This idea is for students to explore truncations of solids.

Basically, there are two different types of truncations that can be created. One is to slice off the vertices of a solid through the mid-point of the edges between each vertex. The other is to slice off the vertices through a point *somewhere* between the vertex and the mid-point (for example, one third of the distance down each edge).

This idea is for students to explore the truncations of the five Platonic solids, i.e. the tetrahedron, hexahedron, octahedron, icosahedron and dodecahedron. This would be a useful small group task. As students explore truncations some amazing results are waiting to be to found.

One way for students to truncate solids is to physically cut off the vertices; this however can be messy and possibly risky (in terms of health and safety). My preferred approach is to ask students to visualize, in the first instance, what shapes are formed by truncating. Another approach is to draw construction lines. For example, by truncating a tetrahedron about the mid-point of each edge an octahedron (surprisingly) is formed.

By truncating either a hexahedron and an octahedron about the mid-point of each edge a cuboctahedron is formed. This is also one of the 13 Archimedean solids and these are developed in Idea 78.

Students can explore the following questions:

- What different solids emerge?
- What happens when Euler's rule is applied?
- What is the connection between the Faces, Vertices and Edges of a solid and the different truncations so formed? Is it possible to predict results?

Asking students to try to find and construct all the possible 13 Archimedean solids would be a substantial challenge. To help students engage in such a task they will first of all need to know how an Archimedean solid is defined (i.e. they are formed from more than one regular polygon and at every vertex the same type and number of regular polygons meet). For example, with the cuboctahedron, two equilateral triangles and two squares meet at each vertex.

There are also two infinite sets of Archimedean solids that students could be introduced to, i.e. the set of prisms and the set of anti-prisms. This idea focuses on the finite set of 13.

Students could be told what shapes are required to form them, i.e:

- Equilateral triangles
- Squares
- Regular pentagons
- Regular hexagons
- Regular octagons
- Regular decagons

If further information is considered useful, say for younger students, they could be told the combinations of polygons required to make the solids, i.e:

- Triangles and squares (to form three Archimedean solids)
- Triangles and pentagons (two solids)
- Triangles and hexagons (one solid)
- Triangles and octagons (one solid)
- Triangles and decagons (one solid)
- Squares and hexagons (one solid)
- Pentagons and hexagons (one solid)
- Triangles, squares and pentagons (one solid)
- Squares, hexagons and octagons (one solid)
- Squares, hexagons and decagons (one solid)