Date: _____

Properties of 3D shapes

Sit down with a pen and paper.

1D

1 dimension
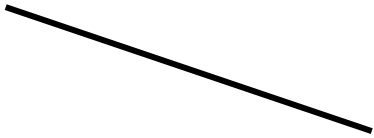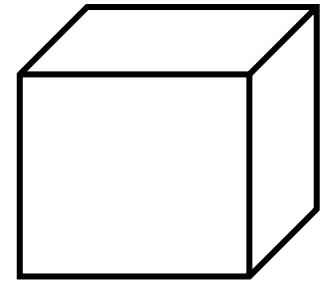
2D

2 dimensions
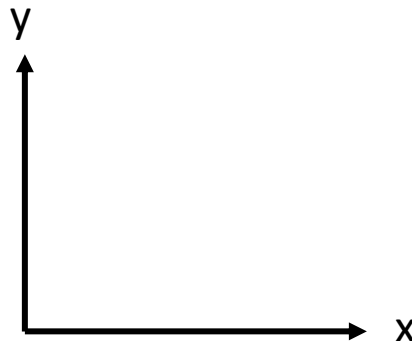
3D

3 dimensions
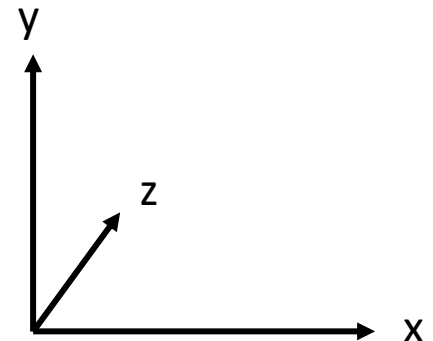
Polygon

Polyhedron

A polygon is a 2D shape made of straight sides

3D shape where each face is a polygon.

Click to explore

Click to explore

Quadrilateral
Area = 15.988496588738

Angles
Sides
Diags
Coords
Guides
Regular

Zoom:
© 2018 MathsIsFun.com v0.89
Reset   Edit
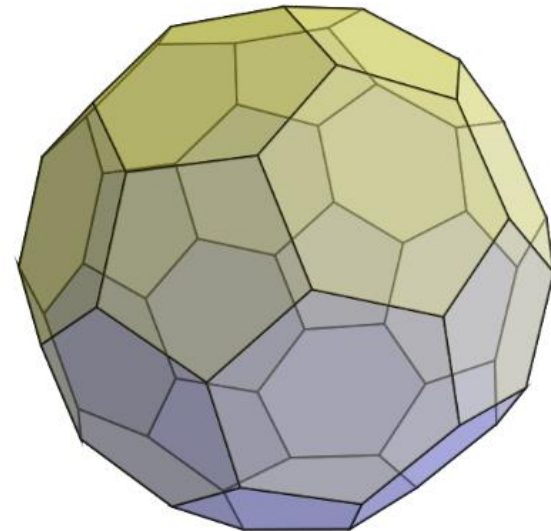
Prisms

A solid object with two identical ends and flat sides.

Click to explore

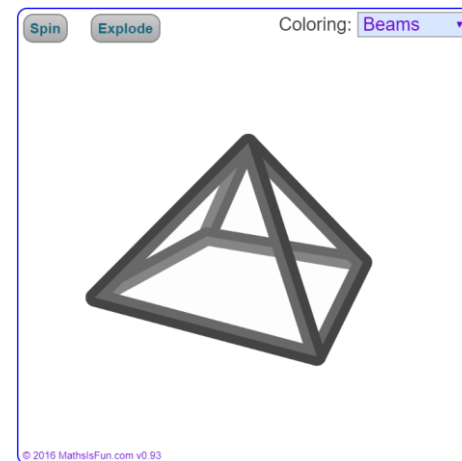Spin　Explode　Coloring: Beams ▾

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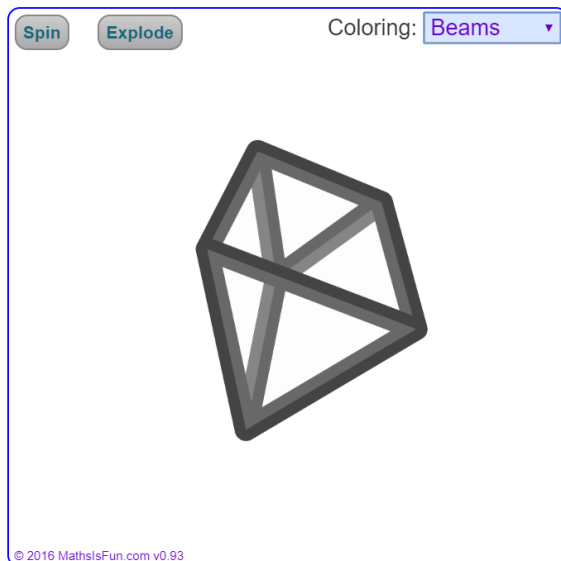
Pyramids

