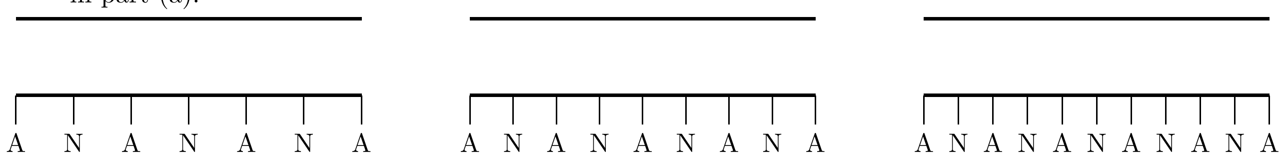
35. (a) Since the pipe is open at both ends there are displacement antinodes at both ends and an integer number of half-wavelengths fit into the length of the pipe. If L is the pipe length and λ is the wavelength then $\lambda = 2L/n$, where n is an integer. If v is the speed of sound then the resonant frequencies are given by $f = v/\lambda = nv/2L$. Now $L = 0.457\,\mathrm{m}$, so $f = n(344\,\mathrm{m/s})/2(0.457\,\mathrm{m}) = 376.4n\,\mathrm{Hz}$. To find the resonant frequencies that lie between $1000\,\mathrm{Hz}$ and $2000\,\mathrm{Hz}$, first set $f = 1000\,\mathrm{Hz}$ and solve for n, then set $f = 2000\,\mathrm{Hz}$ and again solve for n. You should get 2.66 and 5.32. This means $n = 3$, 4, and 5 are the appropriate values of n. For $n = 3$, $f = 3(376.4\,\mathrm{Hz}) = 1129\,\mathrm{Hz}$; for $n = 4$, $f = 4(376.4\,\mathrm{Hz}) = 1526\,\mathrm{Hz}$; and for $n = 5$, $f = 5(376.4\,\mathrm{Hz}) = 1882\,\mathrm{Hz}$.

(b) For any integer value of n the displacement has n nodes and $n + 1$ antinodes, counting the ends. The nodes (N) and antinodes (A) are marked on the diagrams below for the three resonances found in part (a).



$n = 3$ $\quad$ $n = 4$ $\quad$ $n = 5$