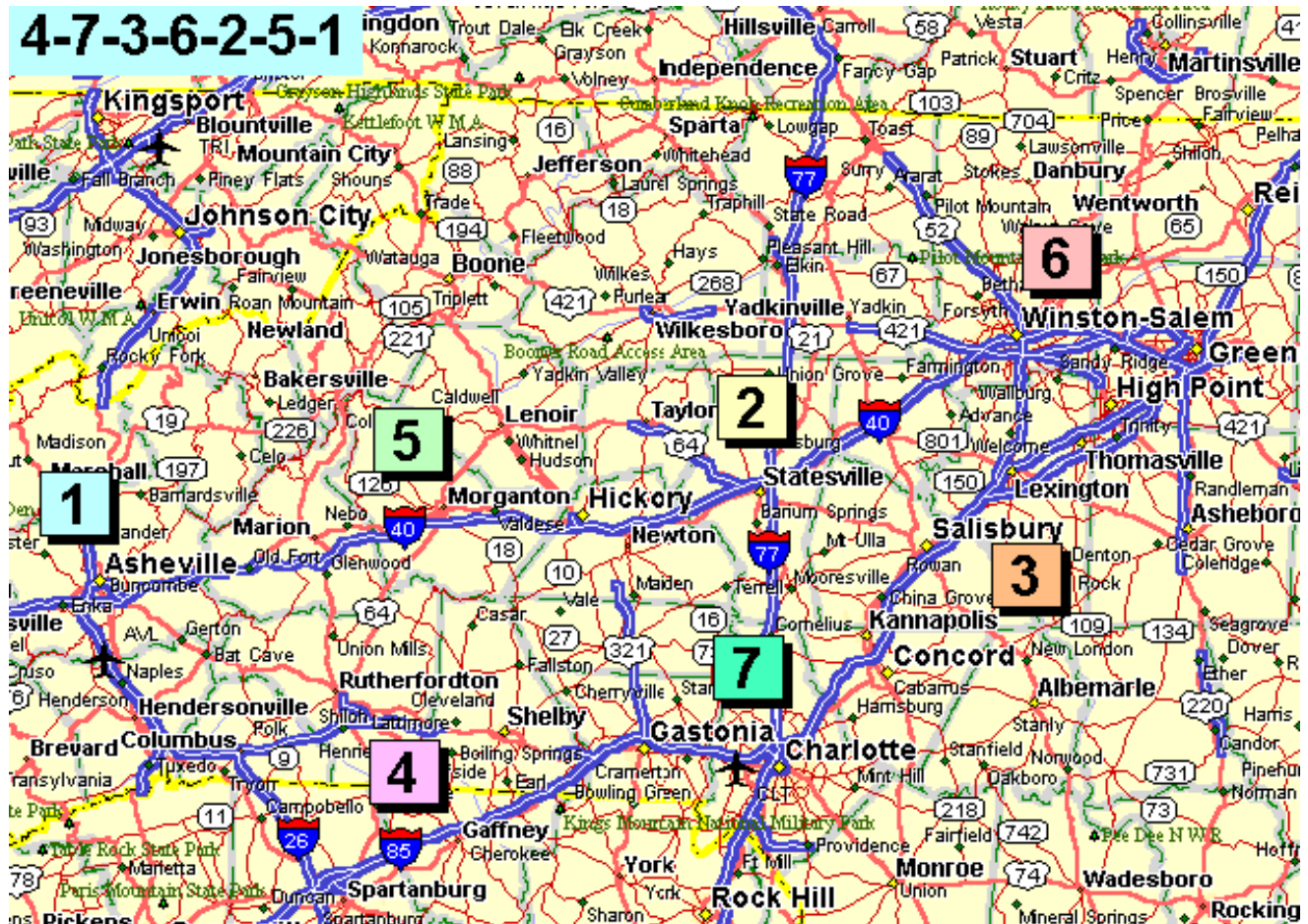


Z. Circle of Fifths

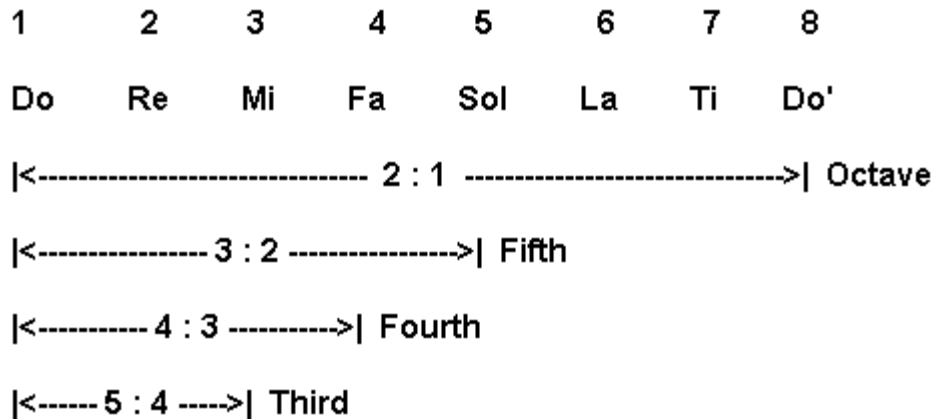


Consonance

Fig. Z-1 below shows the most consonant intervals after the 1:1. The best blend is the unison, where you compare a note with itself, i.e., the 1:1. The next best is

the octave with its 2:1 ratio: you go from Do to "Do junior," the beginning of the next generation. So this is still in the family. The first outside one's family is the fifth (3:2).

Fig. Z-1. Consonant Intervals.



This is the secret behind the circle of fifths. You move by a fifth each time. Most of traditional western music moves by a fifth. The same goes for popular music and jazz.

The Basic Idea of the Circle of Fifths

The *circle of fifths*, also called the *cycle of fifths*, is the key to understanding harmonic changes. You move by a fifth from Do to Sol harmonically. Then you consider Sol your starting point and move a fifth again. You continue in this fashion. It is like moving from your