

## OCL Maths Curriculum: Long Term Plan

### YEAR 7 (MATHS MASTERY 2023/24)

In this year we reinforce and build on the knowledge and skills students have developed in the primary curriculum, and begin to extend the big ideas from the Primary curriculum into our core concepts. In Autumn 1, we use **multiple representations** to build **conceptual understanding** of number and number properties in students schemas. Moving through to Autumn 2, for many students this is the first time they will be introduced to algebra formally. In their Primary education they will have seen and understood the idea of a “missing number” or “unknown”, and may have seen inequality signs, but tier 2 and tier 3 language like “co-efficient, variable, equation, inequality, expression, term, constant” will be new, so careful attention to modelling **mathematical language and notation**, and a focus on building **fluency** in basic algebra skills will be crucial. Moreover, a **conceptual understanding** of algebra as a generalised version of arithmetic will develop by building on the work done in Autumn 1. In Spring 1 and Spring 2 students learn about Geometry for the first time at Secondary. They build on their understanding of shape, space, and basic transformations to understand more formal ideas like the Cartesian plane. In this term students will properly encounter many of the of the higher-level core concepts like **mathematical reasoning** and **problem-solving**. In Summer 1, students build on the **conceptual understanding** that was built in Y7 Autumn 1 to develop **fluency** in operations on fractions. Finally, in Summer 2, students’ **mathematical thinking** is focused on, as students are required to **think proportionally** in different scenarios, and with different **mathematical language and notation**.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Relevant core concepts (strands)</b>	<b>Number</b> Making generalisations about the number system (1)	<b>Algebra</b> Making generalisations about the number system (2)	<b>Geometry and measures</b> 2D Geometry	<b>Geometry and measures</b> The Cartesian plane	<b>Number</b> Fractions	<b>Ratio and Proportion</b> Ratio & Percentages
<b>Relevant end points</b>	- consolidating their numerical and mathematical capability and extending their understanding of the number system to include powers and roots	-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships	-reasoning deductively in geometry including using geometrical constructions	-use language and properties precisely to analyse 2-D shapes	-consolidating their numerical and mathematical capability and extending their understanding of the number system	-Extending and formalising their knowledge of ratio and proportion and formulating proportional relations
<b>Declarative knowledge</b> “Facts and formulae”	<p><b>Unit 1 - numbers and numerals</b></p> <ul style="list-style-type: none"> <li>We use a base 10 number system.</li> <li>Place value can be represented pictorially.</li> </ul> <p><b>Unit 2 - axioms and arrays</b></p> <ul style="list-style-type: none"> <li>Multiplication can be represented pictorially as arrays and bar models.</li> <li>Multiplication has associative, commutative and distributive properties.</li> </ul> <p><b>Unit 3 - factors and multiples</b></p> <ul style="list-style-type: none"> <li>Prime numbers have two distinct factors.</li> <li>Integers share common multiples.</li> </ul> <p><b>Unit 4 - order of operation</b></p> <ul style="list-style-type: none"> <li>Addition and subtraction have equal priority.</li> <li>Multiplication and division have equal priority.</li> </ul>	<p><b>Unit 5 - positive and negative numbers</b></p> <ul style="list-style-type: none"> <li>Negative numbers can be represented on a number line</li> </ul> <p><b>Unit 6 - expressions, equations, inequalities</b></p> <ul style="list-style-type: none"> <li>Know the difference between an expression, equation and inequality</li> <li><math>a \times b = ab</math>, <math>y + y + y = 3y</math>, <math>a \times a = a^2</math>, <math>a/b = a \div b</math></li> </ul>	<p><b>Unit 7 – angles</b></p> <ul style="list-style-type: none"> <li>Angles at a point sum to 360, adjacent angles on a straight-line sum to 180, vertically opposite angles are equal.</li> <li>Alternate and corresponding angles are equal</li> <li>Co-interior angles sum to 180</li> </ul> <p><b>Unit 8 – classifying 2D shapes</b></p> <ul style="list-style-type: none"> <li>The interior angles of a triangle sum to 180.</li> <li>The interior angles of a quadrilateral sum to 360.</li> <li>A kite has two pairs of sides of equal length.</li> <li>A rhombus has sides of equal length and no right angles.</li> <li>A trapezium has one pair of parallel sides.</li> </ul> <p><b>Unit 9 - constructing triangles and quadrilaterals</b></p> <ul style="list-style-type: none"> <li>Triangles can be constructed with SSS, SAS, ASA.</li> <li>Congruent triangles have the same size angles and lengths.</li> </ul>	<p><b>Unit 10 - co-ordinates</b></p> <ul style="list-style-type: none"> <li>Coordinates are written in the form (x,y)</li> <li>Equations of horizontal lines are written in the form <math>y = n</math></li> <li>Equations of vertical lines are written in the form <math>x = n</math>.</li> </ul> <p><b>Unit 11 - area of 2D shapes</b></p> <ul style="list-style-type: none"> <li>The formula for the area of a rectangle is <math>l \times w</math>.</li> <li>The formula for the area of a triangle is <math>\frac{1}{2} \times b \times h</math>.</li> </ul> <p><b>Unit 12 - transforming 2D figures</b></p> <ul style="list-style-type: none"> <li>Rotation needs direction and size.</li> <li>Enlargement needs a scale factor and centre.</li> <li>Reflection needs a line of symmetry.</li> <li>Translation needs a vector.</li> </ul>	<p><b>Unit 13 - prime factor decomposition</b></p> <ul style="list-style-type: none"> <li>Repeated multiplication is represented by powers.</li> </ul> <p><b>Unit 14 - equivalent fractions</b></p> <ul style="list-style-type: none"> <li>Fractions can be represented as area diagrams and bar models.</li> </ul> <p><b>Unit 15 - all operations acting on fractions</b></p> <ul style="list-style-type: none"> <li>Fractions have a numerator and denominator.</li> <li>The place values after a decimal point are <math>1/10</math>, <math>1/100</math>, <math>1/1000</math> and get ten times smaller.</li> </ul>	<p><b>Unit 16 - introduction to ratio</b></p> <ul style="list-style-type: none"> <li>Ratio is written in the form a:b</li> </ul> <p><b>Unit 17 - percentages</b></p> <ul style="list-style-type: none"> <li>Percentage is a fractional operator with a denominator of 100</li> </ul>

