

MA 310 Exam #3

Due Monday, April 8, in class

This is a take-home exam assignment. You may consult with other class members and with me.

You are to personally find real-world examples to illustrate 16 different symmetry types. Read the “Log of Class Activities” for details of these symmetry types.

1. Four of these should be of the type Z_k for four different values of $k \geq 2$. Do not choose Z_1 .
2. Four of these should be of the type D_k for four different values of $k \geq 1$. Do not choose D_∞ .
3. Four of these should be four different border (frieze, strip) pattern types (there are seven possible).
4. Four of these should be four different wallpaper paper pattern types (there are 17 possible).

In all of these cases, try to include a wide variety of different kinds of objects.

You are to personally photograph each of these 16 examples, and then insert the pictures into a document. (You can insert pictures into Microsoft Word documents, for example, by using Insert Picture.) You may need to save your photos under lower resolution first to decrease the memory size of the photos.

Your photographs are to be original, not downloaded from the internet, and no students should be sharing any photographs. You are to add information and explanation to each of your photos. Write a paragraph for each photo. Identify what it is, where you found it, and what symmetry type it has. Provide your reasoning and analysis to justify your assertion. This should be typed, not hand-written. Use tools such as those included with Microsoft Word to add lines and figures to your photos to highlight such features as reflections, rotations, translations, and glide reflections, to accompany your analysis. For example, Microsoft Word provides a palette of shapes that can be used, such as lines, arrows, etc., and there are ways to change color, weight, etc. (Another alternative is to *carefully and precisely* draw the additional lines and figures by hand.) In particular,

1. For the Z_k types, clearly draw an example of the smallest angle of rotation.
2. For the D_k types, clearly draw all lines of reflectional symmetry.

3. For the border patterns, clearly indicate the smallest amount of translation with a vector, draw examples of the different types of vertical reflection lines (if any), draw the horizontal reflection line (if it exists), mark examples of the different possible types of centers of rotational symmetry (if any), and indicate the smallest amount of glide reflection of glide reflection (if it exists) with a vector. Use the flowchart <http://www.math.ttu.edu/~drager/Classes/04Summer/sumacad/fflow.pdf> to carry out your classification. Use the terms hop, jump, walk, sidle, etc.
4. For the wallpaper patterns, clearly indicate with vectors two different nonparallel directions of translation from which all other translations can be obtained, the different locations and types of rotational symmetry (if any), the different types of lines of reflectional symmetry (if any), and the different types of lines of glide reflectional symmetry (if any). Use Farmer's flow chart to carry out your classification. <http://www.math.columbia.edu/~bayer/symmetry/wallpaper/Farmer/FarmerFlowchart.pdf>. Use the terms cm, pm, pg, p1, etc.

Make the effort to produce a well-written, precisely-illustrated, neat document.