Introduction to Waves

Open this Desmos graph: https://www.desmos.com/calculator/gvn0xumgcm

Press play on the t slider. You should see a wave moving to the right and a point going up and down on the wave at x=0.

This will be a qualitative investigation into waves and their associated quantities, and as such the exact numerical values of any of these quantities will not be too relevant.

A travelling wave.

This wave is clearly moving to the right. If we take the x-axis to be real life distance along a rope and the y-axis to be the height of the rope, we can see how this wave appears to be moving to the right. However, focusing on the single point, we can see that each point of mass on the rope is simply oscillating up and down in its own wave, and not actually moving to the right — this is because waves are the method through which energy is transferred from one location to another, without the actual transfer of any mass.

Change the amplitude. You can see that this changes the amplitude of each individual oscillation of each point on the rope, which results in a change in the overall amplitude of the travelling wave.

Change the wavelength of the travelling wave. Notice that this does **not** change the period of each individual oscillation on the rope. The wavelength of the travelling wave is a property that emerges depending on how "in-sync" points on the rope are with their neighbours. We can see this by increasing the wavelength to an absurdly high value, such as 500. Notice that locally, the wave looks more like a straight line, since the points are now more "in-sync" with each other. Now try a wavelength of 5000. The graph becomes nearly indistinguishable to just a straight line moving up and down, oscillating.