Facebook page to your friend's page. Then you go to a friend of your friend. We shortly discover which degrees of the scale mark the addresses of these Facebook members. First though we

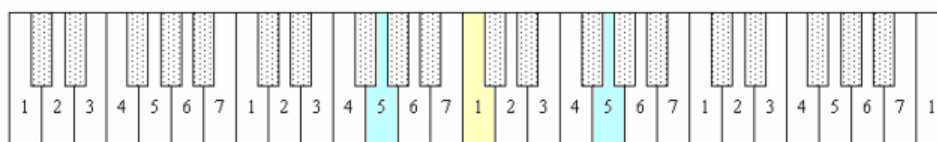
analyze an argument your instructor had with a jazz musician.

Many years ago your instructor got into an argument with a jazz musician who insisted that the best harmonic changes followed the *circle of fourths* and not fifths. The argument became quite intense. But then your instructor reasoned that his musician friend must be right too. How can both be right? Your instructor finally discovered the answer.

See Fig. Z-2. If you go up a fifth from the middle note labeled 1, you get to the 5th degree of the scale. But if you go down a fourth, you get to the 5th degree of the scale in the octave lower.

So moving up by a fifth is equivalent to moving down by a fourth. In either case you get to the 5th degree of the scale.

Fig. Z-2. The Fifth and the Fourth.



