Going in Circles:

Math Teachers' Circles

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What is a Math Teachers' Circle?

A Math Teachers' Circle is a network of mathematicians and middle school mathematics teachers who meet regularly to solve problems in a collaborative environment. Our purpose is to enhance the problem solving skills and the enjoyment of math in middle schools throughout metro Atlanta.

History of Math Circles

- Started in Eastern Europe and Russia in 1920's and 30's
- Came to America in 1990's with the Kaplans and the Berkeley Math Circle
- Student Circles – National Association of Math Circles www.mathcircles.org
- American Institute of Mathematics (AIM) started Math Teachers' Circles for middle school math teachers in 2006

Metro Atlanta Math Teachers' Circle

Math Teachers' Circle Network:
http://www.mathteacherscircle.org/
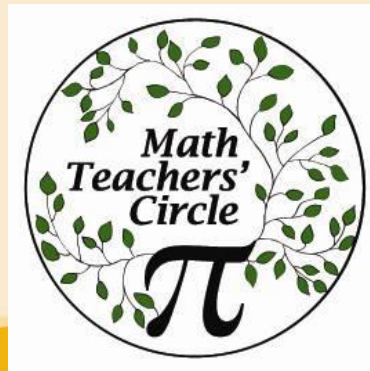
Zometools

Zome is seductive, and it's easy for kids (and adults) to ignore the math and just to try to "build stuff".

 -- Tom Davis
http://www.geometer.org/mathcircles

Getting to Know Zometools

- Look carefully at the balls and the yellow, blue, and red struts. What do you notice?

- What shapes are the holes on the balls?

- How many of each shape?

- What do you notice about the struts?

- How would you describe the arrangement of the holes?

Getting to Know Zometools

- Blue struts - rectangular holes
- Yellow struts – triangular holes
- Red struts – pentagonal holes
- Three lengths for each color strut.
- Every pentagonal hole is surrounded by 5 rectangular holes and 5 triangular holes.
- There are 12 pentagonal holes, 30 rectangular holes and 20 triangular holes.
- Three different lengths for each of the struts.
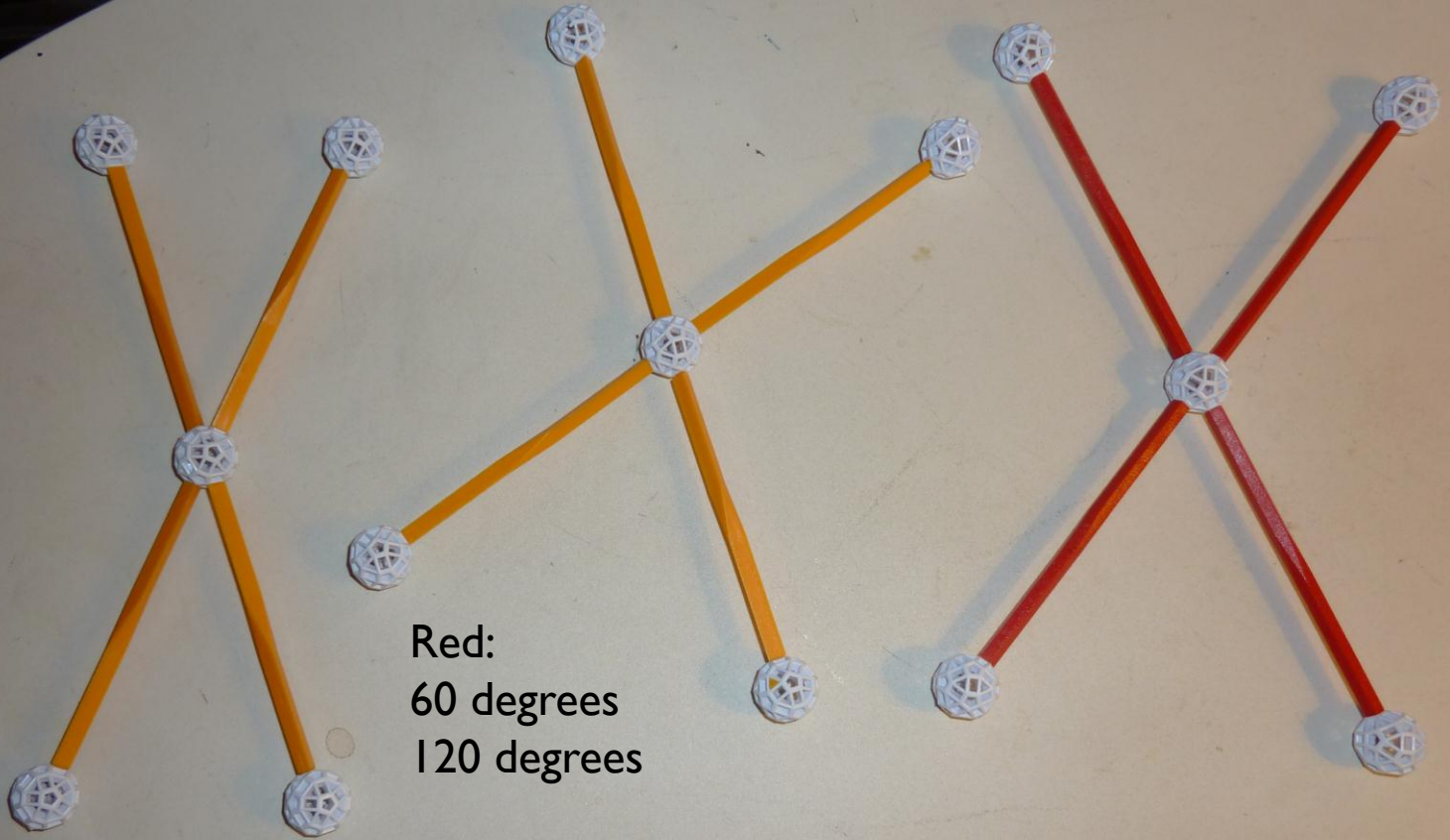- Other observations? The ball is a rhombicosidodecahedron.

