Geometry 1 **Year 10 Foundation**

Key Knowledge/Prior Learning KS2/3 and Retrieval and Suggested Starters
• Area of rectangles, triangles, parallelograms, trapeziums and compound shapes. • Area of circles • Convert between units of measurements & area. • Know properties of 3D shapes. • Perimeter of 2D shapes including circles. • Manipulating & working with decimals. **Retrieval and Suggested Starters** • Practising the fluency of the above skills. • Interleaving & problem-solving questions involving the above topics.

KS4 National Curriculum – what students will be practicing
• Calculate the volume of cuboids & prisms including cylinders. • Use formulae to calculate the volume of pyramids, cones & spheres. • Calculate the surface area of cuboids & prisms including cylinders. • Use formulae to calculate the surface area of pyramids, cones & spheres. • Evaluate and use the speed, distance, time relationship to solve problems. • Evaluate and use the density, mass, volume relationship to solve problems. • Manipulate & evaluate problems linked to rates of pay.

Specific Ambitious Knowledge
• Interleaving topics & problem-solving scenarios.

Key Vocabulary/Literacy Opportunities
• Volume • Surface area • Length, width, height • Perpendicular • Parallel • Circumference • Radius • Diameter • Units of measure (mph, kilometres, etc) • Pounds, pence • Conversion • Density • Mass

Key Formulae/Knowledge:

Volume of a prism = area of cross section × length

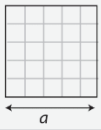
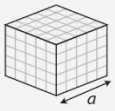
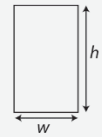
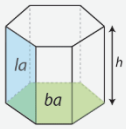
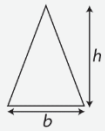
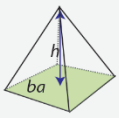
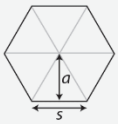
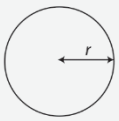
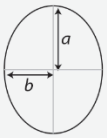
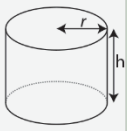
Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

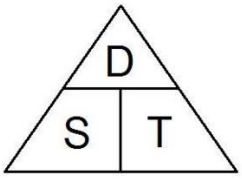
Area of a circle = πr^2

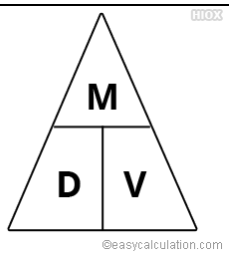
SKILLS YOU NEED
Helping You Develop Life Skills

Area, Surface Area & Volume
reference sheet

Two-dimensional plane shapes	**Area** *The measure of how many squares will fit into a shape.* ***Units²***	Three-dimensional solid shapes	**Surface Area** *The measure of the area of all outward facing sides.* ***Units²***	**Volume** *The measure of how many cubes will fit into a shape.* ***Units³***
Square 	Area = a^2 or $a \times a$ **Example:** $a = 5cm$ $Area = 5^2 = 25cm^2$	**Cube** 	Surface Area = $6 \times a^2$ **Example:** $a = 5cm$ $Surface\ Area = 150cm^2$	Volume = a^3 or $a \times a \times a$ **Example:** $a = 5cm.$ $Volume = 125cm^3$
Rectangle 	Area = $w \times h$ **Example:** $w = width = 10cm$ $height = 20cm$ $Area = 10 \times 20 = 200cm^2$	**Prism** 	Surface Area = $2 \times ba + la$ **Example:** $ba = base\ area = 20cm^2$ $la = lateral\ area\ (all\ sides) = 60cm^2$ $Surface\ area =$ $2 \times 20 + 60 = 100cm^2$	Volume = $ba \times h$ **Example:** $ba = base\ area = 20cm^2$ $h = height = 5cm$ $Volume = 20 \times 5 = 100cm^3$
Triangle 	Area = $b \times h \times 0.5$ **Example:** $b = base = 20cm$ $h = vertical\ height = 15cm$ $Area = 20 \times 15 \times 0.5 = 150cm^2$	**Pyramid** 	Surface Area = $ba + la$ **Example:** $ba = base\ area = 16cm^2$ $la = lateral\ area\ (all\ sides) = 60cm^2$ $Surface\ area = 16 + 60 = 76cm^2$	Volume = $ba \times h \times 1/3$ **Example:** $ba = base\ area = 16cm^2$ $h = height = 9cm$ $Volume = 16 \times 9 \times 1/3 = 48cm^3$
Reg Polygon 	Area = $n \times s \times a \times 0.5$ **Example:** $n = number\ of\ sides = 6$ $length\ of\ side = 5cm$ $a = apothem = 15cm$ $Area = 6 \times 5 \times 15 \times 0.5 = 225cm^2$	**R. Polyhedron** 	Surface Area = $fa \times s$ **Example:** $fa = area\ of\ one\ side = 200cm^2$ $s = number\ of\ sides = 12$ $Surface\ area = 200 \times 12 = 2400cm^2$	**Example:** *There is no simple generic formula for working out the volume of a regular polyhedron.*
Circle 	Area = $\pi \times r^2$ **Example:** $\pi = pi = 3.14$ $r = radius = 5cm$ $Area = 3.14 \times 5^2 = 3.14 \times 5 \times 5 = 78.5cm^2$	**Sphere** 	Surface Area = $4 \times \pi \times r^2$ **Example:** $r = radius = 4.5cm$ $Surface\ area = 4 \times 3.14 \times 20.25$ $= 254.5\ cm^2\ (Approx)$	Volume = $4/3 \times \pi \times r^3$ **Example:** $r = radius = 4.5cm$ $Volume = 4/3 \times 3.14 \times 4.5^3$ $= 381.5cm^3\ (Approx)$
Ellipse 	Area = $\pi \times a \times b$ **Example:** $\pi = pi = 3.14$ $a = radius\ of\ long\ axis = 6$ $b = radius\ short\ axis = 4$ $Area = 3.14 \times 6 \times 4 \times 5 = 75.36cm^2$	**Cylinder** 	Surface Area = $2\pi rh + 2\pi r^2$ **Example:** $r = radius = 5cm$ $h = height = 10cm$ $Surface\ area = 2 \times 3.14 \times 5 \times 10$ $+ 2 \times 3.14 \times 25 = 471cm^2$	Volume = $\pi \times r^2 \times h$ **Example:** $r = radius = 5cm$ $h = height = 10cm$ $Volume = 3.14 \times 25 \times 10$ $= 785cm^3\ (Approx)$

(Not polyhedron)





Cross Curricular Links
• Links to other areas of the maths curriculum such as algebra, percentages, etc. •

Student' Thinking
• Is volume always greater than surface area? • How can we use our knowledge of area to help us with volume?

Projects/Enrichment/Investigations
• Shared documents/Maths/Projects/Problem-solving card sorts. • https://www.mathscareers.org.uk/wp-content/uploads/2014/06/StemCareers_PackagingDesign.pdf • https://www.bowlandmaths.org.uk/projects/mystery_tours.html#sec2 • Cre8- Packaging Project • Cuboids • Cuboid Challenge • https://nrich.maths.org/2650?utm_source=secondary-map • Changing Areas, Changing Volumes • https://nrich.maths.org/5888?utm_source=secondary-map