My mathematical journey

What do I need to remember from before?

Measuring length, area and volume (NP1)

Area of shapes (GM3)

Types of solids and their nets (GM7)

What will I learn about in this unit?

Surface area and volume of cubes and cuboids, prisms, cylinders, spheres, pyramids, cones and frustums

Converting between square and cubic units

Surface area and volume of similar solids

Where does this lead?

Pythagoras and trigonometry in 3D (GM9)

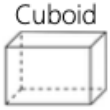
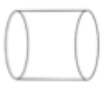
Solving geometric problems, including density and pressure (GM11)

A Level Mathematics

Construction, engineering and architecture

Fingertip facts: what I need to learn by heart

The concepts of surface area and volume are the same for all solids, but some have specific formulae to learn.

Solid	Surface area (sum of the area of all the faces)	Volume (space inside the solid)
Cuboid 		length × width × height $= lwh$
Prism 		area of cross-section × length
Cylinder 	area of two circles + curved surface area $= 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + \pi dh$	area of cross-section × length $= \pi r^2 h$
Sphere 	curved surface area $= 4\pi r^2$	$\frac{4}{3}\pi r^3$
Pyramid 		$\frac{1}{3}$ volume of a prism with same base and height
Cone 	base + curved surface area $= \pi r^2 + \pi rl$	$\frac{1}{3}$ volume of a cylinder with same base and height $= \frac{1}{3}\pi r^2 h$
Frustum 	curved surface area (large cone – small cone) + two circles $= \pi RL - \pi rl + \pi R^2 + \pi r^2$	volume of large cone – volume of small cone $= \frac{1}{3}\pi R^2 H - \frac{1}{3}\pi r^2 h$

Unit conversions

When converting between square units, we square the length conversion factor.
e.g. 1 m^2 = 100^2 cm^2 = 10 000 cm^2

When converting between cubic units, we cube the length conversion factor.
e.g. 1 m^3 = 100^3 cm^3 = 1 000 000 cm^3

Similar solids

The relationship between scale factors of length (1D), area (2D) and volume (3D):