

CIS 3000 Scales Tutorial

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Some graphical content courtesy of [musictheory.net](https://www.musictheory.net).

Introduction

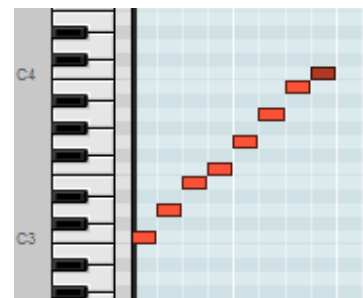
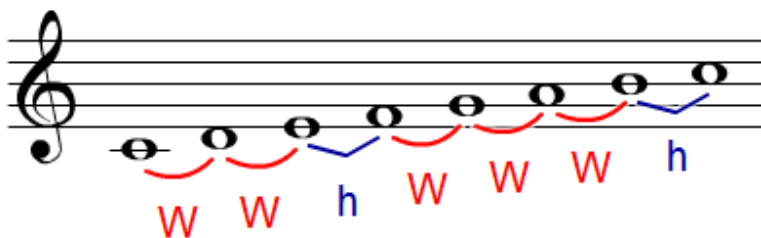
A **scale** is an ordered sequence of notes. Typically, a scale spans one octave (twelve half steps on the piano roll, ie from C to C) and contains seven notes (eight if we count the repeated note at the octave). Which seven notes we select out of the possible twelve in a one octave range determines what kind of scale we have. Note: there are scales which have more or less than seven notes, but we will only be focusing on those with seven, or the heptatonic scales.

The Major Scale

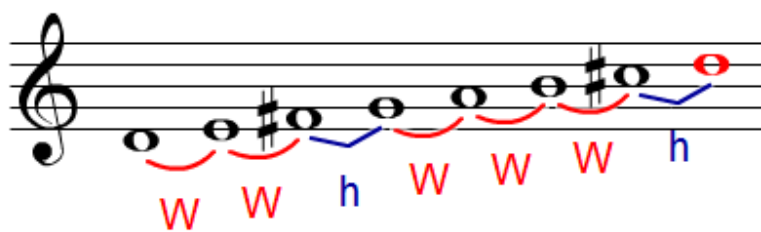
First we'll discuss the **major scale**. A major scale is made up of this sequence of whole steps (W) and half steps (h):

W W h W W W h

Knowing this sequence is useful because you can create scales regardless of the starting note. Here is an example of a major scale starting on C in both traditional staff notation and Reason's piano roll notation:



You might notice how there are no sharps or flats in the C scale, or that all of the notes correspond to the white keys on the piano roll. Here's what the major scale looks like when we start on the D instead:



Notice how there are now two sharps in the scale, corresponding to the two black keys on the piano roll. Both major scales will sound similar because the relative “distance” between notes remains constant. The nice thing about piano roll notation is that this property is immediately apparent whereas it may not be on the staff. Additionally, changing your scale to a different **key** (starting note) only requires a simple highlight and drag in Reason (known as **transposition**).

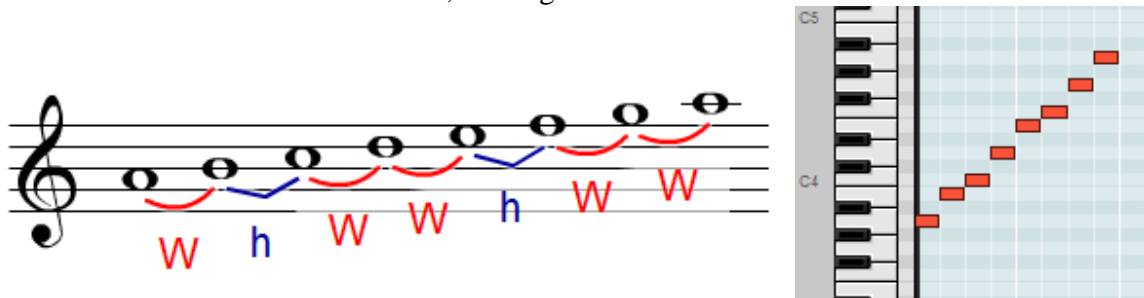
By convention, the first note in the scale is called the **tonic**. The rest of the notes, or **degrees**, can be referred to simply by their respective ordinal number (second, third, etc.).

