UNIT ~~9~~ NINE PROBLEMS

Name Key
Pd. 1

1. If a wave source produces 30 pulses every 5 seconds, calculate its period and frequency.

$f = \frac{30 \text{ pulses}}{5 \text{ sec}} = 6 \frac{\text{pulses}}{\text{sec}} = 6 \text{ hz}$

$T = \frac{1}{f} = \frac{1}{6 \text{ hz}} = \frac{1}{6 \text{ sec}} = \frac{1}{6} \text{ sec}$

2. A wave tank produces a wave every 0.25 seconds with $\lambda = 5$ cm. What is wave speed?

$T = \frac{1}{4} s$ so $f = 4 \text{ hz}$

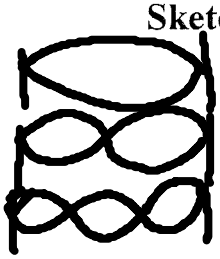
$\lambda = .05 m$

$V = f\lambda = (4 \text{ hz})(.05 m) = .20 \text{ m/s} = \frac{1}{5} \text{ m/s}$

3. A 80 cm-long string fixed at both ends vibrates with a frequency of 440 Hz. Sketch the first three harmonics and calculate the wave speeds of each.

.8 m

$V = \lambda f$



1st harmonic $L = \frac{\lambda}{2}$ $.8 m = \frac{\lambda}{2}$ so $\lambda = 1.6 m$ so $V = 704 \frac{m}{s}$

2nd harmonic $L = \frac{2\lambda}{2}$ $.8 m = \lambda$ $\lambda = .8 m$ $V = 352 \frac{m}{s}$

3rd harmonic $L = \frac{3\lambda}{2}$ $.8 m = \frac{3\lambda}{2}$ $\lambda = .533 m$ $V = 235 \frac{m}{s}$

4. In an experiment to calculate the speed of sound, a 480 Hz tuning fork causes resonance in an 18 cm-long closed tube. Calculate the speed of sound.

$\frac{1}{4}\lambda = .18 m$ $f = 480 \text{ hz}$ $V = f\lambda =$

$\lambda = .72 m$

5. Calculate the fundamental frequency (1st harmonic) for an open tube of length 1.25 m. Use v = 340 m/s.

$V = f\lambda$

$\frac{1}{2}\lambda = 1.25 m$ $V = 340 \text{ m/s}$ $f =$

$\lambda = 2.5 m$