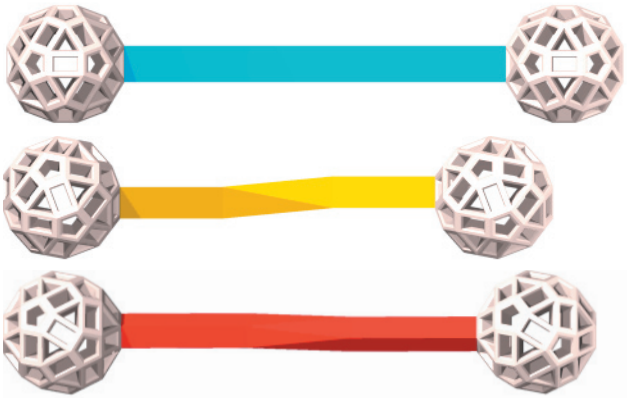
ZOME CHALLENGE

BUILD GENIUS

Why are they twisted?

Examine and compare the blue, yellow and red struts. Notice that the blue struts are straight while the yellow and red struts have a twist in the middle of them. Why?



For Smarty Pants

In the pictures above, which shape holes are parallel with the plane of the card? Why?

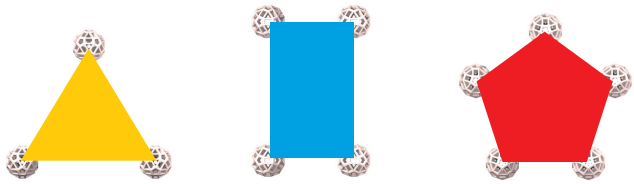
Shape and Number - 1

ZOME CHALLENGE

BUILD GENIUS

Build the shapes of the struts

Notice that the 3 different color struts come in 3 different (cross-sectional) shapes. Can you build all three 2-dimensional shapes using Zome components?



For Smarty Pants

Can you build the 3-dimensional shape of the Zome ball using Zome components?

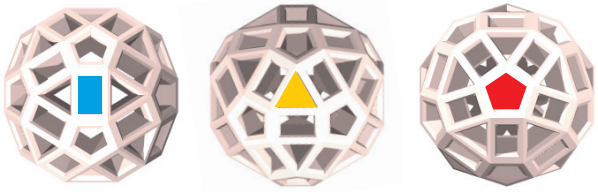
Shape and Number - 2

ZOME CHALLENGE

BUILD GENIUS

How many holes?

How many "red holes" are there in the ball? How many "yellow holes?" How many "blue holes" are there? How many holes are there in the ball in total? What is the "best" strategy to count them?



For Smarty Pants -- Is there a relationship between the number of red holes and the shape of the red strut? the number of yellow holes and the shape of the yellow strut? the number of blue holes and the shape of the blue strut? If the green strut represents the number "1", how many green lines do you predict should be in Zome system?

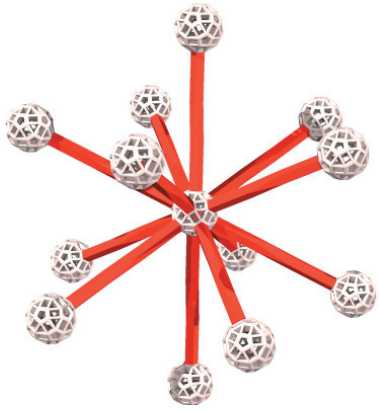
Shape and Number - 3

ZOME CHALLENGE

BUILD GENIUS

Pincushions

Put a red strut in every "red hole" in the ball. Put a ball on the end of every red strut and connect each pair of balls closest together with a strut. Try this with yellow struts in every "yellow hole" and then with blue struts in every "blue hole." What do you notice about the 3-dimensional shapes you get?



For Smarty Pants -- What shapes do you get with various combinations of struts in the ball (i.e. red-yellow, red-blue, yellow-blue) or with all 3 strut colors in the ball?

Shape and Number - 4

ZOME CHALLENGE

BUILD GENIUS

Flat Pincushions

How many different types of flat "pincushions" can you build? Fill all of the holes around one of the ball's equators with struts. Insert a strut that is perpendicular to the plane of each of the flat pincushions. Is there a relationship?

