

10



Platonic Polyhedra

Topic: Geometry

Theme: Learning about the platonic polyhedra and Euler's formula

Abilities: Deduce, manipulate, solve problems, calculate

Material: Straws / colored sheets / sheets of foam (to cut small circles)

Level: Age 14 /18

What are polyhedra?

Platonic polyhedra, or platonic solids, come from the Greek philosopher and mathematician Plato (c. 428-347 B.C.).

He attributed these polyhedra to the Elements and to the Universe as represented below by Johannes Kepler in 1619.

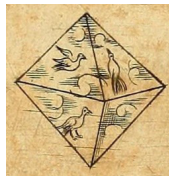
Hexahedron
Earth



Tetrahedron
Fire



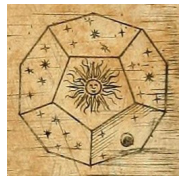
Octahedron
Air



Isocahedron
Water



Dodecahedron
Universe



A **polyhedron** is a solid figure made of flat surfaces called polygons. These surfaces cannot be rounded nor curved.

What is special about Platonic polyhedra:

- They are **convex** polyhedra, which means that if you draw a straight line from one point of the polyhedron to another of its points, the line will stay within the solid.
- They are regular **polyhedra**, which means that their flat surfaces, or faces, are congruent regular polygons and that the same number of edges (or faces) meet at each vertex.

A Swiss mathematician and physicist called Leonhard Euler found a formula that applies to any convex polyhedron. It was used by mathematicians who tried to find other platonic polyhedra. The conclusion was that there are only five of them!

Here is Euler's polyhedral formula:

$$F + V - E = 2$$

in which F is the number of Faces, V the number of Vertices, and E is the number of Edges.

Play!

Create groups and choose 1 Platonic polyhedron to each team. Take enough straws, colored sheets and sheets of foam to build the polyhedron.

You have to build the structure of your platonic solid using the straws as the edges. Then, you have to use the colored sheets to create the faces and glue them in-between the straws.

And lastly, you cut small circles from the sheet of foam and glue them to the vertices of their polyhedron.

Once all the polyhedra are created, you will have emphasized all the needed elements of Euler's formula !