First Investigation - Angles

Which types of angles are possible with each colored strut?
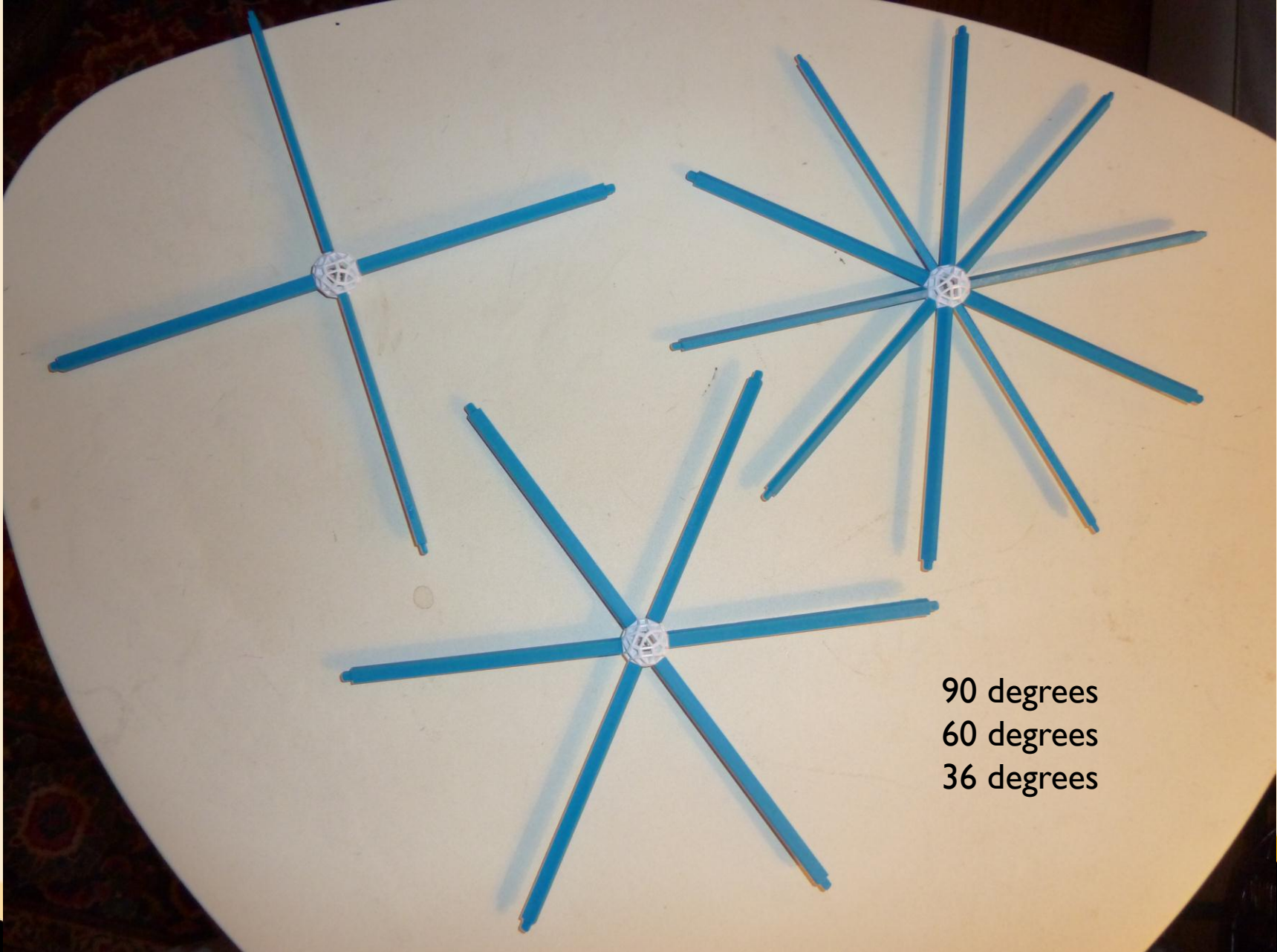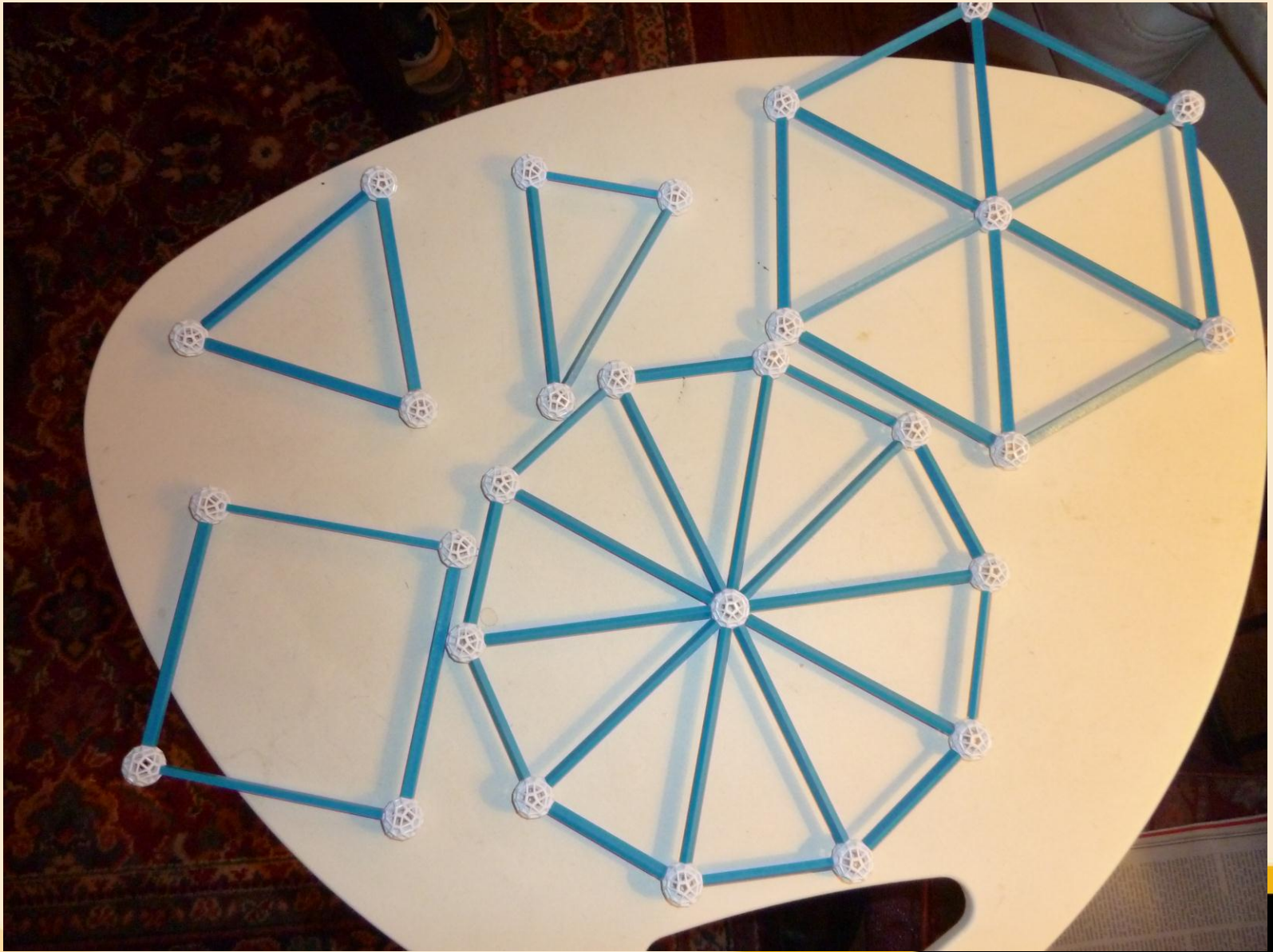
90 degrees
60 degrees
36 degrees

