1) A tuning fork has a frequency $f_A = 440$ Hz. What is the frequency $f_B$ of a second tuning fork, if when they are sounded together, they produce a “beat” every four seconds?

$$f_B = 444 \text{ Hz, or } 396 \text{ Hz}$$

2) Consider the graph shown below —
The vertical axis is labeled in Volts, and the horizontal axis is labeled in millisecond. Draw the superposition of these two oscillations on the graph. Use a colored pencil or pen to show the superposition of the two tones.

3) The speed of sound in air is 330 m/s. What is the wavelength $\lambda$ of a tone that has a frequency $f = 440$ Hz?

$$\lambda = \frac{v}{f} = \frac{330}{440} = 0.75$$

4) The longest string on a piano has a length $L = 2$ m and weighs 50 g (i.e. has a mass $M = 50$ g). What is the speed of propagation of a pulse on the spring if the tension is $T = 300 \text{ N}$

$$\rho = \frac{M}{L} = \frac{0.05}{2} = 0.025 \quad \quad v = \sqrt{\frac{300}{0.25}} = 109 \text{ m/s}$$
5) Tone A has a frequency \( f_A = 200 \text{ Hz} \). Tone B has a frequency \( f_B = 300 \text{ Hz} \).
The two tones are played together.
What is the period \( T \) of the combined sound?

\[
f_C = 100 \text{ Hz} \quad \quad \quad T_C = 0.01 \text{ ms}
\]

6) (For honors students) Complete the graph of tone A, then draw a graph of the superposition of tones A and B with a colored pen or pencil.

What is the frequency of tone A? \( T_A = 1.6 \text{ ms} \rightarrow f_A = \frac{1}{0.0016 \text{ s}} = 625 \text{ Hz} \)

What is the frequency of tone B? \( T_B = 1.2 \text{ ms} \rightarrow f_B = \frac{1}{0.0012 \text{ s}} = 833.333 \text{ Hz} \)

Hint: Calculate \( f_B - f_A \)

What is the frequency of the combined tone?

If you drew the rest of tone A correctly, you should see that the graphs of tones A & B look the same (as far as phase is concerned) at times 0.0 ms and 4.8 ms.

\[
T_C = 4.8 \text{ ms} \rightarrow f_C = \frac{1}{0.0048 \text{ s}} = 208.333 \text{ Hz}
\]