♯**	B♭ A♯	C B♯	D♭ C♯	E♭ D♯	F E♯	G F𝄪	A G𝄪
B	B	C♯	D	E	F♯	G♯	A♯
C	C	D	E♭	F	G	A	B
C♯	C♯	D♯	E	F♯	G♯	A♯	B♯
D	D	E	F	G	A	B	C♯
E♭ **D♯**	E♭ D♯	F E♯	G♭ F♯	A♭ G♯	B♭ A♯	C B♯	D C𝄪
E	E	F♯	G	A	B	C♯	D♯
F	F	G	A♭	B♭	C	D	E
F♯	F♯	G♯	A	B	C♯	D♯	E♯
G	G	A	B♭	C	D	E	F♯
G♯ **A♭**	G♯ A♭	A♯ B♭	B C♭	C♯ D♭	D♯ E♭	E♯ F	F𝄪 G

D.5 The Pentatonic Scales

D.5.1 The 12 Major Pentatonic Scales

The major pentatonic scales are created by removing the fourth and seventh notes of the major diatonic scales. See Section 10.2.

TABLE D.7: THE 12 MAJOR PENTATONIC SCALES (ORDERED BY ROOT NOTE)					
TONIC	**1**	**2**	**3**	**4**	**5**
A	A	B	C♯	E	F♯
A♭	A♭	B♭	C	E♭	F
B	B	C♯	D♯	F♯	G♯
B♭	B♭	C	D	F	G
C	C	D	E	G	A
D	D	E	F♯	A	B
D♭ / C♯	D♭ C♯	E♭ D♯	F E♯	A♭ G♯	B♭ A♯
E	E	F♯	G♯	B	C♯
E♭	E♭	F	G	B♭	C
F	F	G	A	C	D
G	G	A	B	D	E
G♭ / F♯	G♭ F♯	A♭ G♯	B♭ A♯	D♭ C♯	E♭ D♯

D.5.2 The 12 Minor Pentatonic Scales

The minor pentatonic scales are created by removing the second and sixth notes of the minor diatonic scales. See Section 10.3.

TABLE D.8: THE 12 MINOR PENTATONIC SCALES					
TONIC	**1**	**2**	**3**	**4**	**5**
A	A	C	D	E	G
B♭ **A♯**	B♭ A♯	D♭ C♯	E♭ D♯	F E♯	A♭ G♯
B	B	D	E	F♯	A
C	C	E♭	F	G	B♭
C♯	C♯	E	F♯	G♯	B
D	D	F	G	A	C
E♭ **D♯**	E♭ D♯	G♭ F♯	A♭ G♯	B♭ A♯	D♭ C♯
E	E	G	A	B	D
F	F	A♭	B♭	C	E♭
F♯	F♯	A	B	C♯	E
G	G	B♭	C	D	F
G♯ **A♭**	G♯ A♭	B C♭	C♯ D♭	D♯ E♭	F♯ G♭

Appendix E – List of Scale Construction Charts

E.1 The Major Scale (The Ionian Mode)

SCALE CONSTRUCTION CHART - THE MAJOR SCALE (THE IONIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	5	6	8	10	12	13
Relative Position	R	R+2	R+4	R+5	R+7	R+9	R+11	R+12
Keys Recursive	R	+2	+2	+1	+2	+2	+2	+1
Classical Recursive	R	W	W	H	W	W	W	H

E.2 The Natural Minor Scale (The Aeolian Mode)

SCALE CONSTRUCTION CHART - THE NATURAL MINOR SCALE (THE AEOLIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	9	11	13
Relative Position	R	R+2	R+3	R+5	R+7	R+8	R+10	R+12
Keys Recursive	R	+2	+1	+2	+2	+1	+2	+2
Classical Recursive	R	W	H	W	W	H	W	W

E.3 The Harmonic Minor Scale

SCALE CONSTRUCTION CHART - THE HARMONIC MINOR SCALE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	9	12	13
Relative Position	R	R+2	R+3	R+5	R+7	R+8	R+11	R+12
Keys Recursive	R	+2	+1	+2	+2	+1	+3	+1
Classical Recursive	R	W	H	W	W	H	T	H

E.4 The Melodic Minor Scale (Ascending)

SCALE CONSTRUCTION CHART - THE MELODIC MINOR SCALE (ASCENDING)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Chromatic Position	1	3	4	6	8	10	12	13
Relative Position	R	R+2	R+3	R+5	R+7	R+9	R+11	R+12
Keys Recursive	R	+2	+1	+2	+2	+2	+2	+1
Classical Recursive	R	W	H	W	W	W	W	H