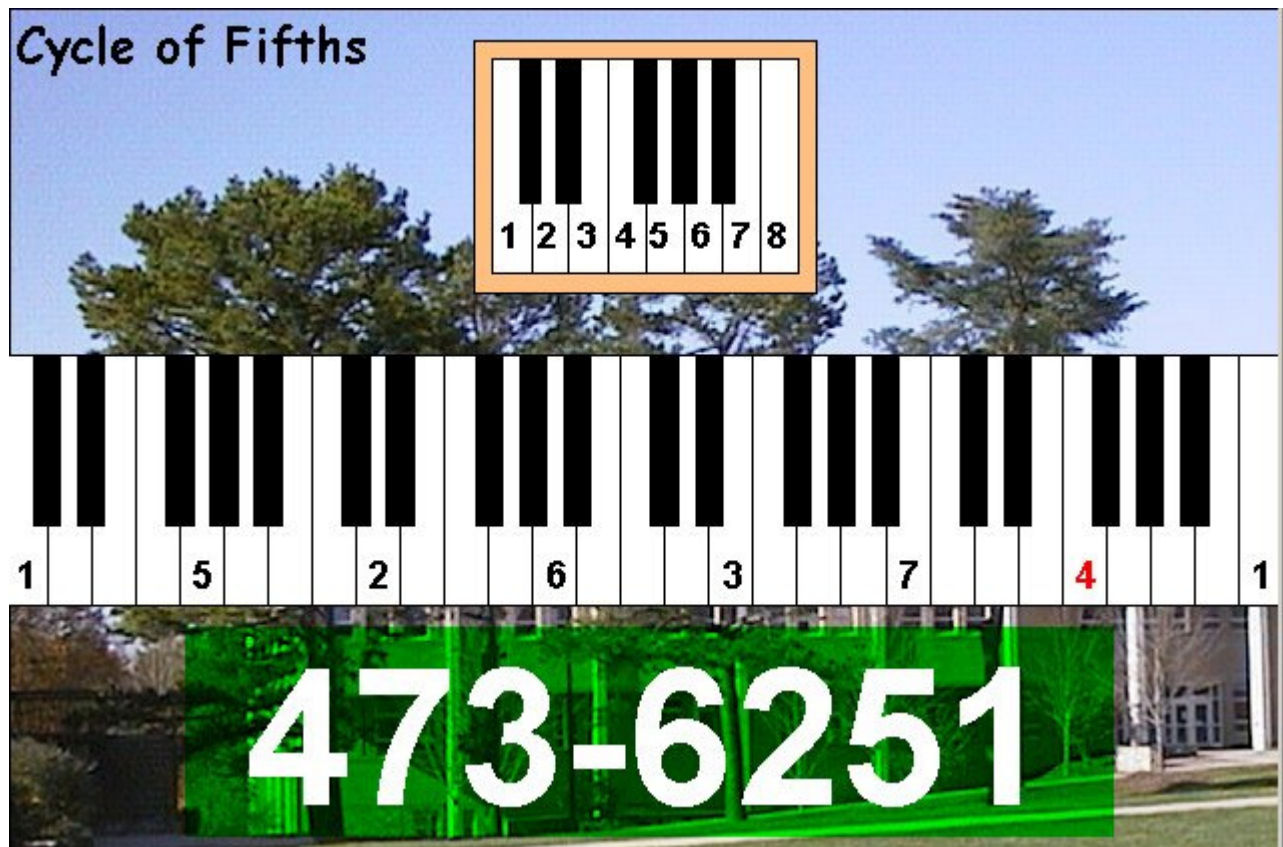
Be careful here that when you move by a fifth that you count 7 half steps. When you move by a fourth, you count 5 half steps. Here is a mathematical proof that moving up by a fifth is the same as moving down by a fourth. Start with 120 Hz so that we can work with a specific frequency. Then your fifth higher is $(120) \frac{3}{2} = (60)(3) = 180$ Hz. If you go down a fourth, you need to deal with the 4:3 ratio in some way. Going down means we use $\frac{3}{4}$. Therefore, $(120)(\frac{3}{4}) = (30)(3) = 90$ Hz. But this is an octave lower than 180 Hz. Therefore, we are on the same degree of the scale, a Sol in each case.

Here's a more abstract version. Go up a fifth means $\frac{3}{2}$. Go down a fourth means $\frac{3}{4}$. But this latter one is an octave lower. Why? Double it and you find $2(\frac{3}{4}) = \frac{3}{2}$, the higher Sol. So both the lower and higher notes are Sols. Remember the importance of seeing things from more than one vantage point.

