Solids and Euler's Rule

Friday, 29 March 2019 8:01 AM

By the end of the lesson I would hope that you have an understanding of the following. I would also hope that you can apply the understanding to a number of different questions and question types:

- Know what it means to be a solid
- Know what it means by the terms
  - Vertex
  - Edge
  - Face
  - Polyhedron
  - Prism
  - Pyramid
- Know that for certain solids, there is a link between vertices, edges and faces
- Know how to use Euler's rule to find the number of either vertices, edges or faces given at least two of them.

RECAP:

In previous lessons we have been looking at the work at a Year 8 level.
We have looked at Triangles and Quadrilaterals and how to find the angles.
We then used the information to develop how to use the number of triangles inside polygons to find the angle sum.
Polygons are 2-D shapes.
We now move on to 3-D shapes.

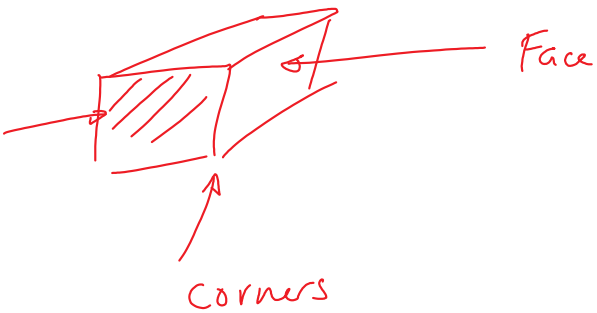
More language

It's important, in Mathematics, to know the language.

Polyhedron
This is a closed solid with flat surfaces, vertices and edges.
They can be named by their number of faces!
Examples include:

- Tetrahedron (4 faces)
- Pentahedron (5 faces)
- Hexahedron (6 faces)

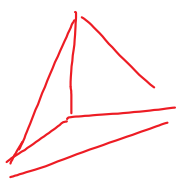
What are vertices, faces and edges?



Vertex

Linking them together... Euler's Rule

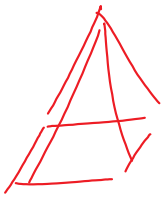
These are REALLY hard to draw, but let's see what I can come up with :)



F = 4
V = 4 ①
E = 6

E = F + V - 2

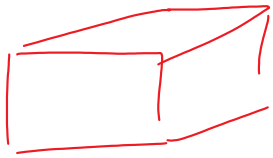
① 6 = 4 + 4 - 2 ✓



F = 5
V = 5
E = 8

② 8 = 5 + 5 − 2 ✓

③ 12 = 6 + 8 − 2 ✓



F = 6
V = 8
E = 12

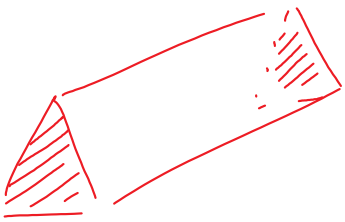
$$Edges = Faces + Vertices - 2$$

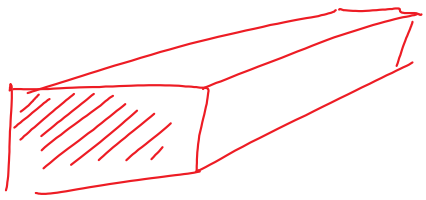
E = V + F − 2

Elephants are **VERY FAT**

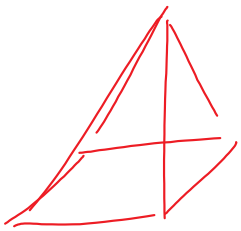
More language

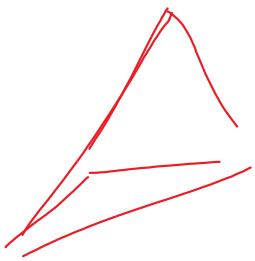
Prisms
These are polyhedra with two identical ends.





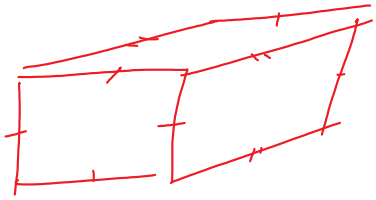
Pyramid



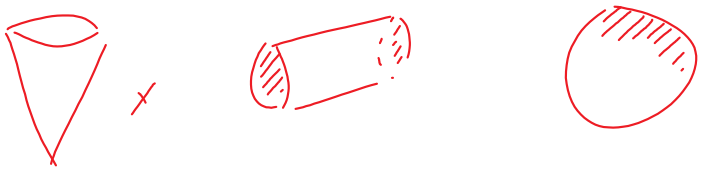


Cube

Cuboid



Tricks!
Cones, cylinders and spheres!



Example of using Euler's Rule

The following example is taken from *Cambridge Essential (Year 8) Textbook.*

Use Euler's rule to find the number of faces on a polyhedron that has 10 edges and 6 vertices.

$$E = V + F - 2$$

$$10 = 6 + F - 2$$

$$4 - 10 = 4 + F$$

$$6 = F$$

$$F = 6$$