

Music 170 Homework problem set 7 (due Nov. 13)

1. Two pipes, both open at both ends, are tuned a perfect minor third apart. If the lower pitched one is $1/2$ meter long, how long must the other (higher pitched) one be?
2. The harmonic overtone series (the ratios $1:2:3:\dots$) defines a sequence of intervals between successive harmonics (first an octave, then a fifth, and so on.) Which is the first of these intervals that is less than a tempered whole tone? A tempered semitone?
3. In the just scale (Rossing page 179), C to E is a perfect major third and E to G is a perfect minor third. What other intervals arise between notes two apart in the scale (e.g., B and D)? Don't forget to look at the interval from B to D (not shown in the book because it wraps around to the next octave).
4. A perfect fifth has a ratio of $3:2$. A perfect major third has a ratio of $5:4$. If we used an equal tempered scale with 17 notes per octave, how far from perfect will its 3rds and 5ths be? (I.e., how far off, in cents, is the best approximation you can make of the perfect interval using notes in the scale?) What do the answers become if we use a 25 note scale instead of 17?
5. A piano string is stretched to $1/20$ meter in length, and weighs 0.5 gram. How much tension must it have to reach the highest note of the piano (the 'C' 4 octaves above middle C)?