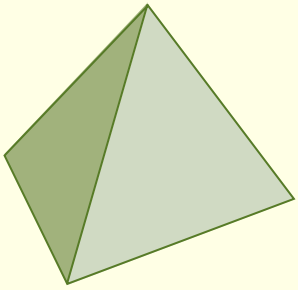
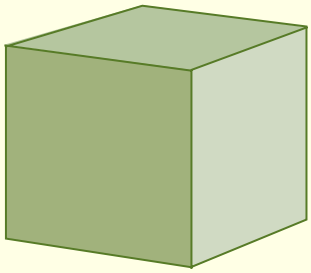
The platonic solids

The ancient Greeks thought the platonic solids were perfect shapes. The platonic solids are three-dimensional and each one has all its faces being the same regular polygon. A special property of each of the platonic solids is that a sphere can enclose them and only touch them at each of the vertices (corners).

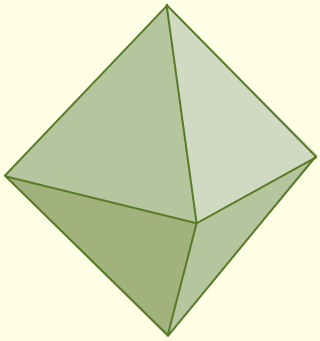
The five platonic solids are:



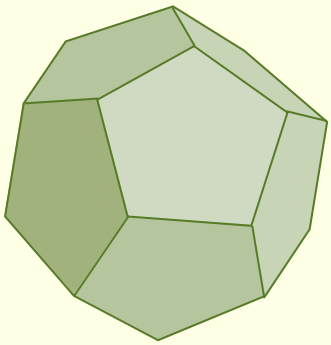
Tetrahedron, made up of 4 equilateral triangles



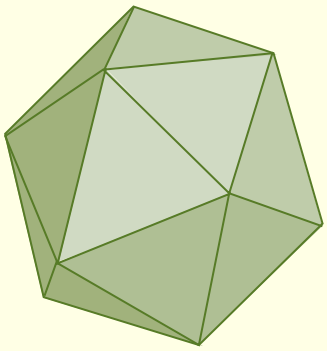
Cube (or hexahedron), made up of 6 squares



Octahedron, made up of 8 equilateral triangles



Dodecahedron, made up of 12 regular pentagons



Icosahedron, made up of 20 equilateral triangles

Exercise 5.8 The platonic solids

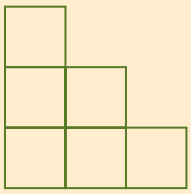
1 The diagrams show three nets of six squares.

a Which of these can be folded to form a cube?

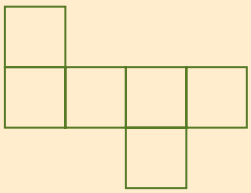
b How many different nets of six squares can be drawn that will fold into a cube? Sketch them.

A

B

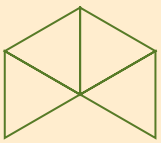


C

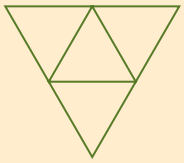


2 Which of these nets would fold up to make a tetrahedron?

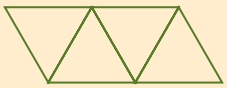
A



B



C



3 **a** Use a compass, pencil and ruler to construct a net for a tetrahedron that has an edge length of 7 cm.

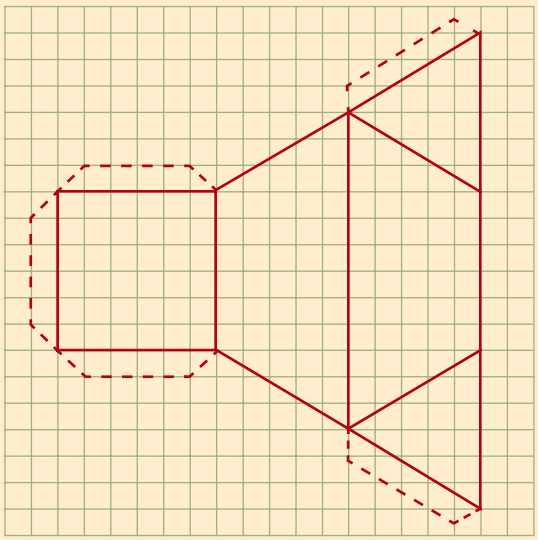
b Draw some tabs onto the net to enable the net to be folded and stuck together to form a tetrahedron.

c Cut out the net and make the tetrahedron.

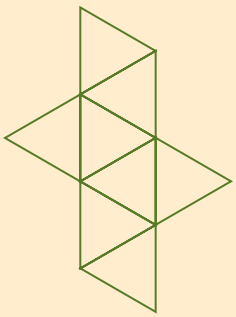
4 **a** Make two accurate copies of this net on light cardboard.

b Fold each net along the lines and glue edges together to form two 3-D shapes that are the same.

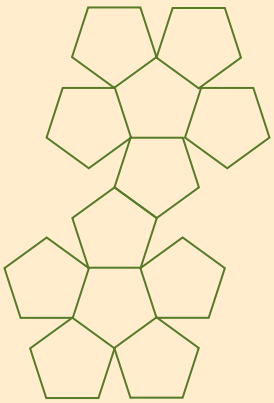
c Use the two pieces to make a tetrahedron.



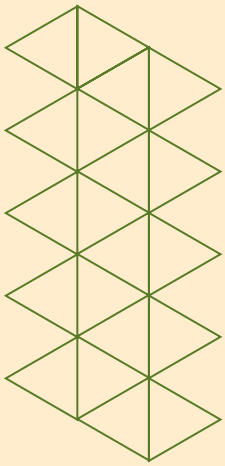
5 Construct enlargements of these three nets, add tabs, cut them out and make up 3-D models of the octahedron, dodecahedron and icosahedron.



Octrahedron net



Dodecahedron net



Icosahedron net

6 Each platonic solid is made up of a number of vertices or corners (V), edges (E) and faces (F).

a Copy and complete the table.

Platonic solid	*Vertices (V)*	*Edges (E)*	*Faces (F)*	*V + F − 2*	*Shape of faces*
Tetrahedron					
Hexahedron (cube)					
Octahedron					
Dodecahedron					
Icosahedron					

b What relationship exists between the number of vertices, edges and faces for platonic solids?

Homework
SP 2.3

Tessellations

A **tessellation** is a complete covering of an area by a repeating pattern of one or more shapes, with no overlapping of the shapes.

A **regular tessellation** is formed by congruent regular polygons. A regular polygon has all sides equal in length and all interior angles equal.

A **semi-regular tessellation** is formed when two or more regular polygons are combined in the tessellation. At each vertex (meeting point) of the polygons, the combination and order of the polygons are exactly the same as (identical to) the combination and order of the polygons that meet at any other point in the semi-regular tessellation.

A **non-regular tessellation** is formed by congruent non-regular polygons (for example, rectangle, kite or isosceles triangle).

Regular and semi-regular tessellations are named by the order (moving clockwise), types of polygons and number of like polygons at any vertex.