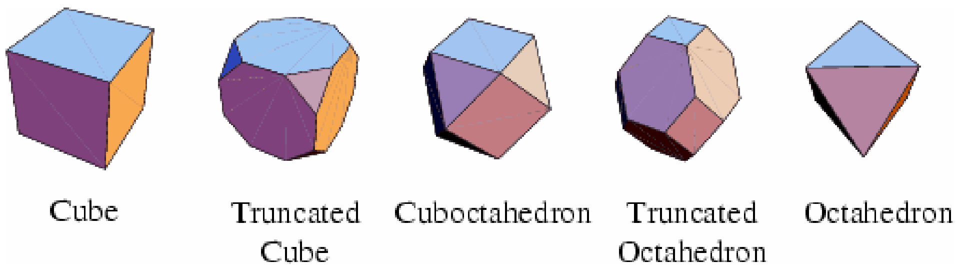
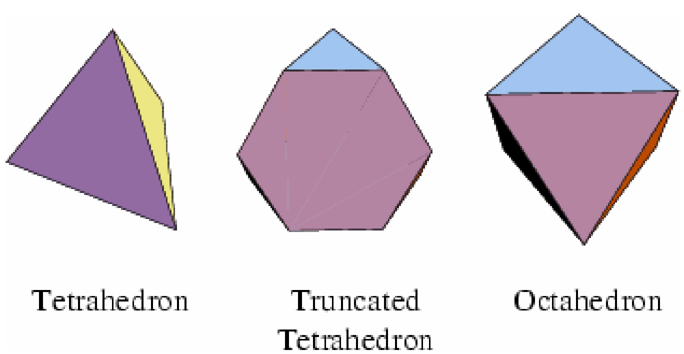
The 5 Platonic (regular) solids
and
the 13 Archimedean (semiregular) solids





Seven of the 13 Archimedean solids (the cuboctahedron, icosidodecahedron, truncated cube, truncated dodecahedron, truncated octahedron, truncated icosahedron, and truncated icosahedron) can be obtained by truncation of a Platonic solid. The three truncation series producing these seven Archimedean solids are illustrated above.

Two additional solids (the small rhombicosidodecahedron and small rhombicuboctahedron) can be obtained by expansion of a Platonic solid, and two further solids (the great rhombicosidodecahedron and great rhombicuboctahedron) can be obtained by expansion of one of the previous 9 Archimedean solids (Stott 1910; Ball and Coxeter 1987, pp. 139-140). It is sometimes stated (e.g., Wells 1991, p. 8) that these four solids can be obtained by truncation of other solids. The confusion originated with Kepler himself, who used the terms "truncated icosidodecahedron" and "truncated cuboctahedron" for the great rhombicosidodecahedron and great rhombicuboctahedron, respectively. However, truncation alone is not capable of producing these solids, but must be combined with distorting to turn the resulting rectangles into squares (Ball and Coxeter 1987, pp. 137-138; Cromwell 1997, p. 81).

The remaining two solids, the snub cube and snub dodecahedron, can be obtained by moving the faces of a cube and dodecahedron outward while giving each face a twist. The resulting spaces are then filled with ribbons of equilateral triangles (Wells 1991, p. 8).

The following table gives the number of vertices *v*, edges *e*, and faces *f*, together with the number of *n*-gonal faces for the Archimedean solids. The sorted numbers of edges are 18, 24, 36, 36, 48, 60, 60, 72, 90, 90, 120, 150, 180 (Sloane's A092536), numbers of faces are 8, 14, 14, 14, 26, 26, 32, 32, 32, 38, 62, 62, 92 (Sloane's A092537), and numbers of vertices are 12, 12, 24, 24, 24, 24, 30, 48, 60, 60, 60, 60, 120 (Sloane's A092538).

n	Solid	*v*	*e*	*f*						
1	cuboctahedron	12	24	14	8	6				
2	great rhombicosidodecahedron	120	180	62		30		20		12
3	great rhombicuboctahedron	48	72	26		12		8	6	
4	icosidodecahedron	30	60	32	20		12			
5	small rhombicosidodecahedron	60	120	62	20	30	12			
6	small rhombicuboctahedron	24	48	26	8	18				
7	snub cube	24	60	38	32	6				
8	snub dodecahedron	60	150	92	80		12			
9	truncated cube	24	36	14	8				6	
10	truncated dodecahedron	60	90	32	20					12
11	truncated icosahedron	60	90	32			12	20		
12	truncated octahedron	24	36	14		6		8		
13	truncated tetrahedron	12	18	8	4			4		

The Platonic solids, also called the regular solids or regular polyhedra, are convex polyhedra with equivalent faces composed of congruent convex regular polygons. There are exactly five such solids (Steinhaus 1999, pp. 252-256): the cube, dodecahedron, icosahedron, octahedron, and tetrahedron, as was proved by Euclid in the last proposition of the *Elements*. The Platonic solids are sometimes also called "cosmic figures" (Cromwell 1997), although this term is sometimes used to refer collectively to both the Platonic solids *and* Kepler-Poinsot solids (Coxeter 1973).

The Platonic solids were known to the ancient Greeks, and were described by Plato in his *Timaeus* ca. 350 BC. In this work, Plato equated the tetrahedron with the "element" fire, the cube with earth, the icosahedron with water, the octahedron with air, and the dodecahedron with the stuff of which the constellations and heavens were made (Cromwell 1997).

The 13 Archimedean solids are the convex polyhedra that have a similar arrangement of nonintersecting regular convex polygons of two or more different types arranged in the same way about each vertex with all sides the same length (Cromwell 1997, pp. 91-92).

The Archimedean solids are distinguished by having very high symmetry, thus excluding solids belonging to a dihedral group of symmetries (e.g., the two infinite families of regular prisms and antiprisms), as well as the the elongated square gyrobicupola (because that surface's symmetry-breaking twist allows vertices "near the equator" and those "in the polar regions" to be distinguished; Cromwell 1997, p. 92). The Archimedean solids are sometimes also referred to as the semiregular polyhedra.

Solid	Schläfli symbol	Wythoff symbol	C&R Symbol	*v*	*e*	*f*	Group
cube		3 2 4	4^3	8	12	6	
dodecahedron		3 2 5	5^3	20	30	12	
icosahedron		5 2 3	3^5	12	30	20	
octahedron		4 2 3	3^4	6	12	8	

tetrahedron		3 2 3	3^3	4	6	4