

31. At the beginning of the exercises and problems section in the textbook, we are told to assume $v_{\text{sound}} = 343$ m/s unless told otherwise. The second harmonic of pipe A is found from Eq. 18-39 with $n = 2$ and $L = L_A$, and the third harmonic of pipe B is found from Eq. 18-41 with $n = 3$ and $L = L_B$. Since these frequencies are equal, we have

$$\frac{2v_{\text{sound}}}{2L_A} = \frac{3v_{\text{sound}}}{4L_B} \implies L_B = \frac{3}{4}L_A .$$

- (a) Since the fundamental frequency for pipe A is 300 Hz, we immediately know that the second harmonic has $f = 2(300) = 600$ Hz. Using this, Eq. 18-39 gives $L_A = (2)(343)/2(600) = 0.572$ m.
- (b) The length of pipe B is $L_B = \frac{3}{4}L_A = 0.429$ m.