Introducing the Pentagon

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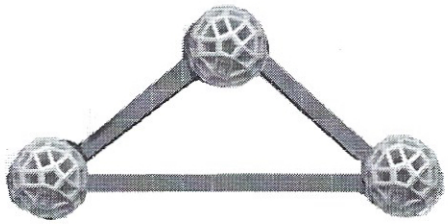
Contact: **Zometool**

The Pentagon

There are two luxurious paths into geometry, mathematical and artistic. Some people have even chosen an artistic path of "sacred geometry."

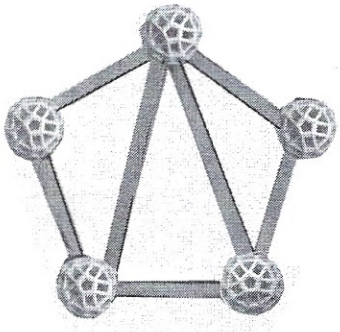
While observing ancient Greek sculpture, they found ideal relations of the human body. In this pamphlet the pentagons will be flat. There are two basic triangles that fit each other. Call them *arms"* and *roofs*.

arm



roof

Triangles can be conveniently built with the *Zometool*. The *arm* triangles have an acute angle of 36°. The *roof* triangle has two 36°angles. This allows two triangles to fit together, with no gaps.



This *regular* pentagon has five edges of equal length. There are also two long, interior struts. The struts make triangles (arms and roofs). Connections can be made with the *Zometool*

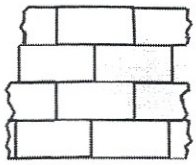
This will be the first

First Pentagon Assembly

This assembly can be taken apart into two roofs and one arm.

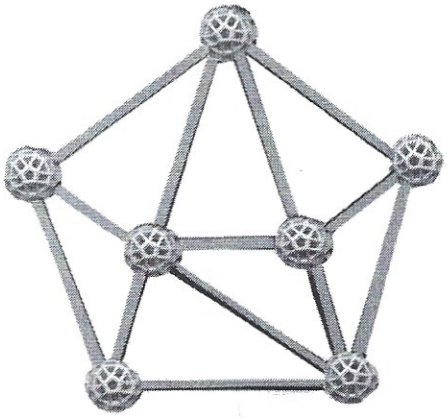
Below is picture of a pentagon with black and white tilings. The edges fit together at their corners. Geometers call this "edge-to-edge"

Ordinary bricks are ***not*** edge-to-edge. The bricks have been shifted.



In geometry edge-to-edge contact requires alignment in which corners lie only on other corners. The black-white pentagon above is tiling is edge-to-edge.

Second Pentagon Assembly.



The next larger pentagon has long struts on all the outside edges.

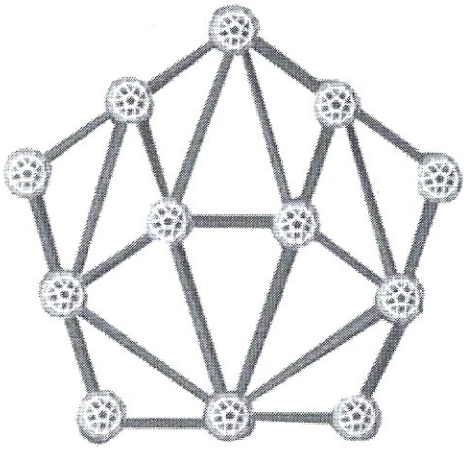
The interior has both short and long struts, 8 long struts and 3 short struts.

If you were to assemble this Zome structure, and then turn it over you would see that it shows what is seen in a mirror.

A black and white tiling, edge-to-edge, is shown below.

Third Pentagon Assembly.

The Third **Pentagon Assembly** has two connected struts in line, on the boundary. They are short struts on the outside edges.

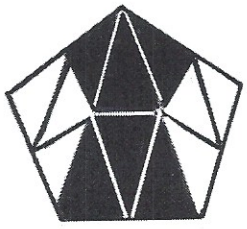


Each edge has two line connections, so there are 10 struts on the outside boundary.

