21.73. **Model:** The amplitude is determined by the interference of the two waves.
Visualize: Please refer to Figure P21.73.
Solve: **(a)** We have three identical loudspeakers as sources. Δr between speakers 1 and 2 is 1.0 m and $\lambda = 2.0$ m. Thus $\Delta r = \frac{1}{2}\lambda$, which gives perfect destructive interference for in-phase sources. That is, the interference of the waves from loudspeakers 1 and 2 is perfectly destructive, leaving only the contribution due to speaker 3. Thus the amplitude is a.
(b) If loudspeaker 2 is moved away by one-half of a wavelength or 1.0 m, then all three waves will reach you in phase. The amplitude of the superposed waves will therefore be maximum and equal to $A = 3a$.
(c) The maximum intensity is $I_{\max} = CA^2 = 9Ca^2$. The ratio of the intensity to the intensity of a single speaker is

$$\frac{I_{\max}}{I_{\text{single speaker}}} = \frac{9Ca^2}{Ca^2} = 9$$