<p><b>Procedural knowledge</b></p> <p>“Methods”</p>	<p><b>Unit 1 - numbers and numerals</b></p> <ul style="list-style-type: none"> <li>To read time from a digital display and an analogue display.</li> <li>To use the four operations with decimals.</li> </ul> <p><b>Unit 2 - axioms and arrays</b></p> <ul style="list-style-type: none"> <li>To multiply numbers.</li> <li>To use the distributive property of multiplication.</li> </ul> <p><b>Unit 3 - factors and multiples</b></p> <ul style="list-style-type: none"> <li>To represent integers as products of factors, pictorially and abstractly.</li> </ul> <p><b>Unit 4 - order of operation</b></p> <ul style="list-style-type: none"> <li>To use order of operations of equal priority.</li> <li>To use calculations involving brackets.</li> </ul>	<p><b>Unit 5 - positive and negative numbers</b></p> <ul style="list-style-type: none"> <li>To use a number line to represent addition and subtraction of negative numbers</li> </ul> <p><b>Unit 6 - expressions, equations, inequalities</b></p> <ul style="list-style-type: none"> <li>To equate expanded and factorised forms using the distributive property e.g., <math>3(a+b) = 3a + 3b</math></li> <li>To substitute numerical values into expressions and evaluate.</li> <li>To represent algebraic expressions using bar models</li> </ul>	<p><b>Unit 7 – angles</b></p> <ul style="list-style-type: none"> <li>To find a missing angle at a point, on a straight line, in parallel lines.</li> </ul> <p><b>Unit 8 – classifying 2D shapes</b></p> <ul style="list-style-type: none"> <li>To find missing angles in triangles and quadrilaterals.</li> </ul> <p><b>Unit 9 - constructing triangles and quadrilaterals</b></p> <ul style="list-style-type: none"> <li>To construct a triangle using SSS, SAS, ASA.</li> <li>To construct a quadrilateral.</li> </ul>	<p><b>Unit 10 - co-ordinates</b></p> <ul style="list-style-type: none"> <li>To find the mid-point of a line segment between two points.</li> <li>To recognise and plot horizontal and vertical lines on a coordinate axis.</li> </ul> <p><b>Unit 11 - area of 2D shapes</b></p> <ul style="list-style-type: none"> <li>To rearrange formula to make a different subject.</li> <li>Use the formula to find the area of a triangle.</li> </ul> <p><b>Unit 12 - transforming 2D figures</b></p> <ul style="list-style-type: none"> <li>Reflect a shape in a line of reflection</li> <li>Enlarge a shape by a given scale factor</li> <li>Rotate a shape from a centre of enlargement.</li> <li>Translate a shape by a given number of units in the x and y direction.</li> </ul>	<p><b>Unit 13 - prime factor decomposition</b></p> <ul style="list-style-type: none"> <li>To find the prime factors of a number using prime factor decomposition.</li> <li>To find the HCF and LCM of a pair of numbers using prime factor decomposition.</li> </ul> <p><b>Unit 14 - equivalent fractions</b></p> <ul style="list-style-type: none"> <li>To express equivalent fractions.</li> <li>To convert fractions to decimals and percentages.</li> <li>Convert mixed numbers to improper fractions.</li> <li>Express one quantity as a fraction of another.</li> </ul> <p><b>Unit 15 - all operations acting on fractions</b></p> <ul style="list-style-type: none"> <li>Find a fraction of a quantity</li> <li>Use four operations with fractions.</li> <li>Use four operations with decimals.</li> </ul>	<p><b>Unit 16 - introduction to ratio</b></p> <ul style="list-style-type: none"> <li>Represent ratio pictorially with bar models.</li> <li>Express ratios involving rational numbers in their simplest form.</li> </ul> <p><b>Unit 17 - percentages</b></p> <ul style="list-style-type: none"> <li>To express one quantity as a percentage of another.</li> <li>Find a percentage increase or decrease without a calculator.</li> <li>Find a percentage of an amount without a calculator.</li> </ul>
<p><b>Conditional knowledge</b></p> <p>“Strategies”</p>	<p><b>Unit 1 - numbers and numerals</b></p> <ul style="list-style-type: none"> <li>To use the four operations with decimals to make a calculation easier.</li> </ul> <p><b>Unit 2 - axioms and arrays</b></p> <ul style="list-style-type: none"> <li>To use the associative, commutative and distributive properties to help solve problems</li> </ul> <p><b>Unit 3 - factors and multiples</b></p> <ul style="list-style-type: none"> <li>To use factors to spot patterns in numbers.</li> </ul> <p><b>Unit 4 - order of operation</b></p> <ul style="list-style-type: none"> <li>To use the distributive property of multiplication to find areas of rectilinear shapes.</li> </ul>	<p><b>Unit 5 - positive and negative numbers</b></p> <ul style="list-style-type: none"> <li>Values may be negative, and when to use the four operations.</li> </ul> <p><b>Unit 6 - expressions, equations, inequalities</b></p> <ul style="list-style-type: none"> <li>To construct an equation, expression, or inequality in different contexts.</li> </ul>	<p><b>Unit 7- angles</b></p> <ul style="list-style-type: none"> <li>To use angle facts to solve problems</li> </ul> <p><b>Unit 8 - classifying 2D shapes</b></p> <ul style="list-style-type: none"> <li>To use angle facts and properties of 2D shapes to solve problems</li> <li>To construct an equation or expression to help solve a problem.</li> </ul> <p><b>Unit 9 - constructing triangles and quadrilaterals</b></p> <ul style="list-style-type: none"> <li>To use knowledge of congruent triangles to compare shapes.</li> </ul>	<p><b>Unit 10 - co-ordinates</b></p> <ul style="list-style-type: none"> <li>To use equations of horizontal and vertical lines to solve problems on a cartesian plane.</li> </ul> <p><b>Unit 11 - area of 2D shapes</b></p> <ul style="list-style-type: none"> <li>To split compound shapes into rectangles/triangles/parallelograms in order to solve a problem.</li> </ul> <p><b>Unit 12 - transforming 2D figures</b></p> <ul style="list-style-type: none"> <li>To combine transformations to produce a desired image.</li> </ul>	<p><b>Unit 13 - prime factor decomposition</b></p> <ul style="list-style-type: none"> <li>To use prime factorisation to solve problems.</li> </ul> <p><b>Unit 14 - equivalent fractions</b></p> <ul style="list-style-type: none"> <li>Convert between fractions, decimals and percentages to solve problems.</li> </ul> <p><b>Unit 15 - all operations acting on fractions</b></p> <ul style="list-style-type: none"> <li>To multiply with fraction to solve a problem.</li> </ul>	<p><b>Unit 16 - introduction to ratio</b></p> <ul style="list-style-type: none"> <li>Identify proportionate relationships between values to solve problems.</li> </ul> <p><b>Unit 17 - percentages</b></p> <ul style="list-style-type: none"> <li>Use find a percentage of a value to solve problems.</li> </ul>

**YEAR 8 (MATHS MASTERY 2023/24)**

In year 8, we build on the strong foundations of **fluency** and **conceptual understanding** built in Y7 to explore some of the more advanced core concepts, and brand-new mathematical ideas. In Autumn 1, students explore sequences, and develop their **conceptual understanding** of algebra as a generalised arithmetic, by understanding how to algebraically describe the number sequences they encountered in their Primary education. Later in the half term, students build on the fluency in algebra they built in Y7 Autumn 2 to *form* and solve equations and inequalities, and in doing so build their **mathematical reasoning**, and **problem-solving** abilities. In Autumn 2, students' schemas around algebra are extended to include geometric interpretations of the equations they have been solving so far. This unit is also an application of the knowledge they have about the cartesian plane from Y7 Spring 2. In teaching students how to link these ideas, **mathematical language, representation and notation** will be crucial, as will a **conceptual understanding** of graphs as an infinity of individual coordinates. In Spring 1, students revisit the core concept of **proportional thinking** (from Y7 Summer 2), and apply the knowledge about graphs they have just learned in Y8 Autumn 2, to come to develop their **mathematical reasoning** in the arena of direct and inverse proportion. As with many units concerning ratio and proportion, fluency in the fundamental skills will be an important 'barrier to entry'. To support with this, the use of **multiple representations**, a focus on **mathematical language**, to build **conceptual understanding** will be important to teaching. In Spring 2, students encounter the curriculum area of probability and statistics for the first time in their lives. This is no longer covered in the Primary curriculum, and therefore, an extreme clarity in the **mathematical language** we introduce will be crucial to developing strong foundational understanding. Finally, in Summer 1 and Summer 2, students build on the 2 half-terms of geometry they learned in Y7, deepening their **fluency** and **mathematical thinking**, and extending these ideas to yet more formal contexts. This term will be an important term in developing students **problem-solving** skills, and supporting students to present their work in a way that supports clarity in their **mathematical reasoning**.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Relevant core concepts (strands)	Number + Algebra Equations and inequalities	Algebra + Ratio and Proportion Graphs	Ratio and Proportion + Number Proportional Reasoning + Estimation	Probability & Statistics Representations and reasoning with data	Geometry and measures Angles	Geometry and measures Area, volume and surface area
Relevant end points	-consolidating their numerical and mathematical capability and extending their understanding of the number system  -consolidating their algebraic capability and extend their understanding of algebraic simplification and manipulation	-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships  -Identify the connection between ratio and different forms, such as equations and fractions, and develop fluency in converting between them	-Extending and formalising their knowledge of ratio and proportion and formulating proportional relations  - selecting and using appropriate calculation strategies to solve increasingly complex problems and use application and interpretation of limits of accuracy	-use language and properties precisely to analyse probability and statistics  -exploring what can and cannot be inferred in statistical and probabilistic settings and express their arguments formally.	-reasoning deductively in geometry including using geometrical constructions  -begin to model situations mathematically and express the results using a range of formal mathematical representations	- using mathematical language and properties precisely.  -selecting and using appropriate calculation strategies to solve increasingly complex problems, including exact calculations involving multiples of $\pi$ .