For Smarty Pants -- Each pincushion defines a plane. How many of each type of plane intersects one ball in Zome space?

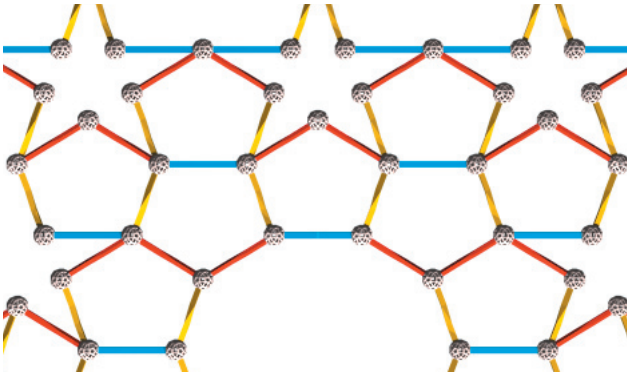
Symmetry & Tilings - 1

ZOME CHALLENGE

BUILD GENIUS

2D Crystals

Choose a flat pincushion and use some or all of its struts as a "seed" for a 2-dimensional crystal. It should be made of one or two shapes in a pattern that repeats. How would you classify the different tilings that are possible?



For Smarty Pants -- Can you build a 2D crystal from more than two shapes? Can you build a pattern that never repeats?

Symmetry & Tilings - 2

ZOME CHALLENGE

BUILD GENIUS

3D Crystrals

Turn a 2D crystal pattern (tiling) into a 3D crystal. (Or build a new 3D tiling!) Imagine your 2D crystal pattern is a map of a city. Can you build the houses and buildings?

For Smarty Pants -- Zome planet! Can you work with all the people building cities, and fit them together to form a planet?

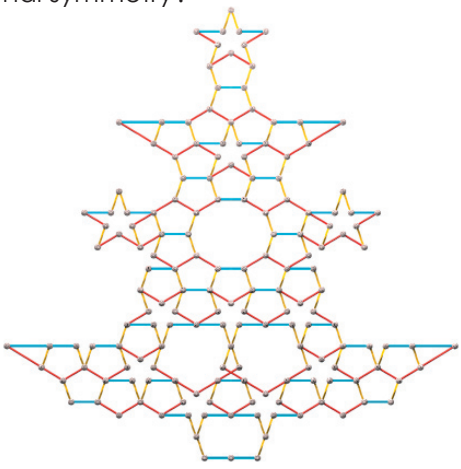
Symmetry & Tilings - 3

ZOME CHALLENGE

BUILD GENIUS

Reflection, but no rotation

Can you build a "2-dimensional" model which has reflection symmetry but no rotational symmetry? Try to build the most intricate and beautiful model you can! How many things can you name which have reflection symmetry but no rotational symmetry?



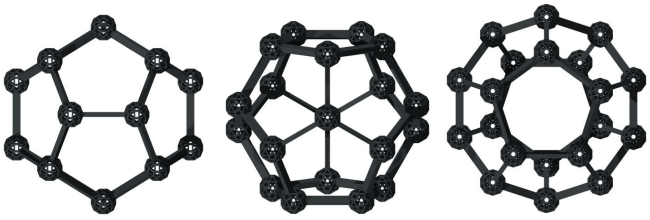
Symmetry & Tilings- 4

ZOME CHALLENGE

BUILD GENIUS

The Shadow Knows

Choose a picushion model (see Shape and Number - 4), remove the interior struts, and insert a long red, yellow or blue strut in one of its nodes. Now, cast a shadow with the model so that the long strut "disappears," i.e., is parallel with the light rays (use an overhead projector or sunlight). Try this with several models and different color struts. Is there a relationship between the shape of the strut and the shadow?



For Smarty Pants -- Can you build a "flat" model of one of the shadows using Zome parts? Why, or why not?

