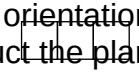
Acle Academy

KS3 STAGE 9, GEOMETRY AND MEASURES, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:
Visualising and Constructing • Measure distances to the nearest millimetre • Create and interpret scale diagrams • Use compasses to draw circles Interpret plan and elevations **Calculating Space** • Know and use the number π • Know and use the formula for area and circumference of a circle • Know how to use formulae to find the area of rectangles, parallelograms, triangles and trapezia Know how to find the area of compound shapes	**Visualising and Constructing** • **Constructions** • You will need to know how to complete the standard mathematical constructions • Use compasses to construct clean arcs • Use ruler and compasses to construct the perpendicular bisector of a line segment • Use ruler and compasses to bisect an angle • Use a ruler and compasses to construct a perpendicular to a line from a point (at a point) • **Loci** • You will learn how to apply these standard mathematical constructions to solve problems • Understand the meaning of locus (loci) • Know how to construct the locus of points a fixed distance from a point (from a line)	Compasses, Arc, Line segment, Perpendicular, Bisect, Perpendicular bisector, Locus, Loci, Plan, Elevation. Circle, Pi, Radius, diameter, chord, circumference, arc, tangent, sector, segment, (Right) prism, cylinder, Cross-section, Hypotenuse, Pythagoras' theorem. Addition, Subtraction, Vector, Magnitude, Direction, Coordinate, Velocity, Vector product, Scalar, Parallel, Resultant. 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.

	• Identify when to use the locus of points a fixed distance from a point (from a line) • Identify when a perpendicular bisector is needed to solve a loci problem • Identify when an angle bisector is needed to solve a loci problem • Choose techniques to construct 2D shapes; e.g. rhombus • Combine techniques to solve more complex loci problems • **Plans and Elevations** • You will explore ways of representing 3D shapes in 2D • Construct a shape from its plans and elevations • Construct the plan and elevations of a given shape • Know how to deal with a change in depth when dealing with plans and elevations **Calculating Space** • **Perimeter, Area and Volume** • You will learn how to solve problems involving arcs and sectors and prisms • Know the vocabulary of circles • Know how to find arc length	

	• Calculate the arc length of a sector when radius is given • Know how to find the area of a sector • Calculate the area of a sector when radius is given • Calculate the angle of a sector when the arc length and radius are known • Know how to find the surface area of a right prism and cylinder • Calculate the surface area of a right prism and cylinder • Calculate exactly with multiples of π • **Pythagoras' Theorem and Trigonometry** You will investigate right-angled triangles and learn how to solve problems involving Pythagoras' theorem • Know Pythagoras' theorem and the formula triangles for SOH CAH TOA • Identify the hypotenuse, adjacent and opposite in a right-angled triangle • Know when to apply Pythagoras' and when to apply Trigonometry theorem • Calculate the hypotenuse of a right-angled triangle using Pythagoras' theorem	

	• Calculate one of the shorter sides in a right-angled triangle using Pythagoras' theorem • Calculate missing sides and angles using Trigonometry **Vectors** • Understand how vectors can be represented (both graphically and via mathematical notation) • Add and subtract vectors • Know the definition of a resultant vector • Find the magnitude of a vector • Multiply by scalar quantities • Understand what makes a vector parallel to another	
Challenge and Support:	**World wide learning/ links to 21st century:**	**Cultural capital/ Industry/ Enrichment:**
• (Given a single point marked on the board) show me a point 30 cm away from this point. And another. And another … • Provide shapes made from some cubes in certain orientations. Challenge pupils to construct the plans and elevations. Do groups agree? • If this is the plan  show me a possible 3D shape. And another. And another.	• Draughts people and architects need to draw accurate scale diagrams of the buildings and other structures they are working on. Although the drawings are complicated they still use ordinary mathematical instruments such as rulers and compasses. • Builders, carpenters, garden designers and navigators all use Pythagoras' Theorem in their jobs. It is a method based on a right angled	Year 7 – storming the Castle trip Geometry: Representing the castle in scale drawing Measures and conversions Units used in History at Norwich castle e.g. Perch Use Google images to show artists who use mathematics – Escher NRICH website – access current articles and enrichment activities.

• Demonstrate how to create the perpendicular bisector (or other constructions). Challenge pupils to write a set of instructions for carrying out the construction. Follow these instructions very precisely (being awkward if possible; e.g. changing radius of compasses). Do the instructions work?
• Give pupils the equipment to create standard constructions and challenge them to create a right angle / bisect an angle
• Show me a sector with area 25π. And another. And another …
• Always/ Sometimes/ Never: The value of the volume of a prism is less than the value of the surface area of a prism.
• Always/ Sometimes/ Never: If $a^2 + b^2 = c^2$, a triangle with sides a, b and c is right angled.
• Kenny thinks it is possible to use Pythagoras' theorem to find the height of isosceles triangles that are not right-angled. Do you agree with Kenny? Explain your answer.
Convince me the hypotenuse can be represented as a horizontal line.
	triangle that allows them to work out unknown lengths.
	• A Vector is an object that has both a magnitude and direction. Geometrically, we can picture a vector as a directed line segment, whose length is the magnitude of the vector and with an arrow indicating the direction. Vectors are used to describe complex systems such as fluid dynamics, quantum mechanics and meteorology
		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
		  ○ 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.

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	• When constructing the bisector of an angle some pupils may think that the intersecting arcs need to be drawn from the ends of the two lines that make the angle. • When constructing a locus such as the set of points a fixed distance from the perimeter of a rectangle, some pupils may not interpret the corner as a point (which therefore requires an arc as part of the locus) • The north elevation is the view of a shape from the north (the north face of the shape), not the view of the shape while facing north. • Some pupils will work out $(\pi \times r)^2$ when finding the area of a circle • Some pupils may use the sloping height when finding cross-sectional areas that are parallelograms, triangles or trapezia • Some pupils may confuse the concepts of surface area and volume • Some pupils may use Pythagoras' theorem as though the missing side is always the hypotenuse • Some pupils may not include the lengths of the radii when calculating the perimeter of an arc

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.

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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:																													