Declarative knowledge "Facts and formulae"	<b>Unit 1 – Sequences</b> <ul style="list-style-type: none"> <li>Understand linear sequences as patterns within number grid columns</li> <li>Know the features of linear and non-linear sequences</li> </ul> <b>Unit 2 - Forming and Solving equations</b> <ul style="list-style-type: none"> <li>Understand equality in algebraic relationships</li> <li>Recognise linear equations</li> </ul> <b>Unit 3 – forming and solving inequalities</b> <ul style="list-style-type: none"> <li>Inequalities are the relationships between two expressions which are not equal to one another</li> <li>Know the inequality symbols i.e. <math>&lt;, &gt;, \leq, \geq</math></li> <li>know different representations of inequalities</li> </ul>	<b>Unit 4 – linear graphs and identify key features of linear graphs</b> <ul style="list-style-type: none"> <li>Equations of horizontal lines are written in the form <math>y = n</math></li> <li>Equations of vertical lines are written in the form <math>x = n</math>.</li> <li>know that parallel lines have the same gradient</li> </ul> <b>Unit 5 – ratio and problem solving</b> <ul style="list-style-type: none"> <li>Understand the relationship between ratio and other proportional descriptors</li> <li>Convert between ratio and fraction writing one part of a ratio as a fraction of another</li> <li>Convert between ratio and equation</li> </ul> <b>Unit 6 - Real life graphs and rate</b>	<b>Unit 7 – direct and inverse proportion</b> <ul style="list-style-type: none"> <li>Understand multiplicative relationships</li> <li>Know the key features of directly and inversely proportional relationships</li> </ul> <b>Unit 8 – accuracy and estimation</b> <ul style="list-style-type: none"> <li>know the definition of decimal places, significant figures, and truncation</li> </ul>	<b>Unit 9 – univariate data</b> <ul style="list-style-type: none"> <li>Differentiate between different types of data</li> <li>Understand that the mean is a way of sharing out equally</li> <li>Understand mean, median, mode and range</li> </ul> <b>Unit 10 – bivariate data</b> <ul style="list-style-type: none"> <li>Understand that bivariate data has each data entry has 2 connected values</li> <li>Know the different types of correlations</li> <li>Know that scatter graphs help make predictions about hypothetical data</li> </ul>	<b>Unit 11 – angles in parallel lines and polygons</b> <ul style="list-style-type: none"> <li>Know what is meant by a polygon, an interior angle, and develop a sense of an interior angle of a polygon.</li> </ul> <b>Unit 12 – bearings</b> <ul style="list-style-type: none"> <li>know bearing conventions and notation</li> <li>know that bearings can form part of a position description</li> </ul>	<b>Unit 13 – circles</b> <ul style="list-style-type: none"> <li>Understand Pi as the ratio between diameter and circumference</li> </ul> <b>Unit 14 – 3D Shapes</b> <ul style="list-style-type: none"> <li>Know that solid shapes have three dimensions</li> <li>Know the key features of 3D shapes</li> </ul> <b>Unit 15 – surface area and volume of prisms</b> <ul style="list-style-type: none"> <li>Understand the concept of volume and surface area</li> <li>Know that volume of prism = Area of cross section <math>\times</math> depth</li> </ul>

		<ul style="list-style-type: none"> <li>Understand graphical representation of (changing) rate</li> <li>Understand rate as one measure per another</li> </ul>				
<p><b>Procedural knowledge</b></p> <p>“Methods”</p>	<p><b>Unit 1 – Sequences</b></p> <ul style="list-style-type: none"> <li>Make links between linear sequences and number grids</li> <li>Form and generalise position to term rules</li> <li>Represent sequences abstractly and pictorially</li> </ul> <p><b>Unit 2 - Forming and Solving equations</b></p> <ul style="list-style-type: none"> <li>Solve simple linear equations</li> <li>Form and solve linear equations with unknown on both sides</li> </ul> <p><b>Unit 3 – forming and solving inequalities</b></p> <ul style="list-style-type: none"> <li>Test and solve linear inequalities</li> <li>Solve inequalities with unknown on both sides</li> </ul>	<p><b>Unit 4 – linear graphs and identify key features of linear graphs</b></p> <ul style="list-style-type: none"> <li>Identify the equations of horizontal and vertical lines</li> <li>Plot coordinates from a rule</li> <li>Identify key features of a linear graphs</li> <li>Find the gradient and the y-intercept and write it in the form <math>y = mx + c</math></li> <li>Find equations of parallel lines</li> </ul> <p><b>Unit 5 – ratio and problem solving</b></p> <ul style="list-style-type: none"> <li>Use bar models and equivalence to solve ratio problems</li> <li>Relate ratios and other proportional descriptions</li> </ul> <p><b>Unit 6 - Real life graphs and rate</b></p> <ul style="list-style-type: none"> <li>Interpret and express graphical linear relationships</li> <li>Describe, compare and visualise changing rates</li> <li>Calculate distance, speed and time</li> <li>Draw and interpret displacement-time graphs</li> </ul>	<p><b>Unit 7 – direct and inverse proportion</b></p> <ul style="list-style-type: none"> <li>Identify and use scale factor and constant of proportionality to find missing values in direct and inverse proportional relationships</li> <li>Use algebraic notation to describe directly and inversely proportional relationships</li> </ul> <p><b>Unit 8 – accuracy and estimation</b></p> <ul style="list-style-type: none"> <li>Round numbers to a required decimal place and significant figures</li> <li>Identify errors and write it as an error interval including truncation</li> <li>Identify and reason if an estimate is an over- or under-estimate</li> </ul>	<p><b>Unit 9 – univariate data</b></p> <ul style="list-style-type: none"> <li>Identify different types of data</li> <li>Interpret and represent data in different ways</li> <li>Calculate averages from a given set of data</li> <li>Find mean from frequency tables</li> <li>Compare data sets</li> </ul> <p><b>Unit 10 – bivariate data</b></p> <ul style="list-style-type: none"> <li>Represent bivariate data with a scatter diagram and read data from a scatter diagram</li> <li>Draw and use lines of best fit</li> <li>Identify different types of correlations from a scatter diagram</li> </ul>	<p><b>Unit 11 – angles in parallel lines and polygons</b></p> <ul style="list-style-type: none"> <li>Use triangles to find the sum of interior angles of any polygons</li> <li>Find missing angles in polygons</li> <li>Find exterior angles in any polygon</li> <li>Calculate problems with interior and exterior angles</li> </ul> <p><b>Unit 12 – bearings</b></p> <ul style="list-style-type: none"> <li>Use bearing notations and conventions</li> <li>Describe a position using bearing and direction</li> <li>Find missing angle in bearing problems</li> <li>Generalise and spot patterns with bearings A from B and B from A.