Year 9 Higher Topic 7

Topic title: Area and Volume

Calculating areas and volumes of 2D and 3D shapes

Always make sure you are using common units
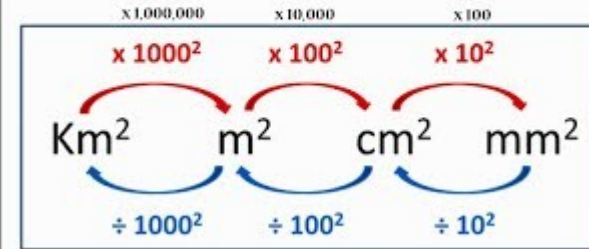
Substitute in lengths carefully,

Check if you need to combine the formulae for different shapes if you can a composite shape.

What careers would use these skills?

Are and volume if essential to many professions, Being able to calculate the perimeter or area of an object of space will also help you when decorating or improving your own home.
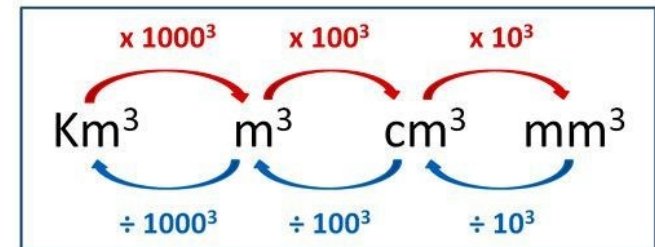
Converting AREA Units

AREA consists of Square Units, so we need to SQUARE all our Lengths.

x 1,000,000   x 10,000   x 100

$\times 1000^2$ $\times 100^2$ $\times 10^2$

Km^2 m^2 cm^2 mm^2

$\div 1000^2$ $\div 100^2$ $\div 10^2$

Converting VOLUME Units

VOLUME is how much 3D space is occupied, and is measured in cubes.

VOLUME consists of Cube Units, so we need to CUBE all our Lengths.

$\times 1000^3$ $\times 100^3$ $\times 10^3$

Km^3 m^3 cm^3 mm^3

$\div 1000^3$ $\div 100^3$ $\div 10^3$

VOLUME conversions use powers of 3, and usually create very large results.

$3m^3 = ?\ cm^3$ **Need to x 100^3** $3 \times 100 \times 100 \times 100 = 3\ 000\ 000\ cm^3$ ✓

Area

Shape	Dimensions	Area formula
Square	a	a^2
Rectangle	h, b	bh
Parallelogram	h_{perp}, b	bh_{perp}
Triangle	h_{perp}, b	$\frac{bh_{perp}}{2}$
Trapezium	a, h_{perp}, b	$\frac{(a+b)h_{perp}}{2}$
Circle	r	πr^2
Sector	r, θ	$\frac{\theta}{360}\pi r^2$

Area

Shape	Dimensions		Area formula
Compound shape	Strategy 1 Split into shapes	Strategy 2 Shaded area	Strategy 1 Split into shapes $A_{area} + B_{area}$
	A, B	B, A	Strategy 2 Shaded area $A_{area} - B_{area}$

Surface Area

Shape	Dimensions	Surface area formula
General idea for all shapes		Calculate the area of each face on the shape. Add the up all the areas
Cylinders	D, r, h	$2\pi r^2 + \pi Dh$
Cones	l, r	$\pi r^2 + \pi rl$
Spheres	r	$4\pi r^2$

Volume

Shape	Dimensions	Volume formula
Prisms	A_{CS}, l	$A_{CS} \times l$
Cones and pyramids	H_{Vert}, A_{Base}	$\frac{A_{Base} \times H_{Vert}}{3}$
Spheres	r	$\frac{4}{3}\pi r^3$

Perimeter

Shape	Dimensions	Perimeter formula
General idea for all shapes		Add up all the side lengths around the shape
Arcs	D, θ, Arc	$\frac{\theta}{360}\pi D$