Project Ideas

You should do your project alone or with one other classmate. Here are some ideas to get you started thinking about possible projects. Be creative – don't feel limited by these ideas.

Some of these projects are much more significant than others. Choose a project that seems reasonable to you, but keep in mind that projects will be graded both on correctness and on cleverness / level of intellectual content / difficulty.

By March 22, you must have selected your project topic, chosen your project partner (if any), and turned in to me a short project proposal (explaining to me what you intend to do for your project). Only one group may do any particular project; in the event that 2 groups want to do the same project, the first one to get their proposal to me will get to do it, and the other group will have to choose another topic.

Projects will be due some time during the last week of classes (details to follow).

1. Run an orbifold shop. Allow people to buy vertices, etc. Help they make different orbifolds with their purchases. Have samples of all possible patterns (fabric store?)

2. Make puzzles and models illustrating extrinsic topology.

3. Write a computer program that allows the user to select one of the planar symmetry groups, start doodling, and see the pattern replicate, as in Escher's drawings.

4. Write a similar program for drawing tilings of the hyperbolic plane, using one or two of the possible hyperbolic symmetry groups.

5. Make sets of tiles which exhibit various kinds of symmetry and which tile the plane in various symmetrical patterns. Or, make a set of tiles to construct a Penrose tiling, one that never repeats and has no symmetry.

6. Do some research into the progress researchers are making into discovering the shape of space. Read up on some articles in physics journals on this subject. Look into work by Jeff Weeks and Neil Cornish, to get started from the math direction.

7. Write a computer program allowing the user to input one or two transformations, which then draws the fundamental domain this generates, along with tiling of the complex plane by fundamental domains

8. Write a computer program similar to the one above, but allow the user to input a picture and a collection of transformations, and then take (a section of) this picture to use as fundamental domain, and use this picture to tile the complex plane.

9. Write a computer program that replicates three-dimensional objects according to a three-dimensional pattern, as in the tetrahedron, octahedron, and icosahedron.

10. Construct kaleidoscopes for tetrahedral, octahedral and icosahedral symmetry.

11. Construct a four-mirror kaleidoscope, giving a three-dimensional pattern of repeating symmetry.

12. Exhibit paper cutting patterns, and describe transformation groups (see Paper Doll cutting by Chaim Goodman-Strauss, at

    http://comp.uark.edu/ cgstraus/sym.2/sym.2.3.html, for some very cool ideas)

13. Knit a mobius band and a klein bottle hat, or a projective plane

14. Make some hyperbolic cloth

15. Sew some topological surfaces

16. Create a physical model of stereographic projection, and use it to illustrate various theorems, like that it preserves circles and angles, and the correlation between rotation above and inversion in the unit circle below.

17. Do some investigation about knots – more about the Jones polynomial, or properties of mutant knots, or constructing seifert surfaces for knots, or... (see me for more ideas).

18. Make a cool video about some aspect of the class you found interesting.