Q- A person standing a certain distance from an airplane with four equally noisy jet engines experiences a sound level of 120dB. What sound level intensity would this person experience at double the initial distance when the captain shuts down all but one engine?

Let the minimum Intensity for audible sound is $I_{\rm 0}\,and$ that of the sound produced by the jet is I.

The level of loudness in dB is given by the relation

$$L = 10* \log_{10}(I/I_0) = 120$$

Now as the intensity is inversely proportional to the square of the distance from the source and the distance is doubled, the intensity will decrease by a factor of 4 or will be I/4.

As further the three engines are shut the intensity is one fourth of the initial and hence in all the intensity will become I' = I/16.

Hence the new level of sound will be given by

 $L' = 10* \log_{10}(I/16I_0)$

Hence subtracting the two equations we have

$$L'-L = 10 \left(\log_{10} \frac{I}{16I_0} - \log_{10} \frac{I}{I_0} \right) = 10 * \log_{10} \frac{1}{16}$$

Or $L'-120 = 10 * \log_{10} \frac{1}{16} = -10 * 1.2 = -12 \text{ dB}$
This gives
 $L' = 120 - 12 = 108 \text{ dB}$