There are also 5 short struts in the interior, and 5 interior long struts.

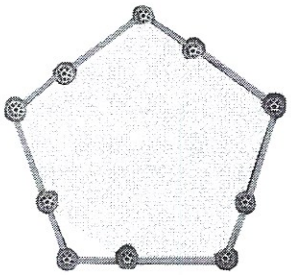
This pentagonal construction has a symmetric mirror image with a central, vertical line. If a Zome assembly were turned over (back to front) it is exactly like the original.

There are 6 roof triangles and 6 arms triangles. The black and white version resembles an insignia.

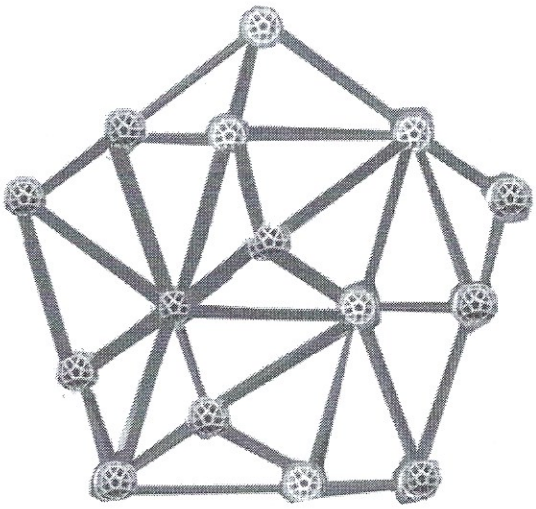


Fourth Pentagon Assembly.

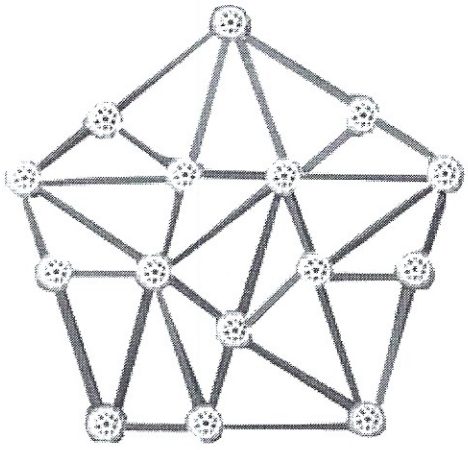
The fourth assembly has edges that are attached to a short strut and a long strut. In the previous assemblies, "edges" refer to straight boundary lines. Start at the top, and go around counter clockwise.



The edges are governed by a short strut then a long strut, short then long, short then long again, etc. Continue five times and finish the cycle.



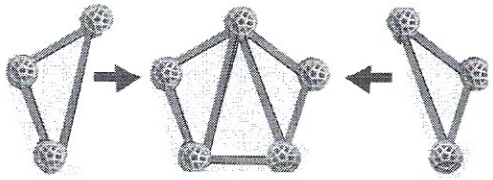
At the right the lattice is guided by these circular nodes. But there are other methods. We can begin with a single node on top, like a Christmas tree.



The star, held by the border, could make a Chtistmas ornament. From the treetop, the edges act like a mirror. They go downwards, passing away from the treetop.

