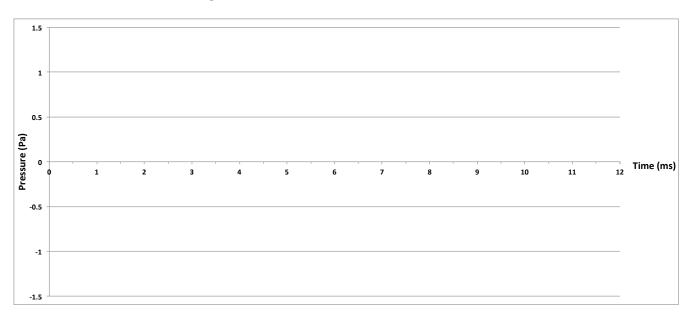
Name\_\_\_\_\_ Section\_\_\_\_

Please show all of your work!

- 1. On the axes provided below, graph the following:
  - a. 100-Hz sine wave with a peak amplitude of 1.0 Pa
  - b. 200-Hz sine wave with a peak amplitude of 0.5 Pa
  - c. Sum of the previous two waves



2. Find the equation that describes the waveform that you graphed for part 1c.

3. Calculate the sound pressure level that corresponds to a sound pressure of  $5\,x\,10^{\text{--}3}\,$  Pa.

4. Calculate the overall A-weighted level of the spectrum below.

Band	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
$L_P$	82 dB	77 dB	72 dB	60 dB	64 dB	57 dB	50 dB	40 dB

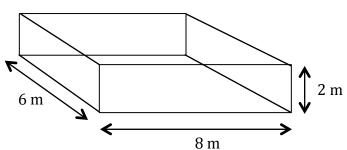
- 5. Three small fans are located near each other at 1.5 m above the ground, and produce an annoying noise in the 250 Hz band. A local resident whose bedroom window is at the same height as the fans and is 80 m away complains about this noise. Measurements indicate that noise levels in the 250 Hz band at 2 m from each fan are 85 dB, 92 dB, and 91 dB respectively.
  - a. Calculate the total level from the three fans at the window. (Note that you do not need to A-weight anything in this problem)

b. A noise control barrier is to be located 3 m from the fans, and must reduce the 250 Hz fan noise to 55 dB outside the neighbor's window. Measured from ground level, how tall must the barrier be? (A copy of the nomograph is attached to this exam for reference.)

6. The room pictured has the following absorption coefficients at 500 Hz:

Floor: Carpet,  $\alpha = 0.14$ 

Ceiling: Acoustic Ceiling Tile,  $\alpha = 0.70$  Walls: Gypsum Wallboard,  $\alpha = 0.10$ 

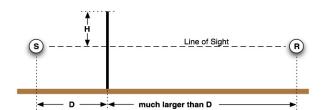


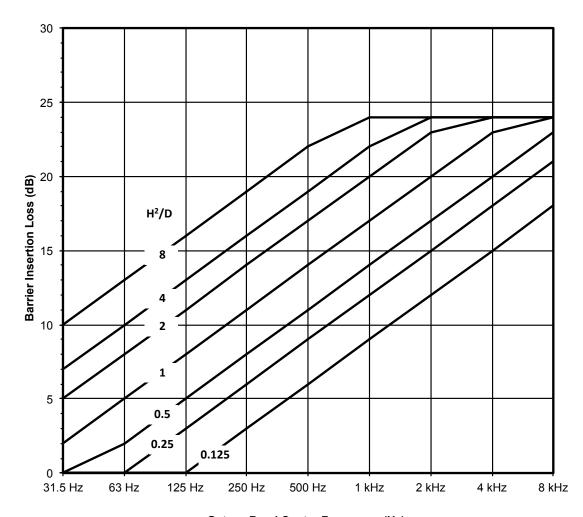
a. Calculate the total absorption in this room.

b. Calculate the reverberation time.

c. Calculate the mean free path.

## **Sound Barrier Calculation**





Octave Band Center Frequency (Hz)