A solid object where:
- The sides are triangles which meet at the top (the apex).
- The base is a polygon (a flat shape with straight sides)
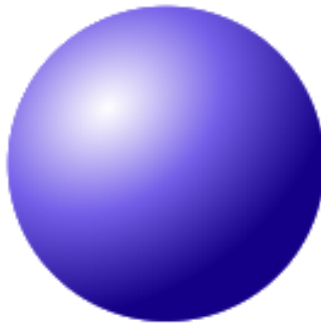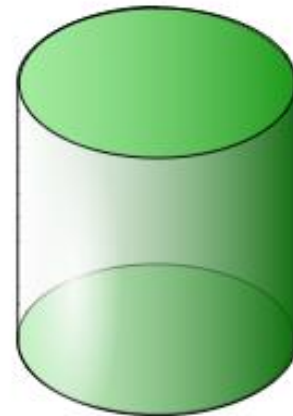
Click to explore

Spin　Explode　Coloring: Beams ▾

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3D shapes with curved surfaces.

Cones

Spheres

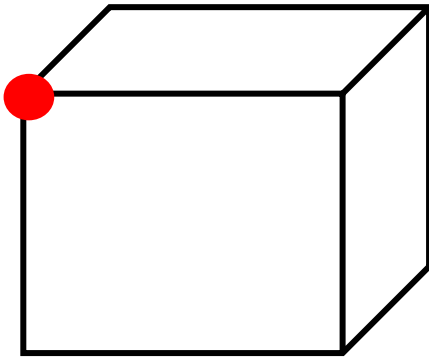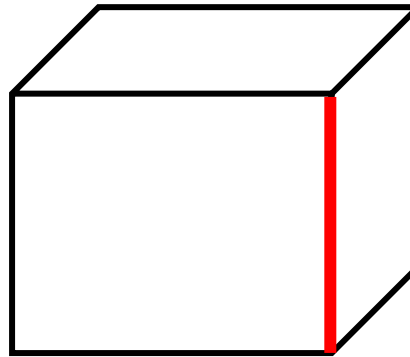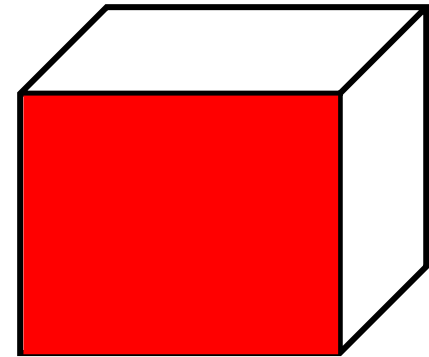## **Cylinders**

Vertex

Edge

Face

<u>Questions</u>

1 How many faces does a tetrahedron have?

2 How many edges does a cube have?

3 How many vertices does a octahedron have?

4 What is the mathematical name for this shape?
(Made of 20 equilateral triangles)

5 How many faces does a dodecahedron have?

6 How many edges does a cone have?

7 How many faces does a sphere have?

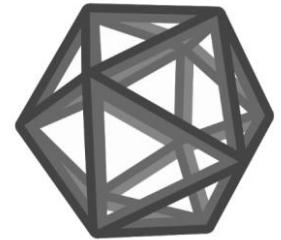1 How many faces does a tetrahedron have? **4 faces**

2 How many edges does a cube have? **8 edges**

3 How many vertices does a octahedron have? **6 vertices**

4 What is the mathematical name for this shape?
(Made of 20 equilateral triangles) **Icosahedron**

5 How many faces does a dodecahedron have? **12 faces**

6 How many edges does a cone have? **1 edge**

7 How many faces does a sphere have? **1 faces**

1 What is the mathematical number of a pringles pot?

2 How many vertices does a sphere have?

3 What shapes can you make if you slice a section off a cube?

4 What is the name of half a sphere?

5 Explain why a cone is not a polyhedron.

6 What shape might you associate with a diamond?

7 Is a cuboid a prism?

1 What is the mathematical name of a pringles tube?

Cylinder

2 How many vertices does a sphere have? **None**

3 What shapes can you make if you slice a section off a cube?

Have a look

4 What is the name of half a sphere? **Hemisphere**

5 Explain why a cone is not a polyhedron.

One of the sides is curved.

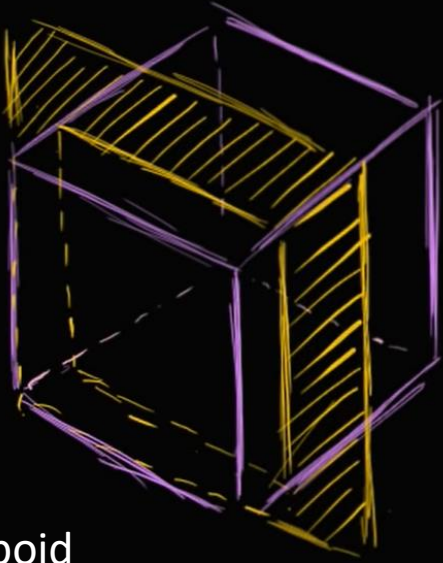6 What shape might you associate with a diamond?

