The Wave Equation

All right, welcome back. We're going to do an example problem and continue our sound wave notes here. We're going to start with an example problem of some intense calculations on how to figure out different frequencies of different sounds and how to relate them back to normal wave lengths and normal frequencies.

So to produce the opposite effect of helium, a man takes a breath of argon through which sound travels at 310 meters per second. Normally, the man's voice has a frequency of 230 Hertz. What is the wavelength of the man's voice? And what is the new frequency of the man's voice if the wavelength stays the same?

So what we want to do here is we want to attack that first problem, the wavelength of the man's voice. So we know that wavelength equals-- I'm sorry, velocity equals wavelength times frequency. So we know that 343 is the normal speed of sound in air, and that's equal to the wavelength times the man's normal frequency of his voice, which is 230 Hertz. So doing a little math, we get 100-- 1.49 meters for the wavelength.

And then the second question asks, what is the new wave-- new frequency of the man's voice if the wavelength stays the same? So what we're going to do is we're actually going to use the velocity equals wavelength times frequency equation as well again here, except this time we're going to use the new speed of sound, which was 310, which was caused by that argon.

And then we're going to use the wavelength of the man's voice, which does not change. And that's from the previous part a here. And then we're going to solve for the frequency. And when we do the algebra there, we actually get 208 Hertz. We're going to do a second example here that asks, what is the wavelength of a middle C played in air? So the C being a musical instrument, a musical note. And the velocity is 343 for speed of sound in air. And the frequency of middle C is 262 Hertz.

So we're actually going to identify our variables, as I did there. And then we know that velocity once again-- or velocity or wave speed equals wavelength times frequency. So we plug-in our givens and we solve for wavelength, which once again is that lambda right here that you're seeing. And we get an answer of 1.31 meters for our wavelength.