3. Waves moving on a lake have a speed of 2.0 m/s and a distance of 1.5 m between adjacent crests.
   a. What is the frequency of the waves?

$$v = f \cdot \lambda$$

$$f = \frac{v}{\lambda}$$

$$f = \frac{2.0\ {}^{m}/_{s}}{1.5\ m}$$

$$f = \frac{1.3}{s}$$

$$f = 1.3\ Hz$$

   b. Find the period of the wave motion.

$$f = \frac{1}{T}$$

$$T = \frac{1}{f}$$

$$T = \frac{1}{1.3\ Hz} = \frac{1}{1.3/s}$$

$$T = 0.77\ sec$$

7. What is the frequency of blue light that has a wavelength of 420 nm?

$$v = f \cdot \lambda$$

$$3.0\ x\ 10^{8}\ {}^{m}/_{s} = f \cdot 420\ nm$$

$$3.0\ x\ 10^{8}\ {}^{m}/_{s} = f \cdot 4.2\ x\ 10^{-7}\ m$$

$$7.1\ x\ 10^{14}\ Hz\ = f$$

11. Compute the wavelength in air or ultrasound with a frequency of 50 kHz if the speed of sound is 344 m/s.

$$v = f \cdot \lambda$$

$$344\ {}^{m}/_{s} = 50\ kHz \cdot \lambda$$

$$344\ {}^{m}/_{s} = 50{,}000\ Hz \cdot \lambda$$

$$0.007\ m\ = \lambda$$

$$7\ mm\ = \lambda$$

13. During a thunderstorm, 4.5 s elapses between observing a lighting flash and hearing the resulting thunder. Approximately how far away, in kilometers and miles, was the lighting flash? (Assume that 1 kilometer equals 0.621 miles)

Assume that the time that light takes to get to you is negligible. Since the speed of light = 3.0 x 10^8 m/s and the speed of sound is 344 m/s, this is a reasonable assumption.

$$v = \frac{d}{t}$$

$$344\ {}^{m}/_{s} = \frac{d}{4.5\ s}$$

$$d = 1500\ m$$

$$d = 1500\ m\ * \frac{1\ km}{1000\ m}$$

$$d = 1.5\ km$$

Convert km into miles…

$$d = 1.5\ km\ * \frac{0.621\ miles}{1\ km}$$

$$d = 0.93\ miles$$