</li> </ul>	<p><b>Unit 13 – circles</b></p> <ul style="list-style-type: none"> <li>Calculate circumference and arc lengths</li> <li>Calculate areas of circles and sectors and compound shapes</li> </ul> <p><b>Unit 14 – 3D Shapes</b></p> <ul style="list-style-type: none"> <li>Identify 3D solids and its key features</li> <li>Visualise and represent 3D shapes as a net</li> <li>Identify and create plans and elevation drawings</li> </ul> <p><b>Unit 15 – surface area and volume of prisms</b></p> <ul style="list-style-type: none"> <li>Find surface areas of cube, cuboids and cylinders</li> <li>Find volumes of cuboids, prisms and cylinders</li> </ul>
<p><b>Conditional knowledge</b></p> <p>“Strategies”</p>	<p><b>Unit 1 – Sequences</b></p> <ul style="list-style-type: none"> <li>Reason with a variety of sequences and representations</li> </ul> <p><b>Unit 2 - Forming and Solving equations</b></p> <ul style="list-style-type: none"> <li>Manipulate pictorial and abstract algebraic representations</li> <li>Use algebraic relationships embedded within various contexts</li> </ul> <p><b>Unit 3 – forming and solving inequalities</b></p> <ul style="list-style-type: none"> <li>Manipulate different representations of inequality from a range of contexts</li> <li>Manipulate inequalities and explore the conditions for preservation of the relationship</li> </ul>	<p><b>Unit 4 – linear graphs and identify key features of linear graphs</b></p> <ul style="list-style-type: none"> <li>Make links between the graphical and the algebraic representation of a linear graph</li> </ul> <p><b>Unit 5 – ratio and problem solving</b></p> <ul style="list-style-type: none"> <li>Solve problems involving contexts relating to ratio</li> </ul> <p><b>Unit 6 - Real life graphs and rate</b></p> <ul style="list-style-type: none"> <li>Contextualise speed and compare it in different measures</li> </ul>	<p><b>Unit 7 – direct and inverse proportion</b></p> <ul style="list-style-type: none"> <li>Solve problems involving directly and inversely proportional relationships in various contexts</li> </ul> <p><b>Unit 8 – accuracy and estimation</b></p> <ul style="list-style-type: none"> <li>Estimate quantities in a variety of contexts including area and perimeter</li> </ul>	<p><b>Unit 9 – univariate data</b></p> <ul style="list-style-type: none"> <li>Analyse data in multiple representations</li> <li>Use the mean to solve problems</li> </ul> <p><b>Unit 10 – bivariate data</b></p> <ul style="list-style-type: none"> <li>Reason mathematically to discuss correlations versus causation</li> </ul>	<p><b>Unit 11 – angles in parallel lines and polygons</b></p> <ul style="list-style-type: none"> <li>Solve problems involving interior and exterior angles in polygons</li> </ul> <p><b>Unit 12 – bearings</b></p> <ul style="list-style-type: none"> <li>Find missing angle problems involving bearings</li> <li>Deduce possible locations involving loci and bearings</li> </ul>	<p><b>Unit 13 – circles</b></p> <ul style="list-style-type: none"> <li>Solve problems involving circles</li> </ul> <p><b>Unit 14 – 3D Shapes</b></p> <ul style="list-style-type: none"> <li>Solve problems involving 3D shapes</li> </ul> <p><b>Unit 15 – surface area and volume of prisms</b></p> <ul style="list-style-type: none"> <li>Solve problems involving volume and surface area in a variety of contexts</li> </ul>

**YEAR 9 (OCL LTP 2023-24)**

In year 9, students have spent 2 years developing a **conceptual understanding** of many of the central ideas in number, algebra, and ratio, as well as **fluency** in many of the skills necessary to achieve at KS4. This year, this knowledge and these skills are utilised to explore more advanced and ‘exotic’ areas of Mathematics, as students prepare to begin studying the formal Mathematics of GCSE Maths next year. In Autumn 1, students are exposed to a variety of curriculum areas which cement their **fluency** and **conceptual understanding** in preparation for the more advanced ideas in the rest of Y9. In Autumn 2, students’ understanding of algebra is deepened and extended as they reason with purely abstract ideas, including changing the subject, and algebraic factorisation. In this half term, **mathematical thinking** and **mathematical reasoning** feature prominently. These algebraic ideas are built on in Spring 2, when graphs are studied as an alternative **representation** of the equations and inequalities they have come to manipulate **fluently**. In Spring 1, and Summer 1, students’ build on the large maps of geometry knowledge they have built over their education to encounter more nuanced **problem-solving** in spring 1, including forming and solving equations, before brand new ideas are introduced in Trigonometry. Students need to **reason mathematically** and have a **fluent, conceptual understanding** of many previous areas of the curriculum to access this well – including congruence and similarity from Y9 Spring 1, equations and algebraic manipulation from Y9 Autumn 2, and on all occasions before that as their algebraic skills developed, and number skills from across Y7 and Y8. Finally, in Summer 2, students’ meet mathematical Probability for the first time. They build on their understanding of data from Y8 Spring 2 to develop a **conceptual understanding** of the difference between experimental and theoretical probability, and develop **fluency** in using the different tables and graphs which **represent** the data.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Relevant core concepts (strands)</b>	Algebra + Ratio and Proportion + Number	Algebra + Probability	Geometry and measures + Number	Algebra	Geometry and measures	Statistics & Probability