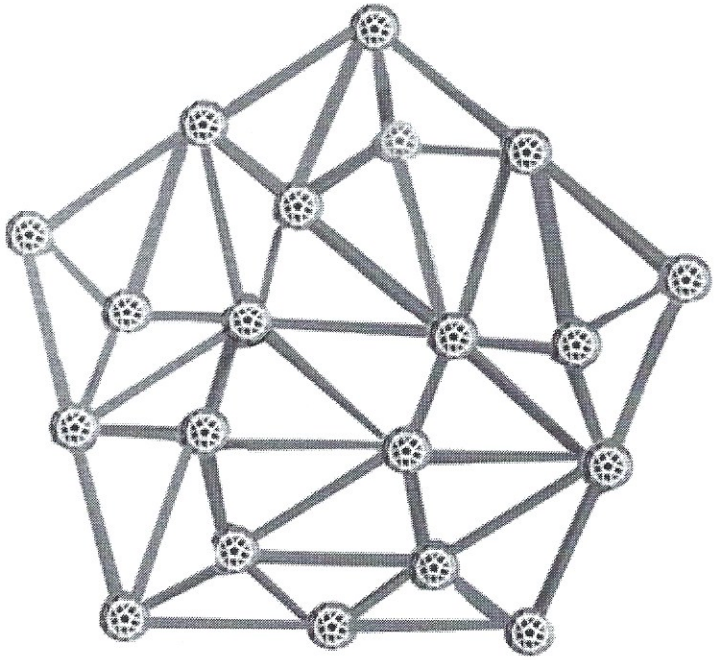
From the beginning , small *arm* and *roof* triangles can assemble features of both rotation and mirroring. But as the assembly grows larger, chaos increases.

Returning to the First Assembly, the completed diagram contained a regular five-pointed star, or *pentagram*. It has the simplest structure of the original form.

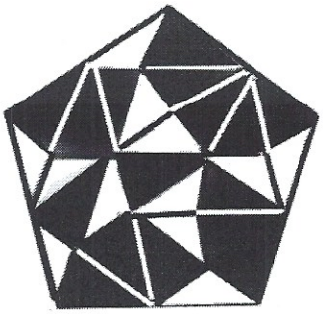


The Fourth Pentagon Assembly resembles the First Assembly.

Fifth Pentagon Assembly.

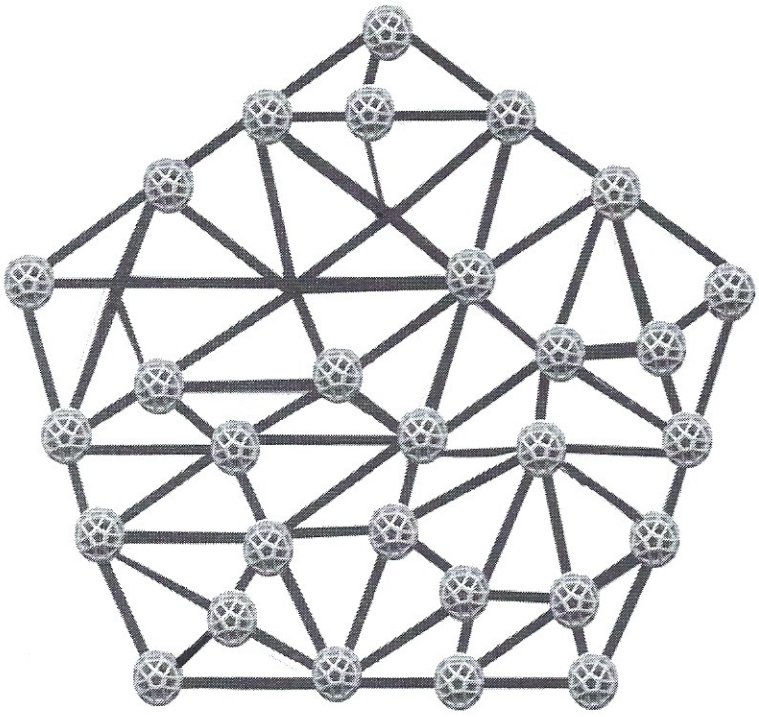


All of the outside struts are long; they give ample room for the inside struts.



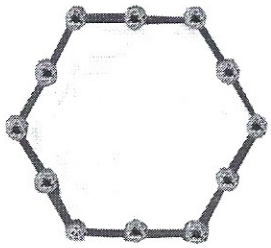
Sixth Pentagon Assembly.

This Sixth Assembly diagram has three short struts to an edge. There are variations that have some long struts, as well as short ones.



Complexity takes over.

Working Advice



The *Zome Tool* can make a pentagon or a *hexagon*.
Hexagons do not lie on the same planes as pentagons.