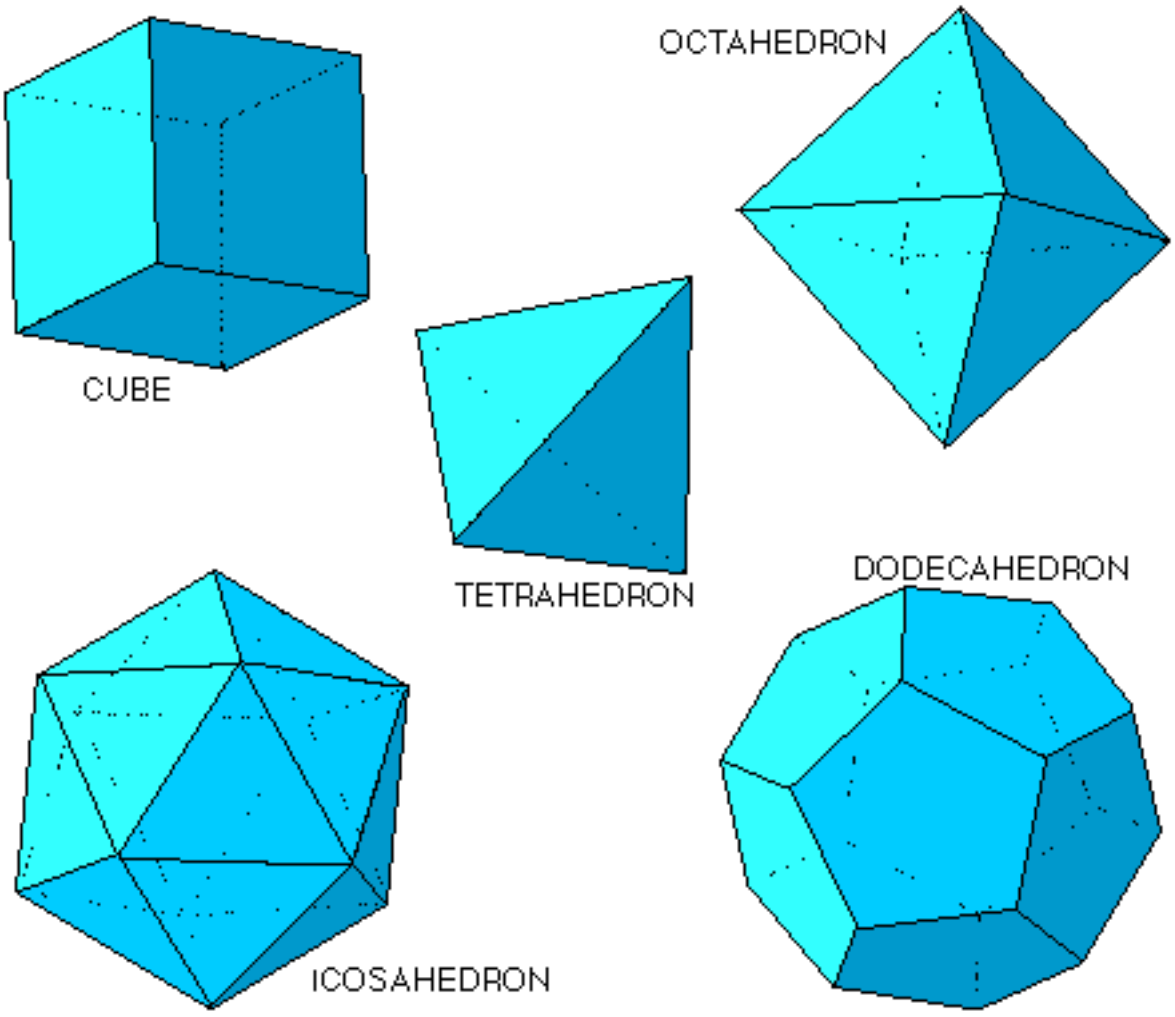
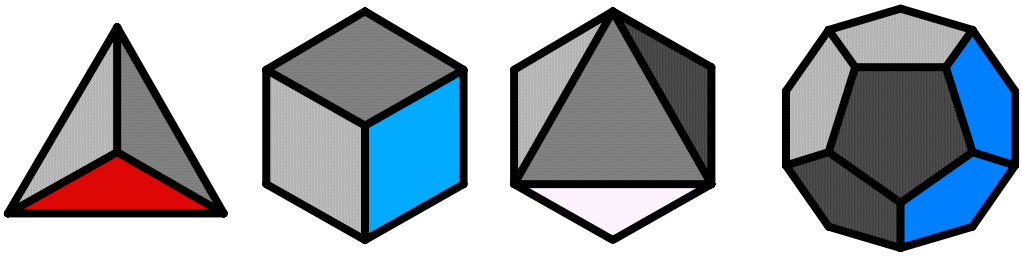
Level 1 Geometry
3rd Quarter Project
Constructing Polyhedra



During the past weeks we have been studying polygons; regular and nonregular. We have looked into their many characteristics. More recently, we have been extending our investigations of polygons, from a 2-dimensional form to a solid form. We have come to know these *solids* as the Platonic Solids and the Archimedean Solids.



