FAPP 9e Writing Projects – Chapter 19

1. Generations of children have enjoyed the popular toy Spirograph®, which allows the user to trace out symmetric patterns. A pencil or pen is placed in a hole in one of several plastic circular disks with teeth on the outside rim. The disk is then meshed in the teeth of another plastic circle and rotated around its inside or outside. Each plastic piece is labeled with the number of teeth that it has on its circumference.

Either obtain a copy of Spirograph® or a closely related toy, or else visit the Web site www.wordsmith.org/~anu/java/spirograph.html, which offers an interactive Java application (which you can download) that mimics what the Spirograph® toy does.

**(a)** Experiment to determine, from the numbers of teeth on the rotating circular disk and the fixed circle, what symmetry pattern the result will have.

**(b)** Choose a rotating circular disk and a fixed circle for which the ratio of the number of teeth reduces to a whole number. For each of several "offsets" (holes to choose for the pencil or pen), trace overlapping designs. What symmetry pattern do you get for the design taken as a whole? Repeat this experiment for other pairs of pieces and try to reach a general conclusion.

**(c)** Write up, in a page or so, a description of your experiments and what conclusions you reached.

2. (Project for a team of two or three) Explore your campus looking for symmetrical patterns in decorative elements of walls, floor, carpets, and ceilings. Find one example each of a rosette pattern, a strip pattern, and a wallpaper pattern. Take a digital photo of each and incorporate your photos into a document of three pages or so that explains to the reader where the pattern can be found, what symmetries (translation, rotation, reflection, or glide reflection) it has, and how you identified the notation for it.

3. (Project for a team of two or three) Visit a store that sells wallpaper and ask for a few old samples. Identify three that have different patterns according to the flowchart in Spotlight 19.7. Write in a page or two your explanations of how you identified the patterns, and attach the wallpaper samples to your report.