

IDEA 84

CUBE DISSECTION 2

This idea is a development of Idea 83 and is based upon the construction of eight equilateral triangle-based pyramids to form two cubes, each with a tetrahedron-shaped hole inside. These eight pyramids will form a regular octahedron and students can see, again, how the cube (hexahedron) and the octahedron are related.

An alternative to having each of the eight pyramids as separate solids is to hinge them together in two lots of four, each one being formed by hinging three pyramids around the three edges of a fourth pyramid. Each of these structures form hollow cubes when turned one way around, yet when they both are unfolded and turned back on themselves, the two shapes will join together to form an octahedron – amazing really.

As well as delighting in the marvel of this construction, students can construct formulae for the volumes of the different solids formed using C = Cube, T = tetrahedron, P = Pyramid and O = Octahedron, i.e.:

- $T + 4P = C$
- $8P = O$
- $2C - 2T = O$

Furthermore if we construct four (congruent) tetrahedrons and place these on four of the eight faces of the octahedron, a bigger tetrahedron can be formed. This tetrahedron will have a volume which is eight times the volume of the smaller tetrahedron. With this information the following formula emerges:

$$8T = O + 4T, \text{ so } O = 4T.$$

Using this information the volumes of the solids can be compared with that of the cube.

SECTION 6

**SFGs, not perhaps
as interesting as
The BFG but
nevertheless some
giant-sized ideas
for the classroom**