Math 113 homework due 3/5 – final homework set

The first step in wisdom is to know the things themselves; this notion consists in having a true idea of the objects; objects are distinguished and known by classifying them methodically and giving them appropriate names.

– Linnaeus

(1) Read sections 15.1, 15.2 and 15.4 in the course notes

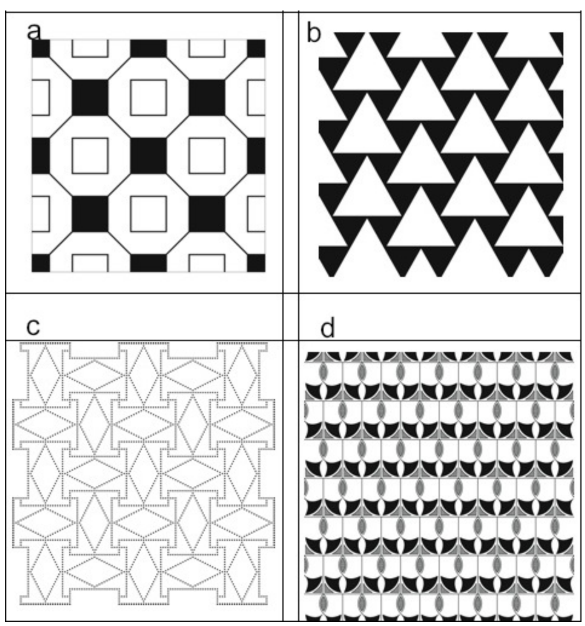
(2) Exercise 15.3 on page 444

(3) Look at the frieze made of "R"s at the bottom of page 433. It has both horizontal reflection H and translation T as symmetries. Show that
   a) HT is a glide reflection
   b) HT = TH
   c) Every symmetry of the frieze is a composition of H's and T's and their inverses. In other words, H and T generate the group of symmetries.

(4) Look at the "frieze groups" table in the course documents on chalk. Finish filling out the table.

(5) Classify the first 3 friezes on page 448 of the course notes. By classify, I mean say what number on the frieze groups table (from the previous question) represents their symmetry group.

(6) Draw the reflection lines in each of the wallpaper patterns in the picture below. You do not need to draw translated copies of a reflection line if the pattern repeats.



(7) Find a center of rotation in wallpaper c above that is not at the intersection of two reflection lines.

(This answers "Kathryn's homework" from class on Wednesday. You can find a similar rotation center on the bricks example)

(8) Look at the "wallpaper groups" table in the course documents on chalk. Which group corresponds to each of the patterns in question 6?

(9) Make your own tessellation by modifying a regular tessellation (i.e. start with a square or rhombus or hexagon or triangle or something else tessellation and modify the sides of the polygon, preserving the symmetry). Identify all the symmetries of your tessellation. Which wallpaper group is its symmetry group?

Note: your tessellation doesn't have to have recognizable tiles (i.e. M.C. Escher-style fish or lizards) but it would be extremely cool if it did.