A Portion of the Circle of Fifths

Start on the 1 in the large keyboard of Fig. Z-3 and count 7 half steps to arrive at the 5. Use the cute small keyboard as a reference to identify the degrees of the scale. Keeping counting by 7 half steps to get all the cases but cheat in going from 7 to 4 making that only 6 half steps, i.e. the tritone. We do this so that we can finish up with the 1 with a total of eight numbers. So we break the cycle between 7 and 4 to pull this off. Note that the last interval (4 to 1) is a fifth. We do the break because popular songs are typically written in groups of 4 units called measures. So now we have two such units. Read the numbers backwards and you get the two units: 1-4-7-3 and 6-2-5-1. When you repeat this, the 1 appears twice in a row: 1-4-7-3-6-2-5-1-1-4-7-3-6-2-5-1-1. Remember this by the phone number 473-6251 and note that you stay on the 1 for twice as long.

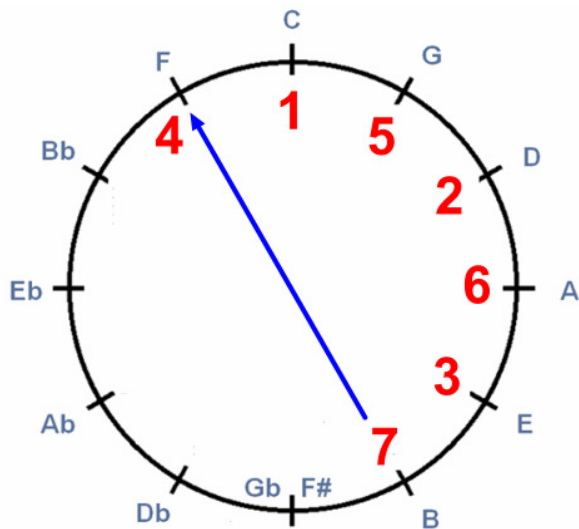
Fig. Z-3. Portion of the Circle of Fifths.



The Full Circle of Fifths

The full circle of fifths is given in Fig. Z-4 with letters. The musicians like to use a circle with labels of the twelve unique notes of the keyboard. Don't worry about the letters. Some of these will be our black keys. We cheat in going from the 7 to the 4. That is powerful enough to analyze so many songs as we do in class. See Fig. Z-5 for a map analogy.

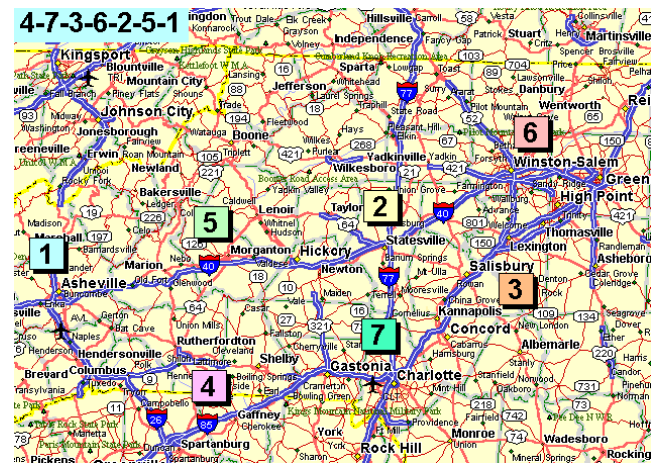
Fig. Z-4. Circle of Fifths and Our Portion.



Note that the subsection we pull out, which has to have the tritone splice (7-4) is our 4-7-3-6-2-5-1. Part of this is 6-2-5-1 and a part of the latter is 2-5-1. Some of the songs we analyze need only these parts. The larger cycle is like a powerful physics

formula and the smaller pieces are simple components of the master rule.

Fig. Z-5. Map Analogy: Traveling to Friends of Friends.



We need to stress that these movements by fifths musically refer to the harmony and not the tunes. The great Russian composer Rimsky-Korsakov (1844-1908) pointed out the importance of orchestrating a harmony with a blend of compatible notes. These are often chosen from the harmonics that go with the root or base note.

So what was Rimsky-Korsakov referring to when he wrote in his *Principles of Orchestration* that "the resonances of different harmonic parts must be equally balanced." Of course, *physics*!

--- End of Chapter Z ---