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# KS3 STAGE 8, GEOMETRY AND MEASURES, MATHS

| Rationale and Context of Unit: | Core curriculum content: | Tier 2 & Tier 3 vocabulary explicitly taught: |
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| Prior key stage 3 content reviewed using pre-tests and whiteboard work at the start of each topic.<br><br>Pre requisites for Geometry & measures visualising and constructing<br>• Key skills: Use a protractor to measure angles to the nearest degree, use a ruler to measure lengths to the nearest millimetre, understand coordinates in all four quadrants, work out a multiplier given two numbers and understand the concept of an enlargement (no scale factor).<br><br>Investigating angles<br>• Key skills: Use angles at a point, angles at a point on a line and vertically opposite angles to calculate missing angles in geometrical diagrams and know that the angles in a triangle total 180°.<br><br>Calculating space<br>• Key skills: Know how to use formulae to find the area of rectangles, parallelograms, triangles and trapezia | Fluency, mathematical reasoning and problem-solving aspects of all content will be explored.<br><br>Content for Geometry & measures<br>Visualising and constructing<br>• Key skills: Enlargements of 2d shapes using the scale factor and centre of enlargement; scales and bearings to work with maps and the representation of 3D shapes using plans and elevations.<br><br>Investigating angles<br>• Key skills: develop your understanding of angles, explore geometrical situations involving parallel lines and use established facts to solve geometric problems.<br><br>Calculating space<br>• Key skills: investigate circles and the value pi to solve problems involving area, circumference and the volume of a cylinder. | • Similar, Similarity, Enlarge, Enlargement, Scaling, Scale Factor, Centre of Enlargement, Object, Image, Scale Drawing, Bearing, Plan and Elevation.<br><br>• Degrees, Right angle, Acute angle, Obtuse angle, Reflex angle, Vertically opposite, Geometry, Geometrical, Parallel, Alternate angles, Corresponding angles, Interior angle, Exterior angle and Regular polygon.<br><br>• Circle, Centre, Radius, Diameter, Chord, Circumference, Pi, (Right) prism, Cross-section, Cylinder, Polygon and Polygonal Solid<br><br>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. |

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| and how to find the area of compound shapes. | | |

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| Challenge and Support: | World-wide learning/ links to 21st century: | Cultural capital/ Industry/ Enrichment: |
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| • Always / Sometimes / Never: to draw a triangle you need to know the size of three angles; to draw a triangle you need to know the size of three sides.<br><br>• Always / Sometimes / Never: The number of vertices in a 3D shape is greater than the number of edges<br><br>• What's the same, what's different: 2 hours 30 minutes, 2.5 hours, 2⅓ hours and 2 hours 20 minutes?<br><br>• Kenny thinks that a triangle cannot have two obtuse angles. Do you agree? Explain your answer.<br><br>• Jenny thinks that the largest angle in a triangle is a right angle? Do you agree? Explain your thinking.<br><br>• Always / Sometimes / Never: The value of the volume of a cuboid is greater than the value of the surface area<br><br>• Convince me that y = 0 is the x-axis<br><br>Support in class | • 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.<br><br>• 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.<br><br>• Measurements are needed for many different jobs, being able to work with measurements means you can build things, make alterations or weigh ingredients for a recipe.<br><br>• 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<br><br>• Ordering the right quantity of turf for a sports field, preparing detailed floor | Use Google images to show artists who use mathematics – Escher<br><br>NRICH website – access current articles and enrichment activities.<br>Search tool: secondary, age 11-14, Geometry and measures.<br>https://nrich.maths.org/public/topic.php?group_id=10<br><br>• 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:<br>  ○ Enrich and enhance the experience of the mathematics curriculum for all learners<br>  ○ Develop mathematical thinking and problem-solving skills<br>  ○ Offer challenging, inspiring and engaging activities<br><br>• Functional Skills Projects<br>• Decades Day – Tetris Nets and "Pac-Man" Transformations activity. |

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| Use of mathematical equipment e.g compass/protractor.<br>Use of calculator for number work.<br>Concrete learning aids.<br><br>Challenge at home<br>NRICH website & TED-ed video riddles<br>→ search criteria 'geometry middle school/lower secondary' | plans and working out how much fertiliser is needed to treat a crop all require knowledge and calculations of area.<br><br>• 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. | |
| **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<br>• History of imperial Measures- google search images. | • Textiles: finding area of materials<br>• Geography coordinate units<br>• History measures/storming castle trip | • Two line segments that do not touch are perpendicular if they would meet at right angles when extended<br>• Pupils may believe, incorrectly, that:<br>- perpendicular lines have to be horizontal / vertical |

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| | | - only straight lines can be parallel<br>- all triangles have rotational symmetry of order 3<br><br>• Some pupils may think that all trapezia are isosceles<br>• Some pupils may think that a diagonal cannot be horizontal or vertical<br>• Two line segments that do not touch are perpendicular if they would meet at right angles when extended. Therefore, the diagonals of an arrowhead (delta) are perpendicular despite what some pupils may think<br><br>• Some pupils may write amounts of money incorrectly; e.g. £3.5 for £3.50, especially if a calculator is used at any point<br>• Some pupils may apply an incorrect understanding that there are 100 minutes in a hour when solving problems<br>• Some pupils may struggle when converting between 12- and 24-hour clock notation; e.g. thinking that 15:00 is 5 o' clock<br>• Some pupils may use the wrong scale of a protractor. For example, they measure an obtuse angle as 60° rather than 120°.<br><br>• Some pupils may think it's the 'base' angles of an isosceles that are always equal. For example, they may think that a = b rather than a = c. |

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| | | • Some pupils may use the sloping height when finding the areas of parallelograms, triangles and trapezia<br>• Some pupils may think that the area of a triangle is found using area = base × height<br>• Some pupils may think that you multiply all the numbers to find the area of a shape<br>• Some pupils may confuse the concepts of surface area and volume<br>Some pupils may only find the area of the three 'distinct' faces when finding surface area<br><br>• Some pupils will wrestle with the idea that a line x = a is parallel to the y-axis<br>• 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.<br>• When reflecting a shape in a diagonal mirror line some students may draw a translation<br>• Some pupils may think that the centre of rotation is always in the centre of the shape<br>• Some pupils will confuse the order of x- and y-coordinates<br>When constructing axes, some pupils may not realise the importance of equal divisions on the axes |

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| Assessment timeline: |
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| • 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.<br>• Pre-checks are conducted at the start of the topic to test student prior knowledge. This informs lesson planning and delivery.<br>• Tracking assessments are conducted once a term with end of year formal exams, for reporting and checking cumulative knowledge.<br>• Testing data leads to discussions about setting, intervention groups and individual in-class intervention.<br>• 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.<br>• Teachers have the autonomy to use whichever resource they wish within the criteria set for the topic.<br>• Students have access to lots of resources at home, including: Kerboodle, MyMaths, Mathswatch, PiXL Maths APP, PiXL Tmes Table App.<br>• |
| **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 |
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| **Unit:** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |