VISUALISING SOLID SHAPES

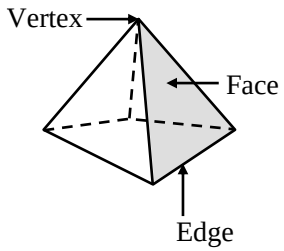
FACES, EDGES AND VERTICES OF SOLID SHAPES

POLYHEDRONS

A polyhedron is a solid shape which is bounded by polygons which are called its faces, these faces meet at edges which are line segments and the edges meet at vertices which are points.

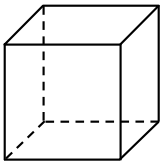
Eg. :

(1) A pyramid which has 5 vertices, 5 faces, 8 edges

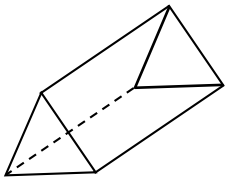


(2) A cuboid which has 8 vertices, 6 faces, 12 edges

(3) A cube has 8 vertices, 6 faces, 12 edges



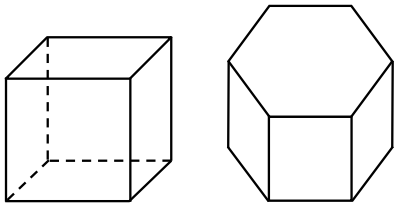
(4) A triangular prism has 6 vertices, 5 faces, 9 edges



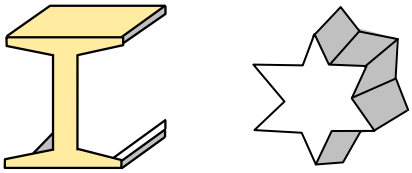
Note : A sphere, a cylinder and a cone are not polyhedrons.

Convex Polyhedrons

A polyhedron is convex if any two points on its surface can be joined by a line segment that entirely lies inside or on the polyhedron.



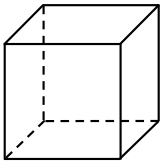
These are convex polyhedrons



These are not convex polyhedrons.

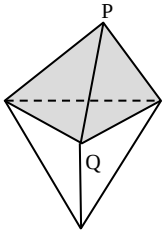
Regular Polyhedrons

A polyhedron is said to be regular if its faces are made up of regular polygons and the same number of faces meet at each vertex.



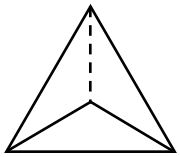
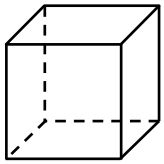
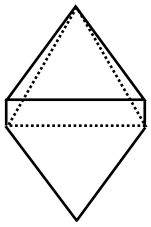
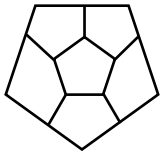
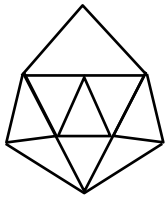
A cube is a regular polyhedron as its faces are made up of regular polygons. Also the vertices are formed by the same number of faces.

This polyhedron is not regular even through all the faces are congruent because at P, 3 faces meet but at Q, 4 faces meet.



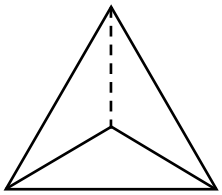
PLATONIC SOLIDS

There are only five regular polyhedrons. These are known as Platonic solids.

NAME	FIGURE	FACES	EDGES	VERTICES
1. Tetrahedron		4 (Triangular)	6	4
2. Cube or Hexahedron e.g., Ice-cube		6 (Square)	12	8
3. Octahedron e.g., Diamond Crystals		8 (Triangular)	12	6
4. Dodecahedron		12 (Pentagonal)	30	20
5. Icosohedron		20	30	12

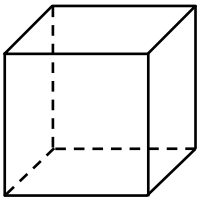
SOLID SHAPES (POLY HEDRONS)

Let us look at the solid shapes once more. In class VII, we have studied some of the regular polyhedrons. They are tetrahedrons and cubes. A regular polyhedron has all its faces congruent. Such solids are also called platonic solids.



4 Faces

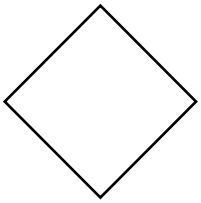
All edges are equal.
All faces are equal.
A regular tetrahedron



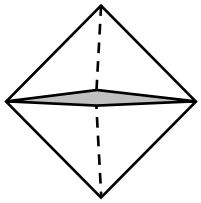
6 Faces

All sides are equal
All faces are equal
A cube or a regular
Hexahedron

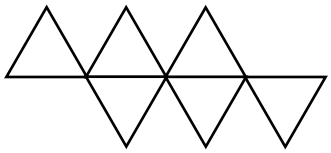
Now look at the solids in figure. This is also regular hexahedron as it has six faces and all six faces are equal.



What we see

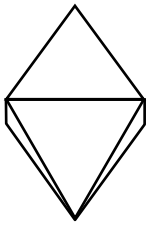


Drawing

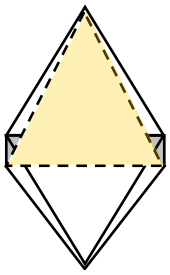


Net

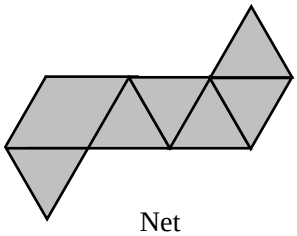
Regular octahedron has 8 faces and equal edges. The faces are eight equilateral triangles as shown in figure.