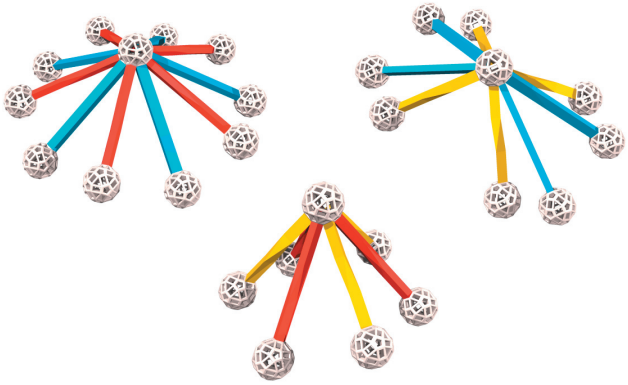
Shape and Number - 5

ZOME CHALLENGE

BUILD GENIUS

A Volcano?

Build a "cone" like one shown below (or one of your own design.) Turn each "V" in the cone into a diamond (rhombus or parallelagram.) Add diamonds to grow the cone until you run out of parts, or? What do you think will happen?



For Smarty Pants -- Can you build a similar model based on a cone with 7 struts? 11 struts?

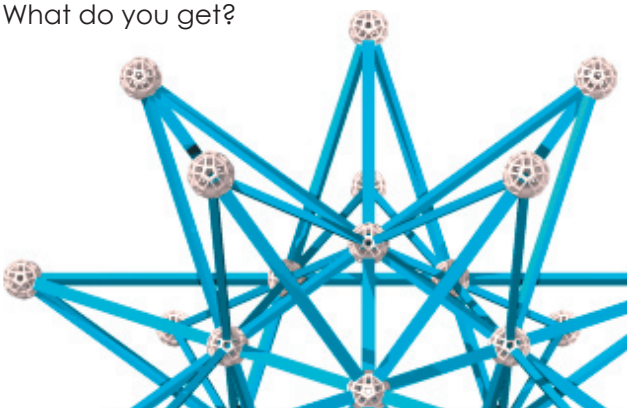
Shape and Number - 6

ZOME CHALLENGE

BUILD GENIUS

Growing Stars

Choose a pincushion model (Shape and Number - 4 & 5). Extend each edge until they cross and put a ball at the crossing point. Now connect each new ball with its closest neighbor(s). What do you get?



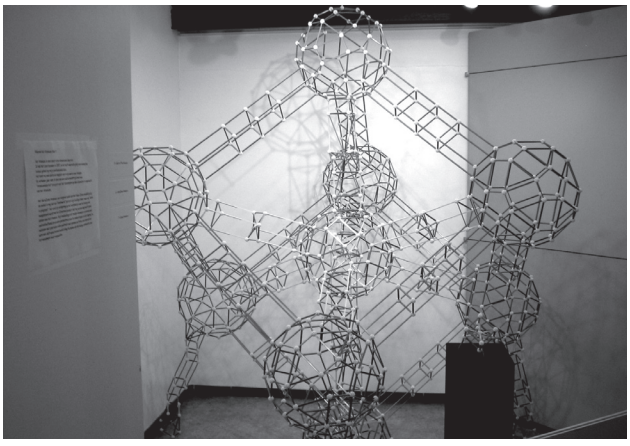
For Smarty Pants -- Now repeat the same process with your new, larger shape. What do you get? Can you continue the process?

Shape and Number - 7

ZOME CHALLENGE

BUILD GENIUS

"I never metazome I didn't like..."



For Smarty Pants

To those who built the giant Zome node (Shape and Number - 2) -- you might ask, "Could I build a giant model using the giant balls?"

Well, stop wondering and start building!

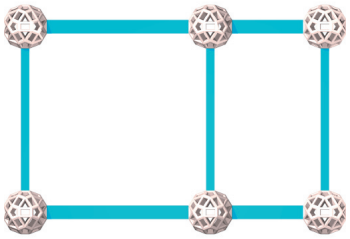
Shape and Number - 8

ZOME CHALLENGE

BUILD GENIUS

Special Rectangles

Build a small rectangle with the same shape as the cross-section of a blue strut (see Shape & Number - 2.) What happens when you build a square onto the longer edge of the rectangle? Can you keep building larger squares in a spiral around the 1st rectangle? What can you tell about the lengths of the short, medium and long struts you used?



