

45.3 Four identical fans produce a combined sound pressure level of 90dBA as measured at a point that is equidistant from each fan. What is the sound pressure level if three fans are shut down?

- A. 70dB
- B. 80dB
- C. 84dB
- D. 87dB

Refer to the table for **Combining Two Sound Levels** and note that when the difference between two source's sound levels is 0dB , the number of decibels to be added to the highest level is 3dB . In this situation, sources are being removed as fans are shut down, but the same principle applies in reverse. To be clear, the table does not offer a way to add 3 or more sources together directly, therefore it is necessary to find an approach that allows adding the sources in pairs only.

First, imagine shutting 2 of the 4 fans down. One pair of fans may be treated as one source and the other pair treated as a second source. The sound pressure level will be reduced by 3dB when have the sources are removed. This reasoning can be confirmed by imagining re-enabling the 2 fans, thereby combining two pairs of sources, and adding back the 3dB .

$$90\text{dB} - 3\text{dB} = 87\text{dB}$$

Next imagine shutting down one of the two remaining fans, thereby removing half the sources. By the same reasoning, another 3dB reduction will be observed.

$$87\text{dB} - 3\text{dB} = 84\text{dB}$$

Again, sense check this answer by adding two 84dB sources together to get 87dB , then adding the two pair of sources to get back to 90dB .

Answer C

45.4 The background noise in a factory prior to any equipment turning on has a sound pressure level of 40dB . Once the equipment is operating, the sound pressure level is 46dB . What is the sound pressure level attributable to the machinery only?

- A. 6dB
- B. 41dB
- C. 43dB
- D. 45dB

Refer to the table for **Combining Two Sound Levels**. The process for combining sound levels involves adding up to 3dB to the *highest* source, depending on the difference in sound level between the two sources. In this case, it is not immediately clear whether the background noise or the machinery is the louder source. Since the most that could be added to arrive at the combined sound pressure level