Zome System

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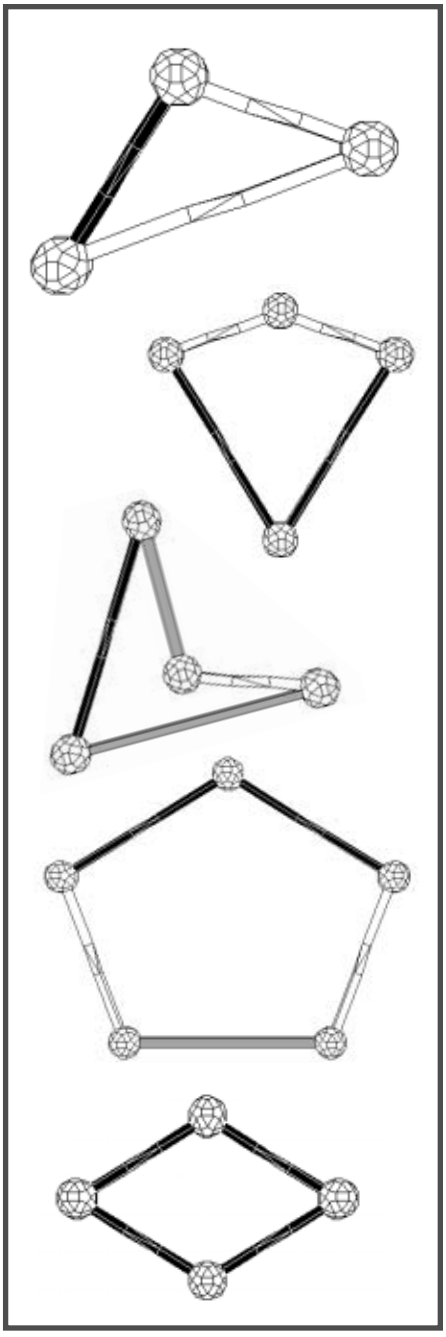
Naming 2-D and 3-D Shapes

Mathematics
Intermediate Concept



Lesson Objective:
Students will determine the definitions of polygons and polyhedra, and identify several specific features of those shapes and solids. They will learn the Greek nomenclature for 2-D and 3-D shapes.

Prerequisite Skills:
Knowledge of basic polygons.

Time Needed:
One or two class periods of 45-60 minutes.

Materials Needed:
• One or two Zome System Creator Kits for 25-30 students

Procedure:
Divide the class into teams of 2-3 students, and distribute the Zome System elements evenly. Tell the students that they will investigate how to name 2-D and 3-D shapes. *Can anyone define a polygon? How many sides does a polygon have? Can they have curved sides? Can the lines cross? How many dimensions does a polygon have?* Ask the students to create a definition of a polygon in their math journals. For example; a polygon is a closed chain of points connected by straight lines in one plane. None of the lines may cross. The word comes from a Greek word which means "many angled." A polygon is said to be convex if none of its vertices dent inward.

Have the students build some random polygons. *Do the polygons have to be flat?* Allow the teams to discuss what they have made and settle on a system of sorting the polygons into groups. *What is a good way to classify the shapes? By number of sides? By color? Do we put convex and concave polygons in separate groups?*

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Now, have the teams build polygons from only blue struts. The polygons must have all equal sides and all equal angles. *What is the name of these special polygons? How many sides do they have?* These kinds of polygons are said to be regular polygons. Challenge the teams to build 3, 4, 5, 6, and 10-sided regular polygons.

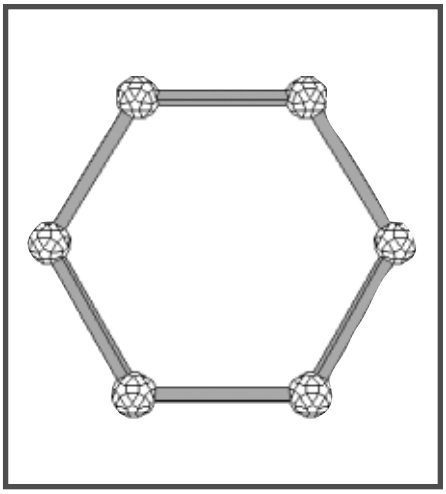
Who can name any of these shapes? What do the names tell us (how many angles the have)*? Does anyone know where these names come from* (derived from Greek words)*? Why would we use Greek, of all languages? Why not English?*

Allow the class to decide how they want to organize the Greek prefixes and numbers they represent. Encourage the students to make a connection between each Greek prefix and corresponding numbers. As each figure which the students built is named, have the students write the prefix and corresponding number into their math journal. Fill in the remaining numbers and prefixes as shown.