E.5 The Seven Diatonic Modes (Recursive Only)

SCALE CONSTRUCTION CHART - THE SEVEN DIATONIC MODES (KEYS RECURSIVE)									
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**White Notes**
Ionian (Major)	R	+2	+2	+1	+2	+2	+2	+1	C to C
Dorian	R	+2	+1	+2	+2	+2	+1	+2	D to D
Phrygian	R	+1	+2	+2	+2	+1	+2	+2	E to E
Lydian	R	+2	+2	+2	+1	+2	+2	+1	F to F
Mixolydian	R	+2	+2	+1	+2	+2	+1	+2	G to G
Aeolian (Minor)	R	+2	+1	+2	+2	+1	+2	+2	A to A
Locrian	R	+1	+2	+2	+1	+2	+2	+2	B to B

SCALE CONSTRUCTION CHART - THE SEVEN DIATONIC MODES (CLASSICAL RECURSIVE)									
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**White Notes**
Ionian (Major)	R	W	W	H	W	W	W	H	C to C
Dorian	R	W	H	W	W	W	H	W	D to D
Phrygian	R	H	W	W	W	H	W	W	E to E
Lydian	R	W	W	W	H	W	W	H	F to F
Mixolydian	R	W	W	H	W	W	H	W	G to G
Aeolian (Minor)	R	W	H	W	W	H	W	W	A to A
Locrian	R	H	W	W	H	W	W	W	B to B

E.6 The Pentatonic Scales

E.6.1 The Major Pentatonic Scale

SCALE CONSTRUCTION CHART - THE MAJOR PENTATONIC SCALE						
POSITION	**1**	**2**	**3**	**4**	**5**	**6**
Chromatic Position	1	3	5	8	10	13
Relative Position	R	R+2	R+4	R+7	R+9	R+12
Keys Recursive	R	+2	+2	+3	+2	+3
Classical Recursive	R	W	W	T	W	T

E.6.2 The Minor Pentatonic Scale

SCALE CONSTRUCTION CHART - THE MINOR PENTATONIC SCALE						
POSITION	**1**	**2**	**3**	**4**	**5**	**6**
Chromatic Position	1	4	6	8	11	13
Relative Position	R	R+3	R+5	R+7	R+10	R+12
Keys Recursive	R	+3	+2	+2	+3	+2
Classical Recursive	R	T	W	W	T	W

Appendix F – List of Transposition Charts

F.1 The Major Scale (Ionian Mode)

TRANSPOSITION CHART - THE MAJOR SCALE (THE IONIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Transposing from Major (Ionian)	0	0	0	0	0	0	0	0
Transposing from Natural Minor (Aeolian)	0	0	+1	0	0	+1	+1	0
Transposing from Harmonic Minor	0	0	+1	0	0	+1	0	0
Transposing from Melodic Minor (Ascending)	0	0	+1	0	0	0	0	0

F.2 The Natural Minor Scale (Aeolian Mode)

TRANSPOSITION CHART - THE NATURAL MINOR SCALE (THE AEOLIAN MODE)								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Transposing from Major (Ionian)	0	0	-1	0	0	-1	-1	0
Transposing from Natural Minor (Aeolian)	0	0	0	0	0	0	0	0
Transposing from Harmonic Minor	0	0	0	0	0	0	-1	0
Transposing from Melodic Minor (Ascending)	0	0	0	0	0	-1	-1	0

F.3 The Harmonic Minor Scale

TRANSPOSITION CHART - THE HARMONIC MINOR SCALE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Transposing from Major (Ionian)	0	0	-1	0	0	-1	0	0
Transposing from Natural Minor (Aeolian)	0	0	0	0	0	0	+1	0
Transposing from Harmonic Minor	0	0	0	0	0	0	0	0
Transposing from Melodic Minor (Ascending)	0	0	0	0	0	-1	0	0

F.4 The Melodic Minor Scale (Ascending)

TRANSPOSITION CHART - THE HARMONIC MINOR SCALE								
POSITION	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Transposing from Major (Ionian)	0	0	-1	0	0	0	0	0
Transposing from Natural Minor (Aeolian)	0	0	0	0	0	+1	+1	0
Transposing from Harmonic Minor	0	0	0	0	0	+1	0	0
Transposing from Melodic Minor (Ascending)	0	0	0	0	0	0	0	0

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