SEOMTC
Athens, OH
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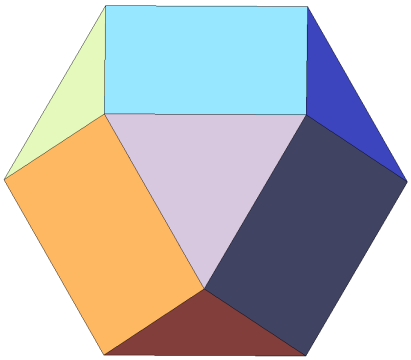
based on an activity originally from:
Julia Robinson Mathematics Festival

ITSPHUN

(Interlocking Triangles, Squares, Pentagons, and Hexagons Using Notches purchased at itsphun.com)



The picture to the right shows a cuboctahedron (thanks to Wikimedia foundation). It has vertices (corners), edges, and faces. (The word "side" is vague in 3D shapes but makes sense in 2D. A cube has "edges" but is made of squares that have "sides.")

Every vertex (corner) looks the same: as you go around it, you see a triangle, a square, a triangle, and a square. By counting the number of sides of each of these (2D) shapes that meet at any corner, we can call it a (3,4,3,4) polyhedron. Or we can say "The recipe for a *cuboctahedron* is (3,4,3,4)."

1. Make a model of a cuboctahedron using the ITSPHUN pieces.

2. How many triangles are needed to make a cuboctahedron?

3. How many squares are needed to make a cuboctahedron?

4. By building the shapes, fill in the chart on the next page. Warning: some of those recipes are impossible!

5. Which recipes are impossible? How can you tell? Is there a way to predict, just by looking at the recipe, whether it's going to work?

6. Think up some more recipes of your own and try them out!

7. Is there a way to predict how many triangles, squares, and pentagons you'll need, just by looking at the recipe and doing some calculations, without actually building the shape?

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Recipe	Triangles	Squares	Pentagons	Hexagons	Name
(3,4,3,4)					cuboctahedron
(4,4,4)					
(3,3,3)					
(5,5,5)					
(3,3,3,3)					
(3,5,3,5)					
(4,5,4,5)					
(3,3,3,3,3)					
(3,4,5)					
(3,4,3,5)					
(3,3,5)					
(3,3,3,5)					
(3,6,6)					
(4,6,6)					
(5,6,6)					
(6,6,6)					