



Mathematics for Every Teacher with Jake Tawney

Lecture 4b: Platonic Solids

Outline:

Which regular polyhedra will tile three-dimensional space?

- What is a regular polyhedron?
 - Faces are congruent regular polygons.
 - Same number of faces coming together at each vertex.
 - Convex, if any two points can be joined by a straight line without leaving the shape.
- **How many regular polyhedra are there?**
 - Plato was concerned with these shapes.
 - What is required to form a solid?
 - We need a gap to fold the shape up.

Name	Face	Number of Faces	Number of Faces at a Vertex	Diagram
Tetrahedron	Equilateral Triangle	4	3	
Octahedron	Equilateral Triangle	8	4	
Icosahedron	Equilateral Triangle	20	5	
Cube	Square	6	3	
Dodecahedron	Regular Pentagon	12	3	



- **Theorem**
 - There are only five Platonic Solids: the tetrahedron, the octahedron, the icosahedron, the cube, and the dodecahedron.
- The Platonic solids are all related to one another.
 - If you take the middle point of all of the faces of the Platonic solids and join them together, you get the same Platonic solid or an opposite (dual) of another Platonic solid.
- **Theorem**
 - The cube is the only Platonic solid that will tile space.