Acle Academy

YEAR 7, STAGE 6 - GEOMETRY AND MEASURES, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:
Material covered within this section revisit Key Stage 2 topics to aid in the transitioning students from primary school content. **Visualising and Constructing** **Key Skills:** • Know the names of common 2D shapes • Know the names of common 3D shapes • **Use a protractor to measure and draw angles** **Investigating Properties of Shapes** **Key Skills:** • Know the properties of rectangles • Know the difference between a regular and an irregular polygon • Add and subtract numbers up to three digits	**Visualising and Constructing** **2D Shapes** • You will construct 2D shapes • Draw 2-D shapes given angles • Draw 2-D shapes given dimensions and angles **3D Shapes** • You will investigate 3D shapes and explore their nets • Recognise prisms • Recognise pyramids • Classify 3-D shapes including cylinders, cones and spheres • Draw nets of 3-D shapes **Investigating Properties of Shapes** **Polygons** You will investigate properties of 2D shapes and angles in polygons	• Protractor, Measure, Nearest, Construct, Sketch, Cube, Cuboid, Cylinder, Pyramid, Prism, Net, Edge, Face, Vertex (Vertices) and Visualise. • Quadrilateral, Square, Rectangle, Parallelogram, (Isosceles) Trapezium, Kite, Rhombus, Delta, Arrowhead, Triangle, Scalene, Right-angled, Isosceles, Equilateral, Polygon, Regular, Irregular, Pentagon, Hexagon, Octagon, Decagon, Dodecagon, Circle, Radius, Diameter, Circumference, Centre, Parallel, Diagonal and Angle. • Length, Distance, Mass, Weight, Volume, Capacity, Metre, Centimetre, Millimetre, Tonne, Kilogram, Gram, Milligram, Litre, Millilitre, Hour, Minute, Second, Inch, Foot, Yard, Pound, Ounce, Pint and gallon. • Metric, Imperial. • Angle, Degrees, Right angle, Acute angle, Obtuse angle, Reflex angle, Protractor, Vertically opposite, Right angle notation, Arc

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Measuring Space

Key Skills:

- Convert between adjacent metric units of length, mass and capacity
- Know rough equivalents between inches and cm, feet and cm, kg and lb, pint and ml
- **Use decimal notation to two decimal places when converting between metric unit**

Investigating Angles

Key Skills:

- Know that angles are measured in degrees
- Know that angles in a full turn total 360°, and angle in half a turn must total 180°
- **Estimate the size of angles**

Calculating Space

Key Skills:

- Know the meaning of perimeter (area, volume, capacity)
- Classify 2D shapes using given categories; e.g. number of sides, symmetry
- Find unknown angles in a triangle
- Find unknown angles in an isosceles triangle when only one angle is known
- Find unknown angles in a quadrilateral
- Find unknown angles in regular polygons
- Solve problems involving 2-D shapes

Circles

You will understand and use the vocabulary of circles

- **Know the names and relationships of the parts a circle**

Measuring Space

Units

- You will solve problems involving measurement
- Convert between non-adjacent metric units length and mass from the smaller unit to the larger unit; e.g. centimetres to kilometres
- Convert between non-adjacent metric units length and mass from the larger notation for all other angles and the degree symbol (°).
- Perimeter, Area, Volume, Capacity, Square, Rectangle, Parallelogram, Triangle, Composite rectilinear, Polygon, Cube, Cuboid, Millimetre, Centimetre, Metre, Kilometre, Square millimetre, square centimetre, square metre, square kilometre, Cubic centimetre, Centimetre cube, Formula, Formulae, Convert, Length, Breadth, Depth, Height and Width.
- 2-D, Grid, Axis, Axes, x-axis, y-axis, Origin, Quadrant, (Cartesian) coordinates, Point, Translation, Reflection, Transformation, Object, Image, Congruent and Congruence.