Red:
60 degrees
120 degrees

Yellow:
36 degrees
144 degrees
72 degrees
108 degrees

First Investigation - Angles

What types of plane figures can be made using the same color struts? (First make a prediction based on the angles we found in the previous exercise then try to build the plane figures.)

Second Investigation – Building

- Make a tetrahedron and a cube. Can you make a regular tetrahedron?

- Put a red strut in every "red hole" in the ball. Put a ball on the other end of the red struts and then connect each pair of balls that are closest together with a strut. Do this for the yellow struts in the "yellow holes".

Third Investigation - Analyzing

- We could ask: What is the surface area of each of the four polyhedrons you have created?

- We could ask: What is the volume of each of the four polyhedrons you have created?

Third Investigation - Analyzing

Fill in the table below for each of the four polyhedra:

Polyhedron	Balls (vertices)	Struts (edges)	Faces

What patterns do you notice?

Common Core Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.

- Reason abstractly and quantitatively.

- Construct viable arguments and critique the reasoning of others.

- Model with mathematics.

- Use appropriate tools strategically.

- Attend to precision.

- Look for and make use of structure.

Common Core - Geometry

- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical

- Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would befound by multiplying the edge lengths of the prism.

- Draw geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

- Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

- Use informal arguments to establish facts about the angle sum and exterior angle of triangles …

- Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Questions or Comments?

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Resources for Zometools:

http://zometool.com/

http://www.sbu.edu/artsandsciences.aspx?id=37514#Introduction

http://www.georgehart.com/zomebook/zomebook.html

World's largest zometool construction:

http://www.flickr.com/photos/zometool/sets/72157621780116435/with/3775502786/

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