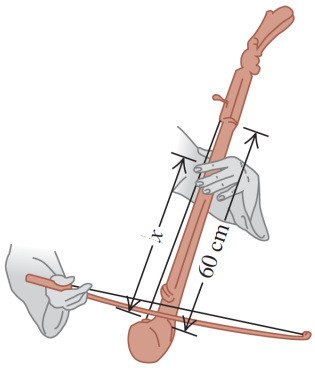
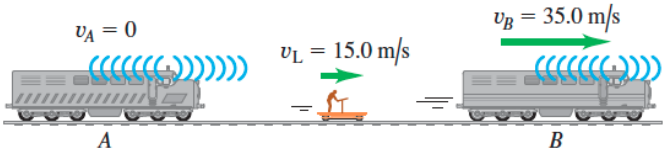
Name: 1B Discussion - Week 3

1. **Standing Waves** *(YF 13th ed. 15.47).* The portion of the string of a certain musical instrument between the bridge and upper end of the finger board (that part of the string that is free to vibrate) is 60.0 cm long, and this length of the string has mass 2.00g. The string sounds an A_4 note (440Hz) when played.
(a) Where must the player put a finger (what distance x from the bridge) to play a D_5 note (587Hz)? For both the A_4 and D_5 notes, the string vibrates in its fundamental mode. (b) Without retuning, is it possible to play a G_4 note (392 Hz) on this string? Why or why not?



2. **Doppler** *(YF 13th ed. 16.45).* Two train whistles, A and B, each have a frequency of 392 Hz. A is stationary and B is moving toward the right (away from A) at a speed of 35.0m/s. A listener is between the two whistles and is moving toward the right with a speed of 15.0m/s. No wind is blowing. (a) What is the frequency from A as heard by the listener? (b) What is the frequency from B as heard by the listener? (c) What is the beat frequency detected by the listener?



3. **Beats** *(YF 13th ed. 16.40).* Two guitarists attempt to play the same note of wavelength 6.50 cm at the same time, but one of the instruments is slightly out of tune and plays a note of wavelength 6.52cm instead. What is the frequency of the beat these musicians hear when they play together?

4. **Wagnerian Opera** *(YF 13th ed. 16.71).* A man marries a great Wagnerian soprano but, alas, he discovers he cannot stand Wagnerian opera. In order to save his eardrums, the unhappy man decides he must silence his larklike wife for good. His plan is to tie her to the front of his car and send car and soprano speeding toward a brick wall. This soprano is quite shrewd, however, having studied physics in her student days at the music conservatory. She realizes that this wall has a resonant frequency of 600 Hz, which means that if a continuous sound wave of this frequency hits the wall, it will fall down, and she will be saved to sing more Isoldes. The car is heading toward the wall at a high speed of $30m/s$. (a) At what frequency must the soprano sing so that the wall will crumble? (b) What frequency will the soprano hear reflected from the wall just before it crumbles?