1. In a harmonic signal, how many octaves above the fundamental frequency is the 8th harmonic?

2. If two sinusoids with period 4 and 6 milliseconds are added, what is the period of the resulting waveform? (Hint: a periodic signal composed of more than one sinusoid has the period of its fundamental frequency—finding that would be a good start!).

3. In Pd:
   - Create a sinusoid, set to 100 Hz and connect to a meter object (it should read about 97 dB). The RMS value is the amplitude on a linear scale.
   - Create a vdelay (a variable delay) object and set its delay to 0.
   - Keeping the sinusoid output connected to the meter, connect the sinusoid output also to vdelay, and connect the output of vdelay to the meter. This will enable you to sum a delayed version of the sinusoid onto itself.
   - What is the new reading on the meter (with a delay of zero)? How much higher in dB is it than the original sinusoid? Compare with your written answer from assignment 2 question 1.
   - At what value would the vdelay object have to be set to obtain a reading of 0 dB on the meter? Try it!

4. In Pd:
   - Create 4 sinusoids, each a harmonic of 250 Hz (250, 500, 750, 1000 Hz).
   - Divide each sinusoid output by its harmonic number using the /~ object and then connect all their outputs to a switch object.
   - Connect the outlet of the switch to both an output object and a vdelay object, and the vdelay out to the output.
   - With the vdelay at 0 and the switch on, describe whether the sound you hear is harmonic or not (or somewhere in between). At which frequency does the pitch of the sound most closely correspond? (You may listen to the individual sinusoids for reference by turning switch off and connecting a sinusoid outlet directly into output object—just remember to delete this connection!)
   - With the delay at 0.002 s, describe the change that happens to both to the tone quality (or timbre) and the pitch of the sound.

5. In Pd, create a 300 Hz beat note that beats twice per second both by summing and multiplying two sinusoids. You may use the patch shown in class available at musicweb.ucsd.edu/~trsmyth/pdpatches170/beatNote10_06_16.pd
   - What are the frequencies of the sinusoids in the sum?
   - What are the frequencies of the sinusoids in the product?

Submit your work on TritonEd.