Regular Polyhedra Worksheet

Dr. Sarah's MAT 3610: Introduction to Geometry

Physical Geometry Manipulatives: polyhedra models, multicolored foam spherical polyhedron

Goals:
- Geometric Perspectives
  I can compare and contrast multiple geometric perspectives.

Welcoming Environment: Actively listen to others and encourage everyone to participate and try to help each other! Keep an open mind as you engage in our class activities, explore consensus and employ collective thinking across barriers. Maintain a professional tone, show respect and courtesy, and make your contributions matter.

Discuss and ask me questions during group work time as well as when I bring us back together:

1. **Building Community**: What are the preferred first names of those sitting near you? If you weren't able to be there write N/A or give reference to anyone you had help from.

2. Investigate polyhedral models via nets and physical models. Roughly sketch each polyhedra and count the vertices V, edges E, and faces F. At the start of the 20th century, Felix Klein revolutionized mathematics and physics with the idea of a transformation group. In his Erlangen Program, the properties of a space were now understood by the transformations that preserved them. His ideas became the basis for geometry. Consider geometric transformations that are isometric and map the polyhedra to itself—generators for rotations of a polyhedra that take it back to the same place—identify lines and nontrivial angles.

name	rough sketch	V	E	F	nontrivial symmetries that preserve the polyhedra
tetrahedron					
cube					
octahedron					

name	rough sketch	V	E	F	nontrivial symmetries that preserve the polyhedra
icosahedron					
dodecahedron					

3. Next, look back at all five polyhedra for patterns involving V, E, and F. Explain what you find.

4. Sketch a spherical polyhedra made out of lunes that has no flat equivalent, using the multicolored foam spherical polyhedron.

5. What is V, E, and F for this spherical polyhedra?

6. What is a nontrivial symmetry that preserves this spherical polyhedron? Identify a line and angle too.

7. If you didn't already, can you find a linear equation involving V, E, and F that all the polyhedra satisfy? List it. Does the spherical polyhedron satisfy it too?

8. **Help each other and PDF responses to ASULearn**: If you are finished with the worksheet before I bring us back together, first ensure that your entire group is finished too, and if not, help each other. Then submit this, continue reviewing and solidifying or discuss upcoming class work. Collate your handwritten responses, preferably on this handout, into one full size multipage PDF for submission in the ASULearn assignment. I recommend you turn it in sometime today, but you have until the next class.