*Highlighted words **MUST** be explicitly taught, defined and recorded in student books as they are first met. Other listed words may be introduced verbally or written in a similar format.*

- Know that the area of a rectangle is given by the formula area = length × width
- Know that area can be measured using square centimetres or square metres, and the abbreviations cm^2 and m^2
- **Know that volume is measured in cubes**

Mathematical Movement

Key Skills:

- Use coordinates in the first quadrant
- Identify a translation
- Carry out a translation in the first quadrant
- Identify a reflection
- Carry out a reflection in the first quadrant using mirror lines parallel to the axes
- **Know the meaning of 'congruent', 'congruence', 'object', 'image'**

unit to the smaller unit; e.g. kilometres and centimetres

- Convert between non-adjacent time units; e.g. hours to seconds

Solve problems involving converting between measures

Investigating Angles

Angles

You will develop knowledge of angles and apply angle facts to deduce unknown angles

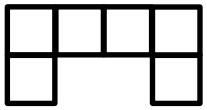
- Find missing angles where they meet at a point
- Find missing angles where they meet on a straight line
- Find missing angles where they are vertically opposite
- **Use known facts to find missing angles**

Calculating Space

Area

You will explore area and use your knowledge to solve problems

	• Recognise that shapes with the same areas can have different perimeters and vice versa • Calculate the area of a parallelogram • Calculate the area of a triangle **Volume** You will investigate volume and use your knowledge to solve problems • Estimate the volume of cubes and cuboids • Calculate the volume of cuboid, including cubes • Recognise when it is possible to use formulae to calculate area and volume • Convert between metric units of area in simple cases • **Convert between metric units of volume in simple cases** **Mathematical Movement** **Coordinates** You will learn to understand and use Cartesian coordinates • Use coordinates to describe the position of a point in all four quadrants • Use coordinates to plot the position of a point in any of the four quadrants	

	Transformations You will use transformations to move shapes • Draw and translate simple shapes • **Carry out a reflection using one of the axes as a mirror line**	
Challenge and Support:	**World wide learning/ links to 21st century:**	**Cultural capital/ Industry/ Enrichment:**
Visualising and constructing • Show me an example of a net of a cube. And another. And another … • What is wrong with this attempt at a net of a cuboid? How can it be changed?  • How many different ways are there to complete these nets? • Convince me a cylinder is not a prism. *NCETM: Geometry - Properties of Shapes Reasoning* **Investigating properties of shapes** • Convince me that a rhombus is a parallelogram	• Inventors, designers and architects need to be able to communicate with the people who will eventually build the objects they have created, to do this they must be able to produce clear instructions. • Buildings, engine parts, vehicles and packaging are all very carefully planned and designed before they are built or made. Most design work starts on paper or a screen using 2d images to represent the final 3d objects. • Measurements are needed for many different jobs, being able to work with measurements means you can build	Use Google images to show artists who use mathematics – Escher NRICH website – access current articles and enrichment activities. Search tool: secondary, age 11-14, Geometry and measures. https://nrich.maths.org/public/topic.php?group_id=10 NRICH provides thousands of free online mathematics resources for ages 3 to 18 - completely free and available to all via their website (nrich.maths.org/). These resources aim to: Enrich and enhance the experience of the mathematics curriculum for all learners

• Jenny writes that 'Diameter = 2 × Radius'. Kenny writes that 'Radius = 2 × Diameter'. Who is correct? • What is the same and what is different: a square and a rectangle? *NCETM: Geometry - Properties of Shapes Reasoning* **Measuring space** • Show me a metric (imperial) unit of measure. And another. And another. • Kenny thinks that 2.5km = 25 000 cm. Do you agree with Kenny? Explain your answer. • *Convince me that 4.25kg does not equal 425g.* **Investigating angles** • Convince me that the sum of angles on a straight line is 180°. • Show a possible set of values for a, b, c and d. And another. And another. • Convince me that the sum of angles around a point is 360°. • Convince me that (vertically) opposite angles are equal. • *Kenny thinks that the sum of opposite angles is 180°. Do you agree? Explain your answer.*	things, make alterations or weigh ingredients for a recipe. • People who work in many varied and unrelated jobs rely on an understanding of angles and how shapes fit together in their daily work. These include designers, architects, opticians and tree surgeons among others • Ordering the right quantity of turf for a sports field, preparing detailed floor plans and working out how much fertiliser is needed to treat a crop all require knowledge and calculations of area. • *You can see examples of reflections, rotations and translations all around you. Patterns in wallpaper and fabric are often translations, images reflected in water are reflections and the blades of a wind turbine are rotations.*	Develop mathematical thinking and problem-solving skills Offer challenging, inspiring and engaging activities Functional Skills Projects *Decades Day – Tetris Nets and "Pac-Man" Transformations activity.*

