Use File > Make a copy to make your own copy of this worksheet, so that you can edit it.

Wave movie and a graph

Link to the [wave movie + graph simulation]

Play with the simulation for a couple of minutes, to explore what you can do with it.

Here are some equations you might find useful

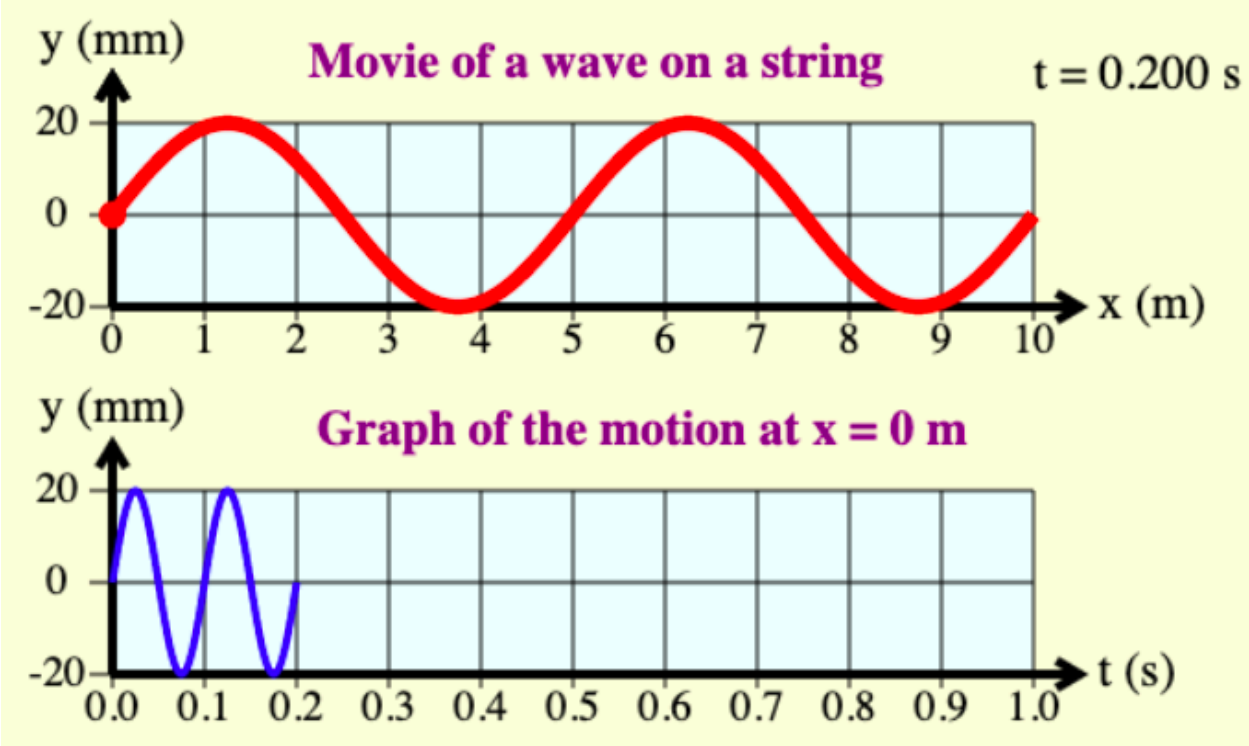
Connections between period (T), frequency (f), and angular frequency (ω):

$$f = \frac{1}{T} \qquad \omega = 2\pi f \qquad \omega = \frac{2\pi}{T}$$

Wavelength: $\lambda = \frac{v}{f}$ Wave speed: $v = \sqrt{\frac{F_T}{m/L}}$

Maximum transverse speed: $v_{t,max} = A\omega$

It's fine to be able to play with the simulation, but it is also important that you know how to calculate things from a static picture, as is shown on the next page.



