1. Open the Pd patches located in the *Examples* folder. Discuss the functionality of the different elements of the patches (objects, messages, number boxes, arguments, data flow, order of connections). Right click on the objects and examine their help patches. Make comments in the patches.

2. Create a patch (save it as: ***wk1-tut1.pd***), using objects and mathematical functions that have been introduced so far, to produce a counter output which cycles in a loop from 0 to 12 (i.e. the counter will output: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 0, […] etc.) Show the output of the counter in a number box.

3. Now add a second counter output that cycles in the opposite direction from 12 to 0 (i.e. the second counter output will be: 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0, […] etc.).

4. Using the metro object, trigger the counter so that it counts up (and down) in 1 second intervals. Make sure you can both stop and start the counters.

5. Automatically reset the counters (to 0) when metro is started. NB: You will need to reset the counters first and then start metro running. Which object will you use to make sure this is always done in the correct order?

6. Where **f** is the resultant frequency (in Hz), f_0 the fundamental (starting) frequency, and **n** the degree of the chromatic scale, we can create a chromatic scale in equal temperament from a particular note, using the formula:

$$f = f_0 * 2^{\,n/12}$$

(For n = 1, formula gives a frequency of one semitone higher from the fundamental; For n = 12, formula gives a frequency of an octave higher / You can use f_0 = 440)