

46 Practice Exam #1

46.1 A fan supplies air through a 12in by 18in rectangular sheet metal duct with 1in fiberglass insulation. The duct run is 15ft long. Local octave band measurements of the sound power level for the fan are 125Hz, 95dB; 250Hz, 94dB; 500Hz, 92dB; 1000Hz, 90dB; 2000Hz, 85dB; 4000Hz, 69dB. What is the expected sound power level for the 1000Hz octave band at the end of the duct run?

- A. 35dB
- B. 52dB
- C. 69dB
- D. 86dB

Refer to the table **Insertion Loss for Rectangular Sheet Metal Ducts** with 1 in. Fiberglass Lining. Look up dimensions 12in by 18in and note the insertion loss for the 1000Hz octave band is $3.7 \frac{dB}{ft}$. Multiply the loss per foot times the length of the duct to obtain the total dB reduction.

$$\left(3.7 \frac{dB}{ft}\right)(15ft) = 55.5dB$$

Subtract the dB reduction from the measured sound power level for the 1000Hz octave band to obtain the final sound power level with the insulated duct inserted.

$$90dB - 55.5dB = 34.5dB$$

Answer A

46.2 A normal shock wave in air has a Mach number of 3. The pressure upstream is 1atm, what is the pressure downstream?

- A. 2 psi
- B. 10 psi
- C. 60 psi
- D. 150 psi

There are two possible approaches for this problem, the first using the **Normal Shock Relationships** table and the second using equations relating downstream flow conditions to upstream flow conditions for a normal shock wave. In both cases, the subscript 1 is used to represent the upstream conditions and the subscript 2 is used to represent the downstream conditions.

Using the table, for $M_1 = 3$, find the corresponding pressure ratio.

$$\frac{P_2}{P_1} = 10.3333$$