<u>Calculating space</u> • 'Show me' an example of when you would measure volume using km^3 • Convince me that the area of a parallelogram is found using base × height • (Given a triangle with base labelled 8 cm, height 5 cm, slope height 6 cm) Kenny thinks that the area is 40 cm^2, Lenny thinks it is 20 cm^2, Jenny thinks it is 240 cm^2 and Benny thinks it is 24 cm^2. Who do you agree with? Explain why. **<u>Mathematical movement</u>** • (Given a grid with the point (-3, 4) indicated) Benny describes this point as (-3, 4). Jenny describes the point as (4, -3). Who do you agree with? Why? • Two vertices of a rectangle are (-1, 2) and (4, -2). What could the other two vertices be? How many solutions can you find? • Convince me that (-2, 3) is in the second quadrant) *NCETM: <u>Geometry: Position Direction and Movement Reasoning</u>*		

Historical, Social, Moral, Spiritual, Cultural context:	Cross curricular links/ literacy/numeracy:	Common misconceptions:
• Explore key mathematicians and links to Geometry e.g Euclid on you tube • *History of imperial Measures- google search images.*	• Textiles: finding area of materials • Geography coordinate units • *History measures/storming castle trip*	• Some pupils will read the wrong way round the scale on a typical semi-circular protractor, therefore using 180° - required angle • Some pupils may measure from the end of a ruler, rather than the start of the measuring scale • Some pupils may think that several repeats of a shape in any pattern constitutes a tessellation • When given a net of a 3D shape some pupils may think that the number of vertices of the 3D shape is found by counting the number of 'corners' on the net • Some pupils may think that a 'regular' polygon is a 'normal' polygon • Some pupils may think that all polygons have to be regular • Some pupils may think that a square is only square if 'horizontal', and even that a 'non-horizontal' square is called a diamond • The equal angles of an isosceles triangle are not always the 'base angles' as some pupils may think • Some pupils may apply an incorrect understanding that there are 100 minutes in a hour when solving problems • Some pupils may struggle when converting between 12- and 24-hour clock notation; e.g. thinking that 15:00 is 5 o' clock • Some pupils may apply incorrect beliefs about place value, such as 2.3 × 10 = 2.30.

		• Many conversions within the metric system rely on multiplying and dividing by 1000. The use of centimetres as an ‘extra unit’ within the system breaks this pattern. Consequently, there is a frequent need to multiply and divide by 10 or 100, and this can cause confusion about the connections that need to be applied. • Some pupils may think that these angles are not equal as they are not ‘vertical’. • Some pupils may think that angles that are ‘roughly’ opposite are always equal, e.g. a = c • Some pupils may use the sloping height when finding the areas of parallelograms and triangles • Some pupils may think that the area of a triangle is found using area = base × height • Some pupils may think that you multiply all the numbers to find the area of a shape • When describing or carrying out a translation, some pupils may count the squares between the two shapes rather than the squares that describe the movement between the two shapes. • When reflecting a triangle some students may draw a translation • When carrying out a reflection some pupils may think that the object and image should be an equal distance from the edge of the grid, rather than an equal distance form the mirror line. • Some pupils will confuse the order of x-coordinates and y-coordinates

		• When constructing axes, some pupils may not realise the importance of equal divisions on the axes.

Assessment timeline:

- Topic test assessments (BAM tests) are conducted at the end of each topic. These are roughly after 2 weeks per topic, but this may vary.
- Pre-checks are conducted at the start of the topic to test student prior knowledge. This informs lesson planning and delivery.
- Tracking assessments are conducted once a term with end of year formal exams, for reporting and checking cumulative knowledge.
- Testing data leads to discussions about setting, intervention groups and individual in-class intervention.
- ***All students have access to a wide range of resources to develop their understanding.***

Home learning

- Homework is set weekly for each group. This will often be via interactive websites with immediate feedback and support.
- Teachers have the autonomy to use whichever resource they wish within the criteria set for the topic.
- *Students have access to lots of resources at home, including: Kerboodle, MyMaths, Mathswatch, PiXL Maths APP, PiXL Tmes Table App*

Feedback

- *Progress check, topic test, tracking assessment and end of year exams. After tracking and end of year exams, this will include "Formative Marking" sheets which give feedback question by question to help support the students with priorities for further work.*

Length of unit (duration indicated in lessons)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Unit: (47 Hours)																													