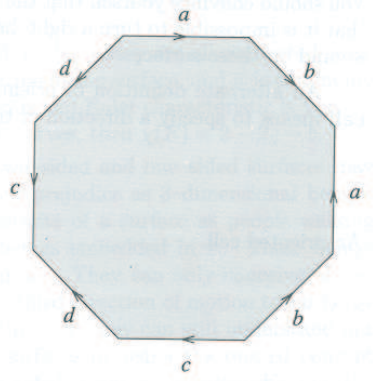
Math 130: Contemporary Mathematics
Team Project #3, due Wednesday, April 1. (No fooling!)

Complete these problems in a group of 3. You may change teams for different assignments if you want. Make sure every member of your team participates in thinking about each problem. Explain your solutions clearly. Credit will be given for creativity and design.

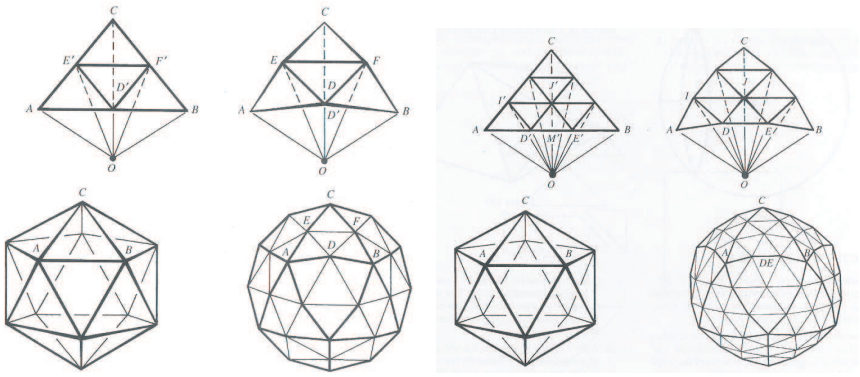
1. Perform the challenge in section 5.1 exercise 12. The answer is yes, it is possible! Explain how it can be done.

2. Page 275 of the text shows an *unfolding* of the octahedron. There are 11 different unfoldings of the octahedron. Find them.

3. With a series of carefully drawn pictures, fold the following identification diagram together (so that a matches a, b matches b, etc.) to obtain a two-holed torus.



4. *Geodesic domes*, invented by Buckminster Fuller, are created in the following way. Starting from an icosahedron, we replace each of the (triangular) faces with a set of smaller triangular faces. Below are pictured the construction of the two-frequency dome, in which every triangle in the icosahedron is replaced with four smaller triangles, and the three-frequency dome, in which every triangle in the icosahedron is replaced with nine smaller triangles. Note that these domes are not Platonic solids, since the same number of triangles do not come together at every vertex.



The two-frequency dome The three-frequency dome

(a) Find the number of vertices, edges, and faces of the two-frequency dome.

(b) Find the number of vertices, edges, and faces of the three-frequency dome.