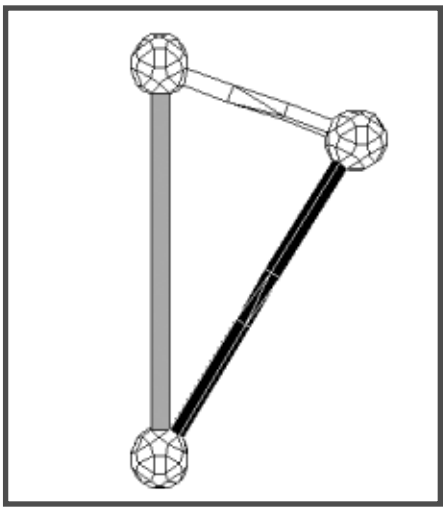
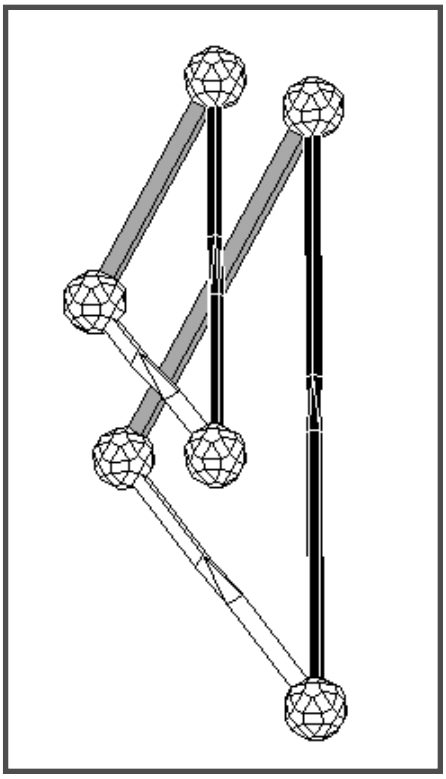
Mathematics
Basic Concept





Lesson Objective:
Students will explore similar triangles using hands-on experience of the side-side-side law. They will learn the concept of congruency.

Prerequisite Skills:
Familiarity with Zome System and the concept of triangles ("Geometric Shapes").

Time Needed:
One class period of 45-60 minutes.

Materials Needed:
- One Zome System Creator Kit for class of 25-30 students
- A yardstick

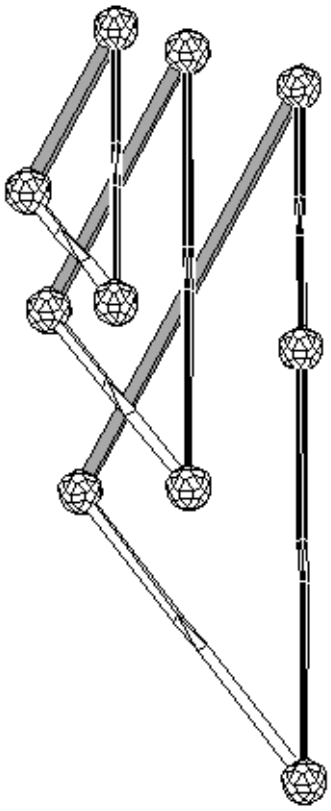
Procedure:
Decide in advance on a unique triangle which can be built with Zome System, and write down the components on the board. For example:
- One long blue strut
- One long red strut
- One medium yellow strut
- Three nodes

Distribute the Zome System pieces evenly to the students. Explain that they are to build as many different geometric shapes they can using only the pieces in the "recipe." The shapes must be closed so that every strut end is connected to another strut. *How many different shapes can we make with these 3 struts and 3 nodes?* Some students will be able to tell that only one specific triangle can be made. However, most will have to experiment to determine this. As your students build, walk around the class and collect

all the triangles on a yardstick. Make sure to always hang them from the same vertex (the most acute angle works best.) The triangles hanging on the yardstick provides a very strong visual cue that the shapes are the same.

How many different shapes have the class made? Why did everyone build the same triangle?

Now repeat the exercise with a different "shape recipe" using a medium blue strut, a medium red strut, a short yellow strut, and three nodes. Long before you've picked up the last triangle, it will be obvious to the class that the triangles are "all the same, but two different sizes."



Place the two sizes on the overhead projector and lead the class in a discussion of what happened: *Why are they all the same, but two different sizes? Why couldn't anyone make a different triangle? What is the relationship between the struts in the little triangle and the struts in the big one? What if we had used 2 short yellow and one short blue strut? How can we be sure that two shapes are exactly the same?* Explain that two shapes that exactly overlap with each other are congruent.

Students should write down their observations in their math journals. The should also try to write a rule about triangles with similar sides. Any remaining time can be used to test the rule using different Zome System components and making further discoveries. Older, or more advanced students, can try the exercise in 3 dimensions. Instead of triangles, they can build similar tetrahedra using 4 nodes and 6 struts each. *Does the rule hold in 3 dimensions as well?*

Assessment:

Take note of student ideas during discussions, and review individual work in math journals. To meet the standard students must determine that it is only possible to build congruent triangles when the edge lengths are set.

Standards Addressed:

* Mathematics standards addressing geometry and spatial sense (NCTM Standard 9).
* Mathematics standards addressing measurement (NCTM Standard 10).

Transfer Possibilities:

Additional work on angles ("Attention!...Angles") and deeper explorations of triangles and their mathematical and architectural uses ("Try the Triangles," "Triangle Tiles - I," "Triangle Tiles - II," "3-D Triangles," "3-D Triangle Tiles," "Tallest Tower in the World," and "Bridge Building Unit").