<b>Relevant end points</b>	<ul style="list-style-type: none"> <li>-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships</li> <li>-consolidating their numerical and mathematical capability and extending their understanding of the number system to include powers and roots</li> <li>-Extending and formalising their knowledge of ratio and proportion and formulating proportional relations</li> </ul>	<ul style="list-style-type: none"> <li>-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships</li> <li>-use language and properties precisely to analyse probability and statistics</li> </ul>	<ul style="list-style-type: none"> <li>- reasoning deductively in geometry including using geometrical constructions</li> <li>-begin to model situations mathematically and express the results using a range of formal mathematical representations</li> <li>- selecting and using appropriate calculation strategies to solve increasingly complex problems and use application and interpretation of limits of accuracy</li> </ul>	<ul style="list-style-type: none"> <li>-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships</li> <li>- extend their mathematical fluency from previous years and extend their understanding of algebraic simplification and manipulation to include quadratic expressions, {and expressions involving surds and algebraic fractions}</li> </ul>	<ul style="list-style-type: none"> <li>-use language and properties precisely to analyse 2-D and 3-D shapes</li> <li>-begin to model situations mathematically and express the results using a range of formal mathematical representations</li> </ul>	<ul style="list-style-type: none"> <li>-use language and properties precisely to analyse probability and statistics</li> <li>-exploring what can and cannot be inferred in statistical and probabilistic settings and express their arguments formally</li> <li>-assessing the validity of an argument and the accuracy of a given way of presenting information</li> </ul>
<b>Declarative knowledge “Facts and formulae”</b>	<p><b>Unit 1 – Coordinates</b></p> <ul style="list-style-type: none"> <li>Know the difference between the x and y coordinates</li> </ul> <p><b>Unit 2 – Linear Graphs Parallel and perpendicular lines</b></p> <ul style="list-style-type: none"> <li>Identify the equations of horizontal and vertical lines</li> </ul> <p><b>Unit 3 – Direct, Inverse Proportion</b></p> <ul style="list-style-type: none"> <li>Recognise when two quantities are directly or inversely proportional to each other</li> <li>Recognise the graphical representation of a proportional relationship</li> </ul> <p><b>Unit 4 – Standard Form</b></p> <ul style="list-style-type: none"> <li>Describe the rule for writing numbers in standard form</li> </ul>	<p><b>Unit 5 – Simplifying algebraic expressions &amp;</b></p> <ul style="list-style-type: none"> <li>Differentiate between expanding brackets and factorising expressions</li> </ul> <p><b>Unit 6: Linear equations</b></p> <ul style="list-style-type: none"> <li>Recognise linear equations</li> </ul> <p><b>Unit 7 – Algebraic Manipulation</b></p> <ul style="list-style-type: none"> <li>Recognise expressions, equations and formulae</li> </ul> <p><b>Unit 8 – Probability</b></p> <ul style="list-style-type: none"> <li>Know that probability is a numerical measure of chance from 0 to 1 inclusive</li> <li>differentiate between theoretical and experimental probability</li> </ul>	<p><b>Unit 9 – Constructions and Loci</b></p> <ul style="list-style-type: none"> <li>know the difference between the term equidistant and loci</li> </ul> <p><b>Unit 10 – Congruence and Similarity</b></p> <ul style="list-style-type: none"> <li>know the difference between similarity and congruence</li> <li>Know the four conditions to test for congruency</li> <li>know that enlargement can produce a bigger shape as well as smaller shape</li> </ul> <p><b>Unit 11 – Triangles and Quadrilaterals</b></p> <ul style="list-style-type: none"> <li>know the properties of triangles and quadrilaterals</li> <li>know the meaning of Tessellation</li> </ul> <p><b>Unit 12 – upper and lower bounds</b></p>	<p><b>Unit 13 – Inequalities</b></p> <ul style="list-style-type: none"> <li>know the difference between an equation and an inequality</li> <li>Know different representations of inequalities</li> <li>Understand inequalities as representations of numerical relationships from a range of contexts</li> </ul> <p><b>Unit 14 – Simultaneous Equations</b></p> <ul style="list-style-type: none"> <li>Know that two equations with two unknowns can be solved simultaneously</li> </ul> <p><b>Unit 15 – Quadratic and other Graphs</b></p> <ul style="list-style-type: none"> <li>Know the key features of quadratic graphs</li> </ul>	<p><b>Unit 16 – Pythagoras</b></p> <ul style="list-style-type: none"> <li>Know Pythagoras theorem formula by understanding that the square of the hypotenuse is equal to the sum of the squares of the other two sides</li> </ul> <p><b>Unit 17 – Trigonometry</b></p> <ul style="list-style-type: none"> <li>know that every right-angled triangle is similar to a right-angled triangle drawn within a unit circle.</li> <li>know that the relationship between the opposite and adjacent is held constant by a set angle</li> </ul> <p><b>Unit 18 – Proof</b></p> <ul style="list-style-type: none"> <li>Know congruency conditions for triangles i.e. SSS, ASA, SAS, RHS</li> </ul>	<p><b>Unit 19 – Mean from Grouped Data</b></p> <ul style="list-style-type: none"> <li>Differentiate between different types of data</li> <li>Know the difference between mean, mode and median</li> <li>know why mean cannot be found from a grouped data and it can only be an estimated</li> </ul> <p><b>Unit 20 – Cumulative Frequency and Box Plots</b></p> <ul style="list-style-type: none"> <li>know the key features of cumulative frequency diagrams</li> <li>know the key features of box plots</li> </ul>

		<ul style="list-style-type: none"> <li>identify set notation for intersections, unions, complements and the universal set</li> </ul>	<ul style="list-style-type: none"> <li>know the difference between the bounds of discrete and continuous quantities</li> </ul>			
