Examples of maths problems for Science of Music  IL016

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Wavelength \( \lambda \) of a sound wave is speed of its propagation divided by the vibration frequency: \( \lambda = v/f \). Find the frequency \( f \) if the speed of sound is 350m/s and wavelength is 7m. (Answer 50Hz)

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Frequency of string = \( \frac{0.5 \text{ length}}{\sqrt{\text{tension on string}}} \times \sqrt{\text{line density}} \)

Find tension that is needed to put on a piano string with length of 80cm and line density of 0.0059 kg/m, so it produces frequency 262Hz (middle C). (Answer 1036 N – this is equivalent to putting an over 100kg weight to stretch it!)

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Bit depth refers to the number of binary (0 or 1) bits used to record sound waveforms. For a bit depth of \( n \) each sampled amplitude is mapped on to one of \( 2^n \) possible values. How many amplitude levels can be distinguished by an 8 bit system? (Answer \( 2^8 = 256 \))

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