For Smarty Pants -- Connect the dots! Place the finished rectangle on piece of paper and draw a spiral connecting opposite corners of the squares, out from the small rectangle. Is there anything special about the spiral?

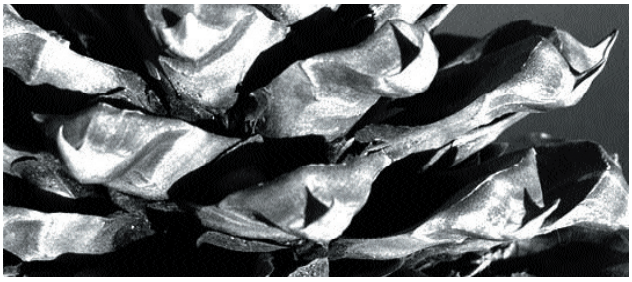
Fibonnacci and Tau -1

ZOME CHALLENGE

BUILD GENIUS

Counting Spirals

Choose 5 plant samples from those provided. Count the number of spirals in the clockwise direction and compare them with the number of spirals in the counterclockwise direction. Mark the starting spiral with a push pin or marker so you don't count any spiral more than once. Tabulate your results. What's the pattern?



For Smarty Pants -- Calculate the ratios of consecutive numbers in the sequence and graph your results, from the lowest pair of numbers to the highest pair. What's the trend?

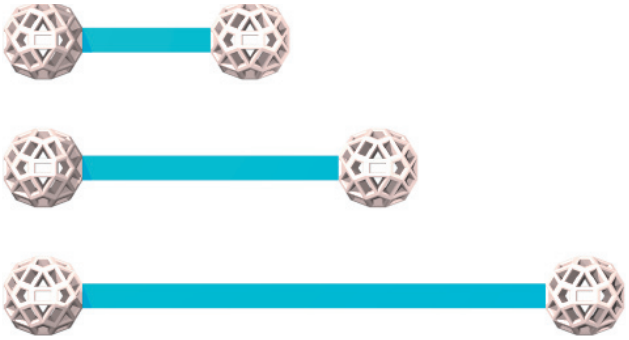
Fibonnacci and Tau -2

ZOME CHALLENGE

BUILD GENIUS

Super Struts

Examine short, medium and long blue struts. Is there any relationship between their lengths? Assuming there is, can you build a longer blue strut (by joining two or more together) that is in the same proportion? Does the series continue?



For Smarty Pants -- Are there shorter struts? If so, can you build models showing the exact lengths of some of them?

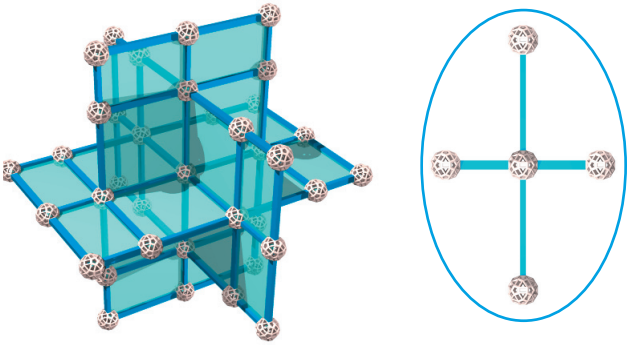
Fibonnacci and Tau -3

ZOME CHALLENGE

BUILD GENIUS

Frame Game

Build a framework of 3 mutually perpendicular Golden Rectangles (below) using blue struts. Connect the corners of the rectangles with lines (struts.) What shape do you get?



For Smarty Pants -- Now turn each edge of your new shape into a "cross" (inset, above.) What shape do you get? Is there a relationship between the two shapes? Do they suggest another shape?