<p><b>Procedural knowledge</b></p> <p>“Methods”</p>	<p><b>Unit 1 – Coordinates</b></p> <ul style="list-style-type: none"> <li>Plot coordinates in all four quadrants</li> <li>Find the midpoint of a line segment joining two points</li> <li>Find an endpoint of a line segment, given the midpoint and one endpoint.</li> </ul> <p><b>Unit 2 – Linear Graphs Parallel and perpendicular lines</b></p> <ul style="list-style-type: none"> <li>Plot coordinates from a rule to generate a straight line</li> <li>Identify key features of a linear graph</li> <li>Identify parallel and perpendicular lines from algebraic equations</li> </ul> <p><b>Unit 3 – Direct, Inverse Proportion</b></p> <ul style="list-style-type: none"> <li>Solve proportion problems</li> </ul> <p><b>Unit 4 – Standard Form</b></p> <ul style="list-style-type: none"> <li>Use standard form to express very large and small numbers</li> <li>Convert between standard form and ordinary numbers</li> <li>Order large and small numbers</li> </ul>	<p><b>Unit 5 – Simplifying algebraic expressions &amp;</b></p> <ul style="list-style-type: none"> <li>Expand single and double brackets</li> <li>Factorise quadratic expressions where the coefficient of <math>x^2</math> is equal to 1.</li> </ul> <p><b>Unit 6: Linear equations</b></p> <ul style="list-style-type: none"> <li>Solve linear equations with one variable</li> <li>Solve unknowns on both sides</li> </ul> <p><b>Unit 7 – Algebraic Manipulation</b></p> <ul style="list-style-type: none"> <li>Write expressions, equations and formulae to represent relationships in a given context</li> <li>Use informal substitution to find the value of one variable given other values</li> <li>Make links between solving linear equations and rearranging formulae</li> </ul> <p><b>Unit 8 – Probability</b></p> <ul style="list-style-type: none"> <li>Be able to calculate the probability of single independent events</li> <li>Be able to calculate the probability of a pair of combined events</li> <li>Be able to identify and interpret sets described by notation and within Venn diagrams</li> <li>Be able to form and interpret Venn diagrams in the context of probability</li> </ul>	<p><b>Unit 9 – Constructions and Loci</b></p> <ul style="list-style-type: none"> <li>Use rulers, protractors and pairs of compasses accurately</li> <li>Construct triangles and quadrilaterals from given information</li> <li>Use the standard ruler and compass constructions for perpendicular bisector of a line segment and bisecting a given angle</li> </ul> <p><b>Unit 10 – Congruence and Similarity</b></p> <ul style="list-style-type: none"> <li>Recognise congruent shapes</li> <li>Enlarging shapes using scale factors and centre of enlargement; including fractional scale factors</li> </ul> <p><b>Unit 11 – Triangles and Quadrilaterals</b></p> <ul style="list-style-type: none"> <li>Investigate diagonals and lines of symmetry in quadrilaterals and triangles</li> <li>Investigate tessellations in triangles and quadrilaterals</li> </ul> <p><b>Unit 12 – upper and lower bounds</b></p> <ul style="list-style-type: none"> <li>Find the upper and lower bounds of a calculation using numbers that have been rounded to a given degree of accuracy</li> </ul>	<p><b>Unit 13 – Inequalities</b></p> <ul style="list-style-type: none"> <li>Test and solve linear inequalities</li> <li>Manipulate and explain different inequality representations</li> <li>Solve inequalities including with unknowns on both sides</li> <li>Manipulate inequalities and explore the conditions for preservation of the relationship</li> </ul> <p><b>Unit 14 – Simultaneous Equations</b></p> <ul style="list-style-type: none"> <li>Relate algebraic and graphical equations</li> <li>Form and solve two simultaneous equations in two variables (linear/linear) graphically and algebraically</li> </ul> <p><b>Unit 15 – Quadratic and other Graphs</b></p> <ul style="list-style-type: none"> <li>Draw quadratic graphs and identify key features of the graph</li> <li>Use quadratic graphs to find the approximate solution to quadratic equations</li> <li>Solve simultaneous equations with quadratics graphically</li> <li>Use and interpret real life graphs</li> </ul>	<p><b>Unit 16 – Pythagoras</b></p> <ul style="list-style-type: none"> <li>Find any missing length of a right-angled triangle</li> </ul> <p><b>Unit 17 – Trigonometry</b></p> <ul style="list-style-type: none"> <li>Find the length of catheti in right-angled triangles from a given angle and the length of the hypotenuse, including through using sine and cosine functions.</li> <li>Find the length of the opposite from the adjacent and given angle (and vice versa)</li> <li>Find any angle in a right-angled triangle from two known side lengths.</li> </ul> <p><b>Unit 18 – Proof</b></p> <ul style="list-style-type: none"> <li>Identify when two triangles are congruent</li> </ul>	<p><b>Unit 19 – Mean from Grouped Data</b></p> <ul style="list-style-type: none"> <li>Calculate estimated mean from grouped data</li> <li>Compare data distributions using mean and median</li> <li>draw and interpret stem and leaf diagrams</li> </ul> <p><b>Unit 20 – Cumulative Frequency and Box Plots</b></p> <ul style="list-style-type: none"> <li>draw and interpret cumulative frequency diagrams and box plots</li> <li>compare data from cumulative frequency diagram and box plot</li> </ul>
<p><b>Conditional knowledge</b></p> <p>“Strategies”</p>	<p><b>Unit 1 – Coordinates</b></p> <ul style="list-style-type: none"> <li>Solve problems using coordinate grids</li> </ul> <p><b>Unit 2 – Linear Graphs Parallel and perpendicular lines</b></p> <ul style="list-style-type: none"> <li>Make links between the graphical and the algebraic representation</li> </ul> <p><b>Unit 3 – Direct, Inverse Proportion</b></p> <ul style="list-style-type: none"> <li>Solve proportion problems</li> </ul>	<p><b>Unit 5 – Simplifying algebraic expressions &amp;</b></p> <ul style="list-style-type: none"> <li>Make links between area and perimeter and expanding brackets</li> </ul> <p><b>Unit 6: Linear equations</b></p> <ul style="list-style-type: none"> <li>Solve problems involving linear equations</li> </ul> <p><b>Unit 7 – Algebraic Manipulation</b></p>	<p><b>Unit 9 – Constructions and Loci</b></p> <ul style="list-style-type: none"> <li>Identify the loci of points and use these to solve