Using this list, the students should be able to name the polygons they built. Usually by convention, however, the higher number polygons can be named numerically. For example, a 37-sided polygon can be called a 37-gon.

Exceptions should be pointed out. For example, under the system just described, a 3-sided polygon should be called a triagon, instead of a triangle. However, in Greek, "gon" means angle, so it is still close to the same naming system. Also, a regular 4-sided polygon is called a square. Other 4-sided figures are called quadrilaterals, which is from the Latin for "four sides." *What is the real name for a square* (regular tetragon)*? For quadrilaterals* (tetragon)*?* Ask each group to present a few of their polygons to the class and explain how and who they gave it a certain name.

Once the class is comfortable naming polygons they should be challenged to apply the Greek naming system to 3-D shapes also. *We know that 2-D shapes are called polygons, but what are 3-D shapes called* (polyhedra)*?* A single 3-D shape is a polyhedron. A polyhedron is named by how many polygon sides or faces is has. For instance a four-faced polyhedron is called a tetrahedron. *What is the name of a polyhedron with 8 faces? With 12? What is the correct name of the shape we normally call a cube* (hexahedron)*?*



3	tria
4	tetra
5	penta
6	hexa
7	septa
8	octa
9	nona
10	deca
12	dodeca
20	icosa
30	triaconta

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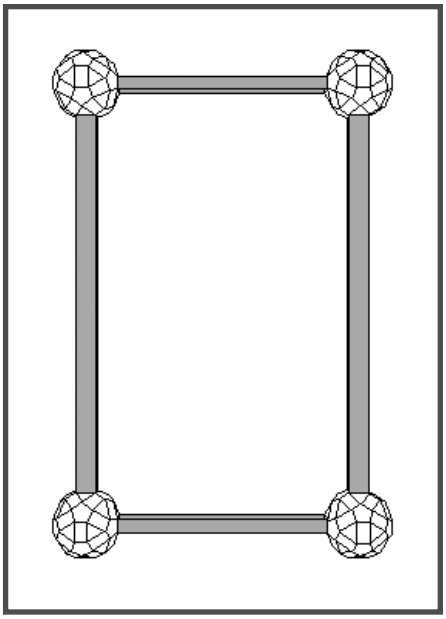
Depending on how much time you have available, allow the teams to build one or several polyhedra and apply the naming rules they have learned to them.

In general, what is the rule for naming 2-D and 3-D shapes? The students should create and write their own definitions in their math journal.

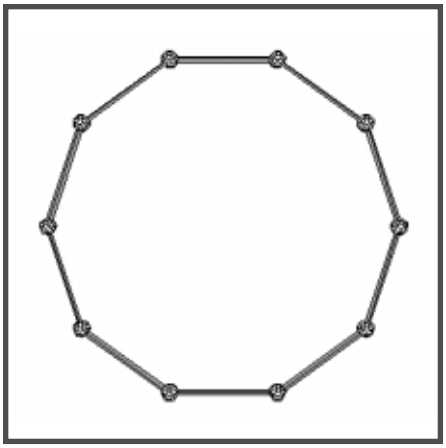
Conclude the class with a discussion on the advantages of conventions in naming geometric shapes. *Why is it useful for us to use the Greek names? Are there other subjects where we use terminology based on a foreign language? What is the purpose of standardization in general?*



Assessment:

Evaluate the polygons and polyhedra the students build and present. Study definitions and comments in math journals.

To meet the standard students must be able to build and name basic polygons and polyhedra. To exceed the standard they must verbalize a general rule for naming polygons and polyhedra.



Standards Addressed:

* Mathematics standards addressing mathematics as a means of communications (NCTM Standard 2).
* Mathematics standards addressing the study of the geometry of one, two, and three dimensions in a variety of situations (NCTM Standard 12).

Transfer Possibilities:

Study of 3-dimensional polyhedra ("Plato's Solids - I," "Plato's Solids - II," "Euler's Formula for Polyhedra," and "Archimedes' Solids"). Discussions of the role of standardized language in math, science, and liberal arts.