Year 7 Knowledge Organiser – 3D Shapes

Objectives

Identify properties of the faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres

Use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries

Know the properties and definitions of special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language

Know and apply formulae to calculate volume of cuboids

Calculate surface area of cuboids

Key Vocabulary

Face – a flat surface of a 3D shape

Edge – a line segment joining one vertex to another

Vertex – where two or more edges meet

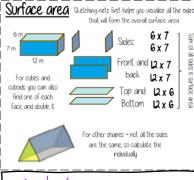Parallel Lines – a set of lines which are equidistant (never meet)

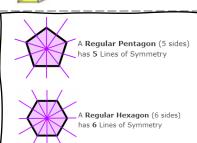Perpendicular Lines – lines which interest at right angles

Polygon – a straight edged 2D shape

Regular Polygon – where all edges are equal, and angles are equal

Surface Area – the total area of the net of a 3D shape

Rotational symmetry – when a shape still looks the same after a rotation.

Surface area

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

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

Sum of all sides = 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 them individually

A **Regular Pentagon** (5 sides) has **5** Lines of Symmetry

A **Regular Hexagon** (6 sides) has **6** Lines of Symmetry

A **Regular Heptagon** (7 sides) has **7** Lines of Symmetry

Notice a pattern between the number of sides of a regular polygon and its number if lines of symmetry? This is also the same for their <u>rotational symmetry</u>.
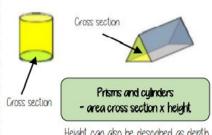
Volumes

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.

Cubes/ Cuboids = base x width x height

Remember multiplication is commutative

Cross section

Cross section

Prisms and cylinders - area cross section x height

Height can also be described as depth

Areas – square units	Areas and volumes can be
Volumes – cube units	left in terms of pi π

Surface area of cuboids:
- Draw the net of the cuboid
- Find the area of each face (l x w)
- Add up the area of each face to find the total

Properties of Quadrilaterals

Square
All sides equal size
All angles 90°
Opposite sides are parallel

Rectangle
All angles 90°
Opposite sides are parallel

Rhombus
All sides equal size
Opposite angles are equal

Parallelogram
Opposite sides are parallel
Opposite angles are equal
Co-interior angles

Trapezium
One pair of parallel lines

Kite
No parallel lines
Equal lengths on top sides
Equal lengths on bottom sides
One pair of equal angles

Polygons

3	– Triangle	5	– Pentagon	8	– Octagon
4	– Quadrilateral	6	– Hexagon	9	– Nonagon
		7	– Heptagon	10	– Decagon

If all the sides and angles are the same, it is a **regular** polygon

Name 2D & 3D shapes

Circle, Square, Rectangle, Triangle, Rhombus, Trapezium, Parallelogram, Hexagon

Cone, Cylinder, Sphere, Cube, Triangular Prism, Tetrahedron, Cuboid, Square based Pyramid

Recognise prisms

A solid object with two identical ends and flat sides

The cross section will also be identical to the end faces

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

Parallel and Perpendicular lines

Perpendicular lines
Straight lines that meet at 90°

Parallel lines
Straight lines that never meet (have the same gradient)

Nets of cuboids

4 cm, 3 cm, 1 cm

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

1cm grids help to draw accurately

Sketch and recognise nets

Do they have the same number of faces?

Where do the edges join?

Are the shapes of the faces correct?