

**Music 170 Homework problem set 8 (due Nov. 20)**

1. The highest-pitched string on a guitar sounds two octaves above the lowest-pitched one. If the two strings were made of the same material, and if they were strung at the same tension, how much larger would the diameter of the bottom string have to be than the top one (as a ratio)?
2. Suppose you have a pipe one meter long, open at both ends, which therefore should sound at about 172 Hz. Suppose you then cut off a piece that sounds a perfect fifth higher than the original pipe did. At what frequency would the remaining length (the one you cut away from the original pipe to get the second one) sound?
3. A room is in the shape of a cube, 10 meters on a side. The wall absorption coefficient is 0.5. What is the predicted reverberation time (RT60)?
4. Suppose a room has an RT60 of 2 seconds at low frequency and 1 second at a high frequency (say 5000 Hz). If a short sound is made in the room, how much more are the high frequencies attenuated than the low ones after one second?
5. A person is standing 4 meters in front of you playing a clarinet. There is a wall 2 meters behind you (so that a line connecting the clarinet player's location to yours would be perpendicular to the wall.) Assuming the wall is flat and reflects sound perfectly, how does the level (in decibels) of the reflection compare to that of the direct sound? How much later does the reflected sound arrive? (Assume sound travels at 343 M/sec and that the sound from the clarinet radiates equally in all directions).