

Basic Acoustics
03:111
Due: Thursday, March 8, 2001

Name: _____

Section: _____

Chapter 4 (Combining Sound Sources)

1. If there are 2 independent sound sources each emitting 65 dB IL, what is the combined sound intensity?
2. Five sound sources each produce 80 dB IL, what is the total level of the five sources combined?
3. Three sound sources each produce 65 dB IL, what is the total level of the three sources combined?
4. What is the total SPL that results from combining one source that produces 94 dB SPL and a second source that produces 74 dB SPL?

Supplemental Material (Chapter 16: Musical Scales and Harmony)

1. What is the definition of a scale?
2. What is the definition of an octave?
3. What is the frequency of the sound that is **3 octaves** above 500 Hz?

4. Draw the spectrum of a 60 dB SPL, 1000-Hz pure tone (sine wave) on a spectrum. Be sure to label your axes.

Chapter 5 (Complex Waves)

1. One of the complex waves that was described in this chapter has the following characteristics: The fundamental frequency (f_0) is 125 Hz, and energy is present at odd and even integer multiples of the f_0 . The amplitude of the 4th harmonic is -6 dB relative to the amplitude of the 2nd harmonic and -12 dB relative to the amplitude of the f_0 . Name the complex wave type.
2. A **sawtooth** wave has a fundamental frequency (f_0) of 123 Hz. The relative amplitude of the 5th harmonic is -14 dB re: the amplitude of the f_0 . What is the relative amplitude of the 10th harmonic.
3. A complex, periodic waveform with energy at odd and even harmonics has a fundamental period of 5 ms. What is the frequency of the 6th harmonic?
4. If the signal level is 60 dB SPL and the noise level is 67 dB SPL, what is the signal-to-noise ratio in dB?
5. If the signal level is 75 dB SPL and the noise level is 69 dB SPL, what is the signal-to-noise ratio in dB?

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6. If signal intensity is 10^{-5} watt/m² and noise intensity is 8×10^{-5} watt/m², what is the S/N ratio in dB?
Show your work.

7. A pulse train has a **pulse duration (P_d)** of 3 ms and a **pulse repetition frequency** of 200 Hz.

a. List the frequency of the first **five** harmonics:

b. List the frequencies in Hz of the first (lowest) three nulls in the amplitude spectrum (no decimals).