SUNY-Fredonia School of Music

A Guide for Converting an Unordered Set into a Prime Form

You are probably already able to "see" and hear many prime forms in your mind without having to go through much written or played rearranging of pc's. However, as sets get larger this sometimes becomes more difficult. For such larger sets, or as an introduction to the process, experiment with the following strategy. Notice that we are starting with pc names [Ab, C#, etc.] and eventually converting to pc integers [8, 1, etc.]; if it easier, start right away by using pc integers.

1. Arrange the pc's in ascending order from left to right, e.g. [D#, F, Ab, C].

2. Double the lowest pc at the octave, e.g., [D#, F, Ab, C, **D#**].

3. Find the largest interval between any two *adjacent* pc's. If there is only one occurrence of this interval, then the *top* note of this interval will become *bottom* note of the normal order, e.g., [C, D#, F, Ab]. Realize that this is a familiar process of inversion in which large intervals invert to small intervals and vice versa. We are finding the largest space (interval) between two *adjacent* pc's so that when we invert, the *entire* set will be contained within the smallest space. Here, the largest interval between two *adjacent* pc's is 4 half steps [Ab, C]; it inverts to encompass the smallest space of the *entire* collection, 8 half steps [C, Ab].

4. If there is more than one occurrence of the largest interval, e.g., [D, F#, G#, A, C#, **D**] we must find what can be called the "best normal order." Write out or consider all such orderings, again with the *top* note of the largest interval as the *bottom* note of the normal order:

   [F#, G#, A, C#, D, **F#**]   is compared to   [C#, D, F#, G#, A, **C#**]

   We must now compare the interval between the first two pc's of each ordering and choose as the "best normal order" the one which has the closest arrangement of intervals. If there is a "tie" for closest arrangement of intervals between the first and second pc, we compare the first pc with the *third* pc. If the "tie" is not been broken here we compare the first and *fourth* pc's, then the first and *fifth* pc's and so on until the "tie" is broken. If the "tie" for smallest interval is never broken, for example, if there were two half steps between each pc, as in a whole-tone set, we would simply use the smallest pc number as the bottom note of the normal order.

5. Although we now have the "best normal order" we must now read right-to-left and left-to right (lowest-to-highest and highest-to-lowest) and compare the arrangement of intervals. We will convert to prime form the reading that begins with the most closely arranged intervals regardless of whether that ordering is right-to-left or left-to right (bottom-to-top or top-to-bottom). For the set below we would read right-to-left (top-to-bottom) since [D, C#, etc.] is smaller than [F#, G#, etc.]

   [F#, G#, A, C#, D]   is read as   [D, C#, A, G#, F#]

6. We reach the prime form as we transpose to zero that ordering which begins with the most closely arranged intervals. In the set above we begin with D as zero: [0, 1, 5, 6, 8].