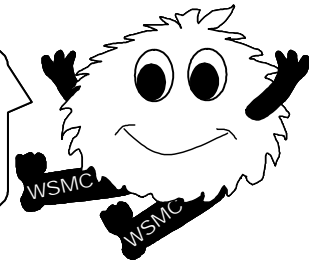


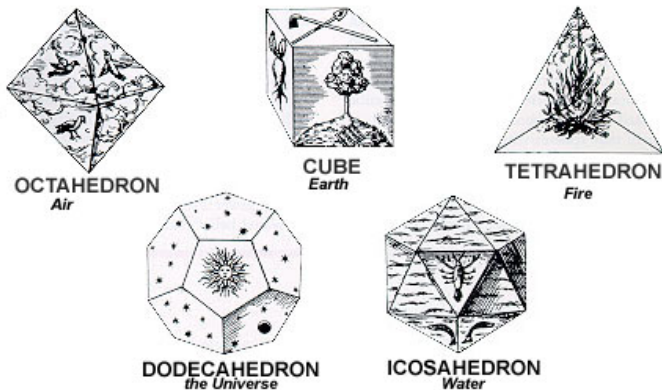
Math History

Got an idea for **Math History**?
 Jot it down and send to Donna Buck,
 PO Box 170, Joyce, WA 98343
 (electronic information can be sent to
 donna_buck@pasd.wednet.edu).



Plato's Five Perfect Solids

A polyhedron is said to be regular if its faces are congruent regular polygons and if its polyhedral angles are all congruent.



There is the tetrahedron with four triangular faces, the hexahedron, or cube, with six square faces, the octahedron with eight triangular faces, the dodecahedron with twelve pentagonal faces, and the icosahedron with twenty triangular faces. Plato mystically associates fire, earth, air, universe, and water to each regular solid.

Plato was a Greek philosopher who lived from 427 BC to 347 BC. He was keenly interested in solid geometry and its place in the workings of our universe. To Plato, symmetry was a fundamental property of the universe, and geometry was a tool to know symmetry. Plato is noted for his observations of the set of five regular solids that bear his name. They are polyhedra with sym-



metrical faces, edges and vertices – perfect solids. He spoke of an atomic universe comprised of four elements: fire, air, earth and water. Four of his solids formed these elements, and the fifth formed the universe itself. And so Plato taught that ideal forms spawn everything in the universe. He thought of nature as a complex system based on diverse instantiations of these ideal forms. The more perfect the form, the more closely it approached whatever truth may lie at the heart of the universe. This seems so highly metaphysical by today's standards as to be useless, but modern scientific abstraction is heading back in this direction. Only five polyhedrons in the observable universe can be perfectly symmetric, so here is a brief overview of all five of Plato's most perfect forms.

Tetrahedron

This solid has four triangular faces, four vertices, and six edges. It is dual to itself. The acuteness of its angles led Plato to name it fire.



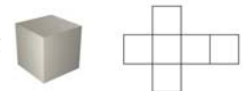
Octahedron

This solid has eight triangular faces, six vertices and twelve edges. It is the dual of the cube. Air is the name given to the octahedron, because it was seen as an intermediate between fire and water.



Cube (Hexahedron)

This solid has six square faces, eight vertices and twelve edges. It is the dual of the octahedron. The stability of the cube led Plato to associate it with the element earth.



Icosahedron

This solid has twenty triangular faces, twelve vertices and thirty edges. It is the dual of the dodecahedron. Plato called the icosahedron water.



Dodecahedron

This solid has twelve pentagonal faces, twenty vertices and thirty edges. It is the dual of the icosahedron. This is the most mysterious and powerful of the five regular solids. It embodies the other four; Plato therefore said that the dodecahedron is the cosmos. He sensed that it was used by God to embroider the heavens.

