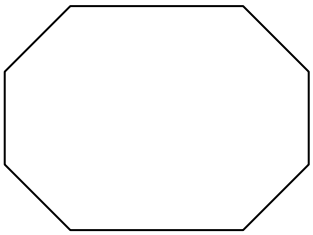
# Platonic Solids

## A Brief Introduction

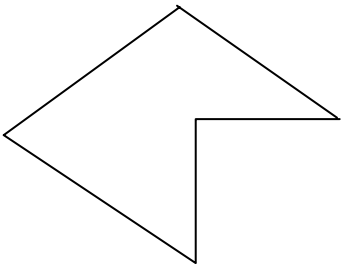
A **polygon** is a two-dimensional shape bounded by straight line segments.

A polygon is said to be **regular** if the edges are of equal length and meet at equal angles.

A polygon is **convex** if the line connecting any two vertices remains inside or on the boundary of the polygon.



Convex



Not Convex

Question 1: Give an example of convex regular polygon.

Question 2: Give an example of not regular convex polygon.

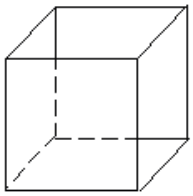
A **Platonic Solid** has the property that each face is an identical convex regular polygon, and that the same number of polygons meets at each corner.

The Platonic solids feature prominently in the philosophy of Plato for whom they are named. The five solids were certainly known to the ancient Greeks and there is evidence that these figures were known long before then.

There are only five Platonic Solids:

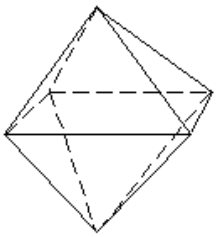
Tetrahedron

Tetrahedron:
Four equilateral triangles, three meeting at each corner.



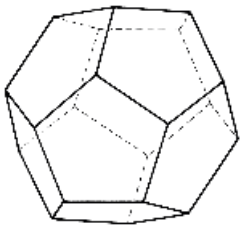
Cube

Cube:
Six squares, three meeting at each corner.



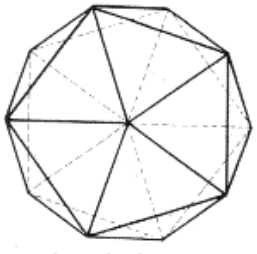
Octahedron

Octahedron:
Eight equilateral triangles, four meeting at each corner.



Dodecahedron

Dodecahedron:
Twelve regular pentagons, three meeting at each corner.



Icosahedron

Icosahedron:
Twenty equilateral triangles, five meeting at each corner.

## Activity 1:

Construct all five solids and record the following information in the table below:

| **Platonic Solid** | **Vertices** | **Edges** | **Faces** |
|---|---|---|---|
| Tetrahedron | | | |
| Cube | | | |
| Octahedron | | | |
| Dodecahedron | | | |
| Icosahedron | | | |

## Activity 2:

For each solid compute the following:

| **Platonic Solid** | **Vertices – Edges + Faces** |
|---|---|
| Tetrahedron | |
| Cube | |
| Octahedron | |
| Dodecahedron | |
| Icosahedron | |

**What is your observation?**

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The formula
**Vertices – Edges + Faces = "your number from Activity 2"**
Is known as *Euler's Formula for Polyhedra.*

## Activity 3:

Construct a solid using only:

(i) Triangles and squares

(ii) Squares and pentagons

Note: A solid such that each face is a regular polygon but there are at least two different kinds of faces is called **semiregular solid.**

Question: Is the same formula from A*ctivity 2* works for your new semiregular solids?