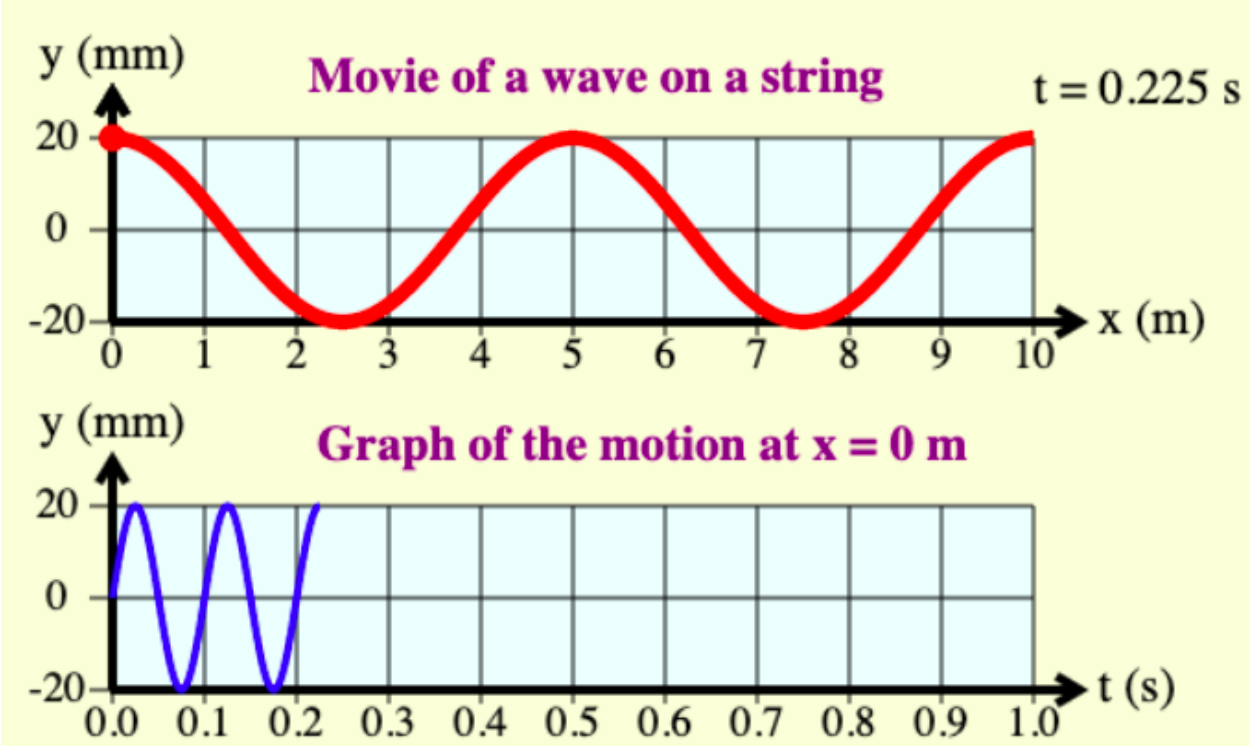
Use the image above to help you determine all of the following.

1. What is the amplitude of the wave? _____ mm
2. What is the frequency of the wave? _____ Hz
3. What is the wavelength of the wave? _____ m
4. What is the speed of the wave? _____ m/s
5. If the mass per unit length of the string is m/L = 32 g/m, what is the tension in the string? _____ N
6. What is the maximum transverse speed of a point on the string? _____ m/s
7. In which direction is the wave moving, +x or -x? _____

Hint: you will need to use information from both the movie and the graph in the picture above to answer question 7.

Explain how you arrived at your answer to question 7:

Now, see this second image. Assume that you only have this image to work with, and not the first image.



For this one, you can't tell whether the wave is moving in the +x or -x direction Explain what is different about this one compared to the first image, and why you can't tell which way the wave is moving if you only have the second image to work with.

This worksheet was created by Andrew Duffy of Boston University on Jan. 6, 2023.