Instructions: Show your work completely for the following problems.

1. If Clint wants to increase the wavelength of waves in a rope, should he shake it at a higher or a lower frequency?

$$v = f \cdot \lambda$$

If you want to increase the wavelength, you mush lower the frequency since the speed will be the same (the medium is the same).

2. Tony wants to determine the speed of a transverse wave. He knows the wave has a frequency of 8.50 Hz and a wavelength of 0.500 m.

$$v = f \cdot \lambda = (8.50 \text{ Hz})(0.500 \text{ m})$$

$$\boxed{v = 4.25 \, ^{\text{m}}/_{\text{s}}}$$

3. Natasha creates a longitudinal wave that has a frequency of 50.0 Hz and travels along a coil spring. If the distance between successive compressions is 0.250 m, what is the speed of the wave?

$$v = f \cdot \lambda = (50.0 \text{ Hz})(0.250 \text{ m})$$

$$\boxed{v = 12.5 \, ^{\text{m}}/_{\text{s}}}$$

4. Bruce notices that wave crests pass the bow of his anchored boat every 4.00 s. He measures the distance between two crests to be 9.25 m. How fast are the waves traveling?

$$v = \frac{\lambda}{T} = \frac{9.25 \text{ m}}{4.00 \text{ s}}$$

$$\boxed{v = 2.31 \, ^{\text{m}}/_{\text{s}}}$$

5. Steve generates five pulses every 0.750 s by dipping his finger into a tank of water. What is the speed of the wave if the wavelength of the resulting wave is 7.70 cm?

$$T_{for \, 1 \, wave} = \frac{0.750 \text{ s}}{5 \text{ waves}} = 0.150 \text{ s}$$

$$v = \frac{\lambda}{T} = \frac{0.0770 \text{ m}}{0.150 \text{ s}}$$

$$\boxed{v = 0.513 \, ^{\text{m}}/_{\text{s}}}$$

6. The speed of a transverse wave in a string is 14.0 m/s. If Nick produces a wave pulse in the string that has a frequency of 8.70 Hz, what is its wavelength?

$$v = f \cdot \lambda \rightsquigarrow \lambda = \frac{v}{f} = \frac{14.0 \, ^{\text{m}}/_{\text{s}}}{8.70 \text{ Hz}}$$

$$\boxed{\lambda = 1.61 \text{ m}}$$

7. A sound wave produced by a clock chime. Thor is 257 m away and hears the chime 0.750 s after the clock strikes 1:00p.
   a. What is the speed of sound of the clock's chime in air?

$$v = \frac{d}{t} = \frac{257 \text{ m}}{0.750 \text{ s}}$$

$$\boxed{v = 343 \text{ }^m/_s}$$

   b. The sound wave has a frequency of 512 Hz. What is its period?

$$T = \frac{1}{f} = \frac{1}{512 \text{ Hz}}$$

$$\boxed{T = 0.00195 \text{ s}}$$

   c. What is its wavelength?

$$v = \frac{\lambda}{T} \leadsto \lambda = v \cdot T = (343 \text{ }^m/_s) \cdot (0.00195 \text{ s})$$

$$\boxed{\lambda = 0.670 \text{ m}}$$