

Y9 Three-dimensional shapes

What do I need to be able to do?

By the end of this unit you should be able to:

- Name 2D & 3D shapes
- Recognise Prisms
- Sketch and recognise nets
- Draw plans and elevations
- Find areas of 2D shapes
- Find Surface area for cubes, cuboids, triangular prisms and cylinders
- Find the volume of 3D shapes

Keywords

2D: two dimensions to the shape e.g length and width

3D: three dimensions to the shape e.g length, width and height

Vertex: a point where two or more line segments meet

Edge: a line on the boundary joining two vertex

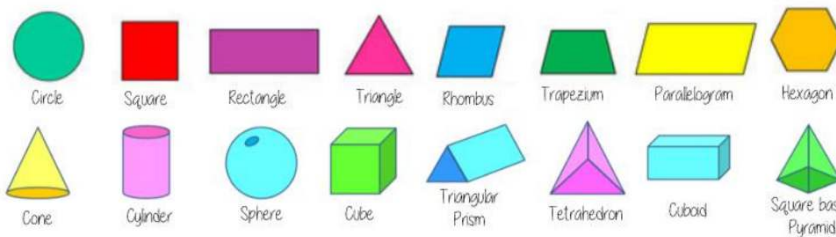
Face: a flat surface on a solid object

Cross-section: a view inside a solid shape made by cutting through it

Plan: a drawing of something when drawn from above (sometimes birds eye view)

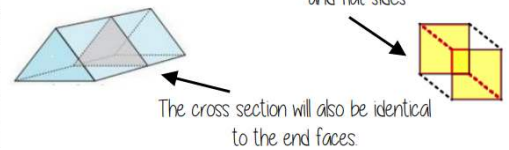
Perspective: a way to give illustration of a 3D shape when drawn on a flat surface.

Name 2D & 3D shapes



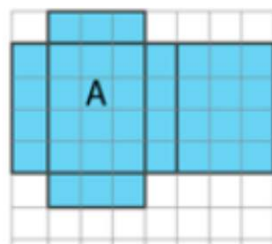
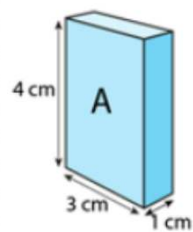
Recognise prisms

A solid object with two identical ends and flat sides



A cylinder although with very similar properties does not have flat faces so is not categorised as a prism

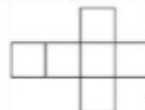
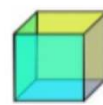
Nets of cuboids



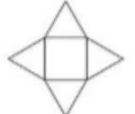
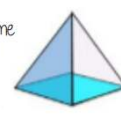
1cm grids help to draw accurately

Visualise the folding of the net. Will it make the cuboid with all sides touching

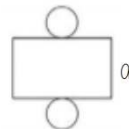
Sketch and recognise nets



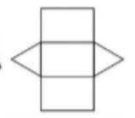
Do they have the same number of faces?



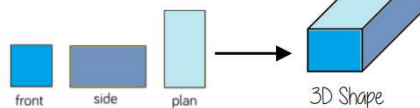
Where do the edges join?



Are the shapes of the faces correct?



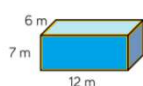
Plans and elevations



The direction you are considering the shape from determines the front and side views

Surface area

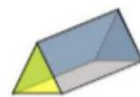
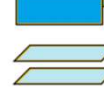
Sketching nets first helps you visualise all the sides that will form the overall surface area



Sides 6×7
Front and back 12×7
Top and Bottom 12×6

Sum of all sides is surface area

For cubes and cuboids you can also find one of each face and double it



For other shapes = not all the sides are the same, so calculate the individually

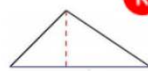
Area of 2D shapes

Rectangle
Base x Height



Triangle

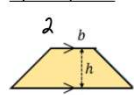
$\frac{1}{2} \times \text{Base} \times \text{Perpendicular height}$



Parallelogram/ Rhombus
Base x Perpendicular height



Area of a trapezium
 $(a + b) \times h$



Area of a circle
 $\pi \times \text{radius}^2$



Surface area - cylinders

The area of the circle

$$\pi \times \text{radius}^2$$



The width of this face is the same as the circumference
 $\pi \times \text{diameter} \times \text{height}$

$$2 \times \pi \times \text{radius}^2 + \pi \times \text{diameter} \times \text{height}$$

Volumes

Volume is the 3D space it takes up — also known as capacity if using liquids to fill the space



Counting cubes

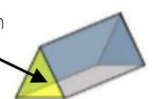
Some 3D shape volumes can be calculated by counting the number of cubes that fit inside the shape

$$\text{Cubes/ Cuboids} = \text{base} \times \text{width} \times \text{height}$$

Remember multiplication is commutative



Cross section



$$\text{Prisms and cylinders} = \text{area cross section} \times \text{height}$$

Height can also be described as depth

Areas — square units
Volumes — cube units

Areas and volumes can be left in terms of π