The (Natural) Minor Scale

The next most commonly used scale is the **natural minor scale**. The natural minor scale is made up of the following sequence of whole steps and half steps:

W h W W h W W

Using this sequence we can probably already figure out how to write this scale in Reason. Let's see what it also looks like on the staff, starting on A:



You may have already noticed an interesting similarity with our C major scale; there are no sharps or flats (at least when starting on A – if you try transposing the scale in Reason you can see which black notes get used in different keys). This is because the minor scale is simply **the major scale starting from a different degree** (in particular, the sixth degree). That is, if you started playing the D major scale on the sixth degree (B) and looped around when you reached D it would become the B natural minor scale. For this reason the B-minor scale is also called the **relative minor** of D.

The Modal Scales

It is in fact possible to create many different types of scales by starting from a different degree of the major scale (7 total, to be exact). These different scales form the **musical modes** or **modal scales**. While the major scale (Ionian mode) and natural minor scale (Aeolian mode) are the most commonly used today, you'll find that these other modes provide unique overall sounds, which might be useful when composing for different parts of your game. We provide the whole step/half step sequences here for your convenience, but the key to understanding these is experimenting with them on your own:

Ionian (I):	W W h W W W h
Dorian (II):	W h W W W h W
Phrygian (III):	h W W W h W W
Lydian (IV):	W W W h W W h
Mixolydian (V):	W W h W W h W
Aeolian (VI):	W h W W h W W
Locrian (VII):	h W W h W W W

Note: The Roman numeral is the degree in the major scale that the mode starts from.

The Other Minor Scales

Technically speaking, any scale which contains the tonic, a minor third (a note which is 3 half steps above the tonic) and a perfect fifth (7 half steps above the tonic) can be called a minor scale. By this definition, the Dorian and Phrygian modes are minor scales as well. The natural minor scale is the most common and, due to its relation with the major scale, is often simply referred to as the **minor scale**. Now we're going to show you two final minor scales that deviate from our old ordering of whole steps and half steps.

The first one is the **harmonic minor scale**. This scale is actually exactly the same as the natural minor except the seventh degree is raised a half step. Thus giving us a sequence like this:

W h W W h (W+h) h

While this may look confusing it's actually very simple; the **(W+h)** simply means that there are 3 half steps between the sixth and seventh notes in the scale. When in doubt, one can easily convert a natural minor scale into a harmonic minor scale by transposing the seventh degree up a half step.

The last scale we're going to go over is the **melodic minor scale**. This scale is again similar to the natural minor, except we're going to raise both the sixth and seventh degree by a half step. We get a sequence like this:

W h W W W W h

The one other thing to note about the melodic minor scale is that it is often only used when ascending (or playing the scale from bottom to top). When descending, composers tend to substitute the natural minor.

Using Scales While Composing

Generally speaking, music tends to "live" within a specific scale – containing notes from that particular scale. That isn't to say composers can't change which scale they're using during a song or choose to use notes that aren't in the scale whenever they want (they often do). However, the "default" scale for a song (if major or minor) is typically designated as the key signature.

While the details of key signatures are less relevant to us since we're using the piano roll notation, the concept of a "home key" is important when trying to compose music. When you're first composing, stick to just using one scale at a time and always reinforce which scale you're using by including the root (this is often done in the bass line). Changing keys (using a new scale) is a valuable technique that composers employ consistently, particularly when moving into a new part of a song or just trying to change the feel (ie from a major scale to its relative minor).

In the end, the easiest way to get better at composing music is to experiment and get experience! Have fun using the tools you've learned and always follow your ear.