What we see

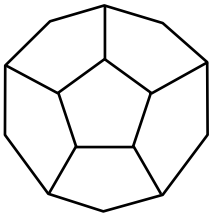


Drawing

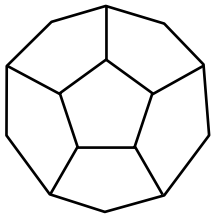


Net

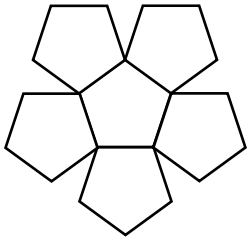
Solid shown in figure is a Dodecahedron having equal regular pentagons as faces. In Greek language do means two and deca means ten. Hence dodeca means Twelve.



What we see

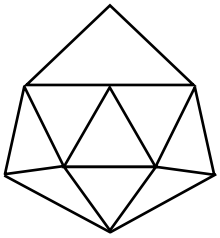


Drawing

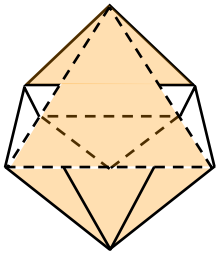


Net of one side

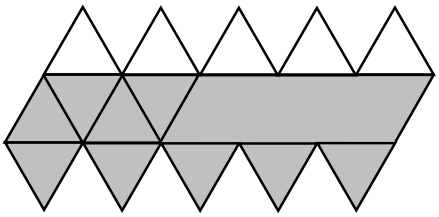
Shows a regular polyhedron having 20 congruent faces. It is called an icosohedron.



What we see



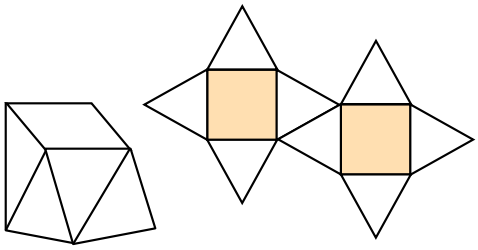
Drawing



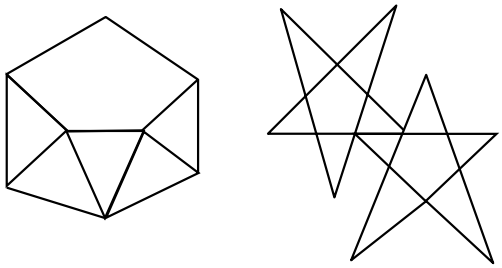
Net

There are many other polyhedrons made with combination of two or three two dimensional shapes.

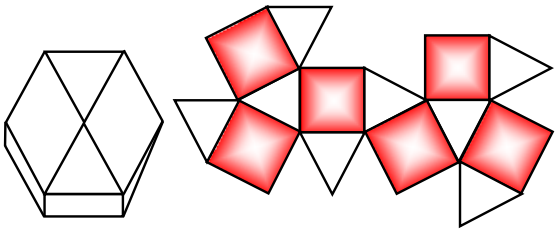
Let us take a quick look at some of them. These are not regular polyhedrons as all of their faces are not congruent to each other.



(a) Square antiprism 2 Squares and 8 Triangles



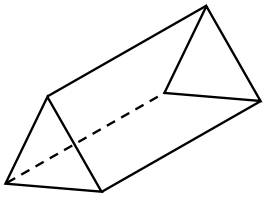
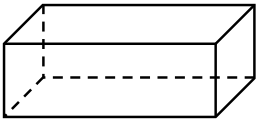
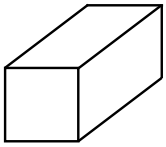
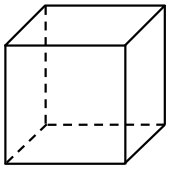
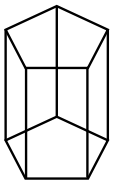
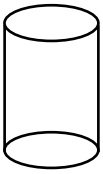
(b) Pentagonal antiprism 2 Pentagons and 10 Triangles



(c) Cuboctahedron 6 Squares and 8 Triangles

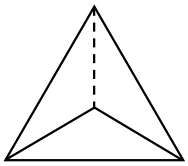
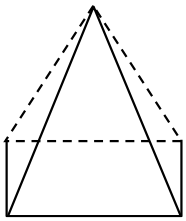
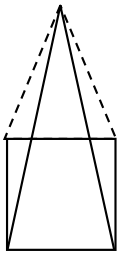
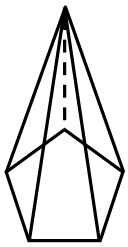
PRISMS

A solid whose base and top are identical polygons and the sides are rectangles, is known as a prism. It is a polyhedron, two of whose faces are congruent polygons in parallel planes and whose other faces are parallelograms.

TYPES	FIGURE	FACES	EDGES	VERTICES
1. Triangular Prism		5	9	6
2. Cuboid Rectangular Prism		6	12	8
3. Square Prism		6	12	8
4. Cube		6	12	8
TYPES	**FIGURE**	**FACES**	**EDGES**	**VERTICES**
5. Pentagonal Prism		7	15	10
6. Cylinder		3	2	—

PYRAMIDS

A pyramid is a polyhedron whose base is a polygon (of any number of sides) and whose other faces are triangles with a common vertex.

TYPES	FIGURE	FACES	EDGES	VERTICES
1. Triangular Pyramid		4	6	4
2. Rectangular Pyramid		5	8	5
3. Square Pyramid		5	8	5
4. Pentagonal Pyramid		6	10	6