Octahedron
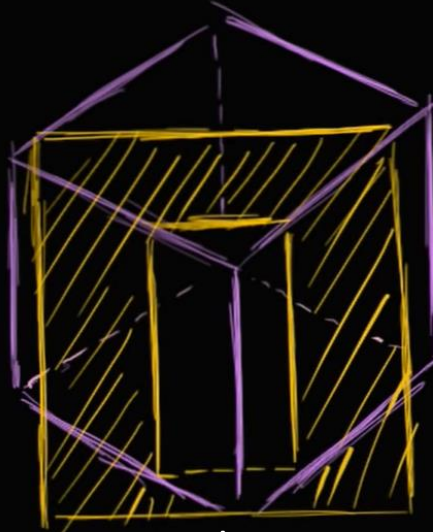
7 Is a cuboid a prism? **Yes**
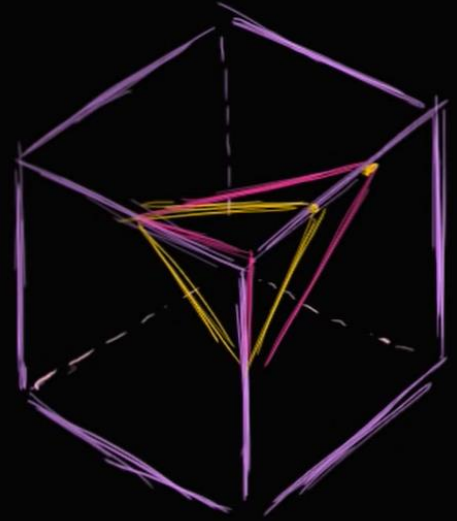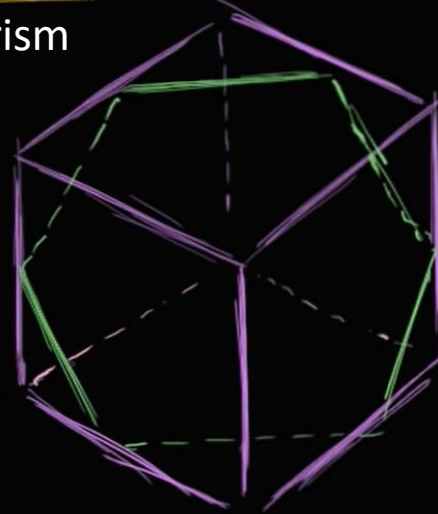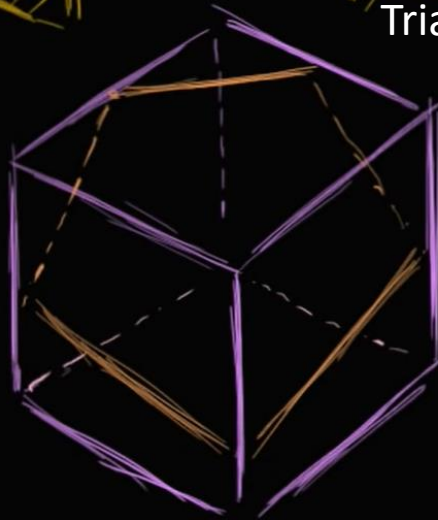
Cuboid

Triangular prism

Tetrahedron

More complex shapes

Euler's Formula

For any polyhedron that does not intersect itself, there is a formula that connects the face (F), edges (E) and vertices (V).

Can you work out what the formula is?

If you are stuck use the buttons below to guide you.

Step 1   Step 2   Step 3   Step 4

Euler's Formula

At the start of any problem you just need as much information as possible. Pick some shapes and find out how many faces, edges and vertices they have. Here are some possible shapes you could look at.

Name	Faces	Vertices	Edges	
Tetrahedron				
Cube				
Octahedron				
Dodecahedron				
Icosahedron				

Euler's Formula

Now that you have more information you can start to play with the numbers. Remember you are looking for a way of connecting F, E and V for all polyhedron. If it works for one and not another it's not going to work for a single formula.

Name	Faces	Vertices	Edges	
Tetrahedron	4	4	6	
Cube	6	8	12	
Octahedron	8	6	12	
Dodecahedron	12	20	30	
Icosahedron	20	12	30	

Resilience – Don't give up!

The operations involved are **adding** and **subtracting**.

Euler's Formula

How do you use **addition** and **subtraction** and end up with 2 with all polyhedron? How could you write this as a formula?

Name	Faces	Vertices	Edges	
Tetrahedron	4	4	6	2
Cube	6	8	12	2
Octahedron	8	6	12	2
Dodecahedron	12	20	30	2
Icosahedron	20	12	30	2

Well done for completing the lesson.

Reflections