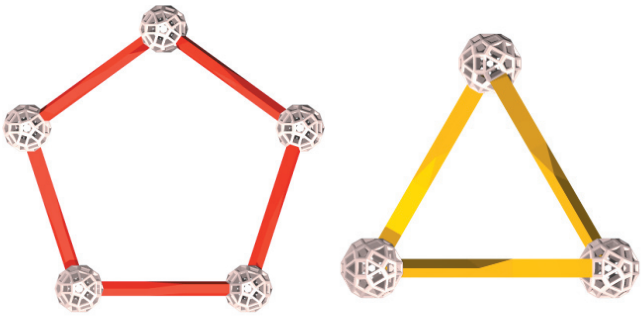
Fibonnacci and Tau -4

ZOME CHALLENGE

BUILD GENIUS

Impossible Shapes

In Shape and Number - 2, you discovered that you can't make a pentagon out of the red struts, or a triangle out of the yellow struts... ***or can you?*** Examine the perfectly "legal" Zome models below. Can you reproduce them?



Hint:

For Smarty Pants -- Can you build a rectangle out of just yellows? Reds? Greens?

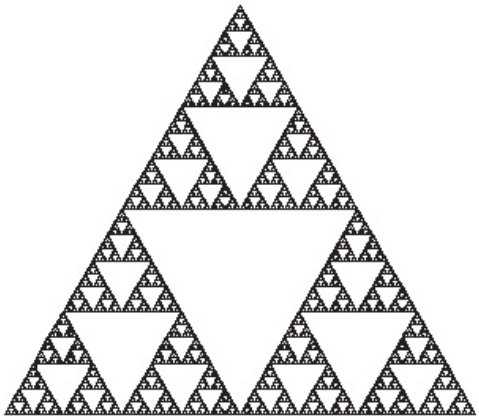
Shadows and Projections -1

ZOME CHALLENGE

BUILD GENIUS

Sierpinski Tetrahedron

Check out the illustration of a Sierpinski triangle, below. Can you build a Sierpinski tetrahedron? (It doesn't have to be regular. If you don't have green lines, try another tetrahedron!)



For Smarty Pants -- Can you build a Sierpinski cube? Octahedron? Other polyhedra?

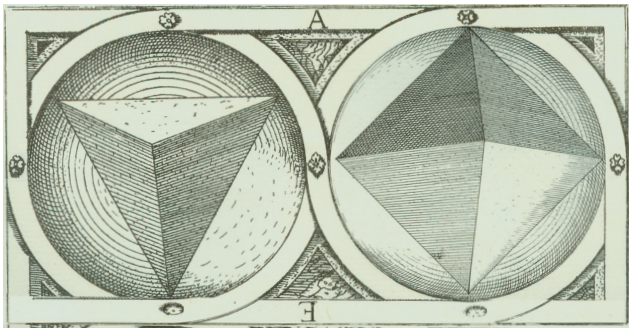
Green Lines - 2

ZOME CHALLENGE

BUILD GENIUS

Oct-Tet Trance

Can you build a regular tetrahedron and a regular octahedron? "Regular" means all the faces have the same shape, all the edges are the same length, and all the angles between the edges are the same. Hint #1: tetrahedron means "4-faces" and octahedron means "8-faces." Hint #3: use green lines.



For Smarty Pants -- Can you expand your model to have an edge length of 2, 3, or 4 green lines? What shapes fill the spaces?

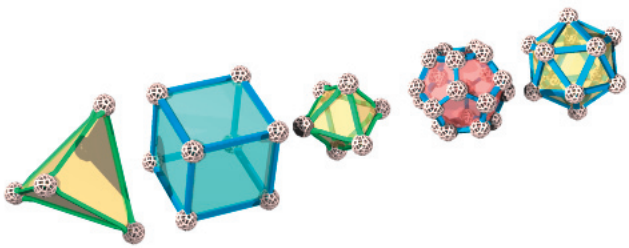
Green Lines - 1

ZOME CHALLENGE

BUILD GENIUS

Kepler's Obsession

There are only 5 regular polyhedra in our 3-dimensional space: the tetrahedron, cube, octahedron, dodecahedron and icosahedron(see Shape and Number - 4 and Green Lines -1 for hints on building them!) All of them are interrelated; can you build a model showing how?



For Smarty Pants -- Estimate how many different ways you could model the relationships between the 5 regular polyhedra with Zome.

Green Lines - 3