# Épreuve de section européenne

## 1 General Knowledge

Give the definition of the bisector of an angle. Prove that any point on the bisector of an angle is equidistant from the two sides of the angle.

## 2 Document

A *polyhedron* is a three-dimensional shape that is made up of a finite number of polygonal *faces* which are parts of planes. Its faces meet in *edges* which are straight-line segments, and the edges meet in points called *vertices*. A polyhedron is a three-dimensional analog of a polygon. Cubes, prisms and pyramids are examples of polyhedra. Cones, cylinders and spheres are examples of solids that are not polyhedra.

Polyhedra are mostly named after their number of faces : tetrahedron, pentahedron, hexahedron, octahedron, decahedron, etc.

A convex polyhedron is a *Platonic solid*, or a *regular polyhedron*, if all its faces are congruent regular polygons and if the same number of faces meet at each of the vertices. There are only 5 Platonic solids, a fact well known by the ancient Greeks. A proof of this result can be found in *Euclid's Elements*.

A convex polyhedron is an *Archimedean solid* if it's composed of two or more types of regular polygons and if the same number of faces meet at each of the vertices. There are 13 Archimedean solids (or 15 if you count separately the mirror images of two of them). They were first listed by Archimedes in a now-lost work and rediscovered during the Renaissance, notably by Johannes Kepler who completed the study in 1619.

A convex polyhedron is a *Johnson solid* if all its faces are regular polygons and if it's not a platonic solid, an archimedean solid, a prism or an anti-prism. There are 92 Johnson solids, that were listed by Norman Johnson in 1966.

Adapted from *Wikipedia, the free encyclopedia*.

## 3 Questions

1. What is the other name of the cube ?
2. How many Platonic solids are there ?
   In what famous work is the proof of this result available ?
3. Give two simple Platonic solids.
4. Who discovered and listed the Archimedean solids ?
5. What is the difference between an Archimedean and a Johnson solid ?
6. Give one simple Johnson solid.