A geometric solid bounded by planes is called a polyhedron. If the polyhedron has congruent regular polygons as faces, and the same number of faces meet at each vertex in exactly the same way, then it is a regular polyhedron. There are only 5 such regular convex polyhedra. Plato knew that the number of convex regular polyhedra was limited to 5, and we therefore refer to them as the Platonic solids. The following table summarizes information about the Platonic solids.

Name of Solid	**Polygons Used for Faces**	**# of Vertices**	**# of Edges**	**# of Faces**
Tetrahedron	equilateral triangles	4	6	4
Cube (Hexahedron)	squares	8	12	6
Octahedron	equilateral triangles	6	12	8
Dodecahedron	regular pentagons	20	30	12
Icosahedron	equilateral triangles	12	30	20

Although there are only five Platonic solids, there are many other polyhedra which have faces that are regular polygons, but not all are congruent. These semiregular polyhedra are called Archimedean solids, and there are 13 of them.

As part of your third quarter project, you are asked to construct a model(s) of a polyhedron. The choice is yours, but limited to the following guidelines. . .

1. Choose one of the following to make:

   a) The five Platonic Solids (worth 3 points for difficulty)

   b) Two out of the nine polyhedra from the truncated group or cubocta group and the first one in the icosidodeca group. (worth 4 points for difficulty)

   c) One out of the last three from the icosidodeca group. (worth 5 points for difficulty)

2. Use any materials that you want. Keep in mind that the sturdier the material the better. It is strongly recommended that you DO NOT use construction paper. Construction Techniques and Tips are included at the end of this packet.

3. A grade out of 30 points will be based on the following 6 categories:

a) Difficulty
b) Following Directions
c) Creativity
d) Aesthetics
e) Sturdiness
f) Accuracy

The project is due on Friday, March 13, 2009. Make sure that your name is on your polyhedra.

Some suggestions/hints/hurdles to consider for your project:

- Cereal and cracker boxes are sturdy, cheap materials.
- This project will take some time, don't leave it until the day before it's due.
- When you construct your polyhedron, the solid will begin to take shape, rising out of the plane.
- Remember to give yourself enough time.
- Euler's characteristic will help you.
- Don't forget to give yourself enough time.
- Enjoy the project.

Euler's Characteristic

$$F + V = E + 2$$

or

$$F + V - E = 2$$

Project Grading Sheet **Name** _____

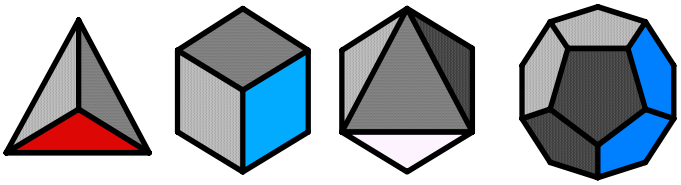
Grade _____

There are three parts to the 3rd Quarter Project.

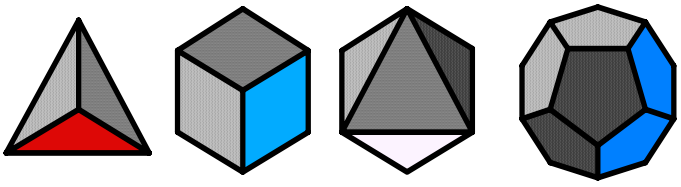
1. Polyhedra Construction. **(30 points)**

2. Description (1 or 2 paragraphs) of your experience in constructing your polyhedra. Include what materials you used and the reason why you chose them, how much time you worked on the project, and the reason for choosing a particular polyhedron and design. **(5 points)**

3. A short one page paper on either Platonic solids or Archimedean solids. Include a bibliography. **(5 points)**



1.	Difficulty	1	2	3	4	5
2.	Following Directions	1	2	3	4	5
3.	Creativity	1	2	3	4	5
4.	Aesthetics	1	2	3	4	5
5.	Sturdiness	1	2	3	4	5
6.	Accuracy	1	2	3	4	5



1.	Description of Project	1	2	3	4	5
2.	Platonic or Archimedean Solids Paper	1	2	3	4	5