problems</li> </ul> <p><b>Unit 10 – Congruence and Similarity</b></p> <ul style="list-style-type: none"> <li>Showing triangles are similar by understanding angle facts</li> <li>Prove pairs of triangles are congruent using SSS, ASA, AAS and RHS</li> </ul>	<p><b>Unit 13 – Inequalities</b></p> <ul style="list-style-type: none"> <li>Form and solve inequalities problems</li> </ul> <p><b>Unit 14 – Simultaneous Equations</b></p> <ul style="list-style-type: none"> <li>Recognise unfamiliar problems that involves forming and solving simultaneous equations</li> </ul> <p><b>Unit 15 – Quadratic and other Graphs</b></p>	<p><b>Unit 16 – Pythagoras</b></p> <ul style="list-style-type: none"> <li>Identify opportunities to use Pythagoras’s theorem in non-obvious contexts</li> <li>Understand that perpendicular lines are often an opportunity to use Pythagoras’ theorem</li> </ul> <p><b>Unit 17 – Trigonometry</b></p> <ul style="list-style-type: none"> <li>Identify opportunities to use trigonometry to find missing</li> </ul>	<p><b>Unit 19 – Mean from Grouped Data</b></p> <ul style="list-style-type: none"> <li>Solve problems involving finding mean from grouped data</li> </ul> <p><b>Unit 20 – Cumulative Frequency and Box Plots</b></p> <ul style="list-style-type: none"> <li>Solve problems with cumulative frequency diagram and box plot</li> </ul>

	<ul style="list-style-type: none"> <li>Interpret and use conversion graphs and other graphs of proportional relationships</li> </ul> <p><b>Unit 4 – Standard Form</b></p> <ul style="list-style-type: none"> <li>Use standard form to solve simple problems</li> <li>Use scales to solve distance and area problems in context</li> </ul>	<ul style="list-style-type: none"> <li>Manipulate familiar formulae such as known formulae for area and perimeter</li> </ul> <p><b>Unit 8 – Probability</b></p> <ul style="list-style-type: none"> <li>Experience representing probabilities and expected outcomes in different ways</li> </ul>	<p><b>Unit 11 – Triangles and Quadrilaterals</b></p> <ul style="list-style-type: none"> <li>Solve problems involving triangles and quadrilaterals</li> </ul> <p><b>Unit 12 – upper and lower bounds</b></p> <ul style="list-style-type: none"> <li>Solve problems involving upper and lower bounds</li> </ul>	<ul style="list-style-type: none"> <li>Solve problems involving quadratics in various contexts</li> </ul>	<p>sides and angles in non-obvious contexts</p> <p><b>Unit 18 – Proof</b></p> <ul style="list-style-type: none"> <li>Use congruent triangles to prove other geometric results</li> </ul>	
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**YEAR 10 (OCL LTP 2023-24)**

In Y10, students enter the first year of formal study for their GCSE. In many schools, students have been tiered into foundation or higher according to how well they fared with the more advanced topics in Y9. For students on both tiers, but particularly those on the foundation tier, core knowledge and skills are revisited, to ensure that students have the **fluency** and **conceptual understanding** necessary to access the entire KS4 curriculum. Having revisited knowledge and skills from KS3, students are equipped to fully explore the core concepts of **mathematical thinking**, **mathematical reasoning**, and **problem-solving**. This is done in every half term, as students build up to answering exam-style questions, and teachers model **mathematical language and notation** which is suitably formal for KS4.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Relevant core concepts (strands)</b>	<b>Number</b>	<b>Number + Probability &amp; Statistics</b>	<b>Algebra</b>	<b>Geometry and measures</b>	<b>Ratio and Proportion + Geometry and measures</b>	<b>Statistics &amp; Probability</b>
<b>Relevant end points</b>	<p>-consolidating their numerical and mathematical capability and extending their understanding of the number system to include powers and roots</p> <p>- selecting and using appropriate calculation strategies to solve increasingly complex problems</p>	<p>-consolidating their numerical and mathematical capability and extending their understanding of the number system</p> <p>-use language and properties precisely to analyse probability and statistics</p> <p>-exploring what can and cannot be inferred in statistical and probabilistic settings and express their arguments formally</p>	<p>- extend their mathematical fluency from previous years and extend their understanding of algebraic simplification and manipulation to include quadratic expressions, {and expressions involving surds and algebraic fractions}</p> <p>-develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems</p>	<p>-use language and properties precisely to analyse 2-D and 3-D shapes</p> <p>-begin to model situations mathematically and express the results using a range of formal mathematical representations</p>	<p>-develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics</p> <p>-begin to model situations mathematically and express the results using a range of formal mathematical representations</p>	<p>-use language and properties precisely to analyse probability and statistics</p> <p>-exploring what can and cannot be inferred in statistical and probabilistic settings and express their arguments formally.</p> <p>-assessing the validity of an argument and the accuracy of a given way of presenting information.</p>
<b>Declarative knowledge "Facts and formulae"</b>	<p><b>Unit 1 – factors, multiples and primes</b></p> <ul style="list-style-type: none"> <li>Know the definition of factors and multiples of a number</li> <li>know the definition of prime numbers and be able to recognise them</li> </ul> <p><b>Unit 2 – powers and roots</b></p> <ul style="list-style-type: none"> <li>Understand the meaning of powers and roots</li> </ul> <p><b>Unit 3 – indices</b></p> <ul style="list-style-type: none"> <li>Know the rules for indices with integer values</li> </ul> <p><b>Unit 4 – standard form</b></p> <ul style="list-style-type: none"> <li>Know the rules for writing a number in standard form</li> </ul> <p><b>Unit 5 – sequences</b></p> <ul style="list-style-type: none"> <li>Recognise and describe arithmetic and geometric sequences</li> <li>Recognise quadratic and Fibonacci-type sequences</li> </ul>	<p><b>Unit 6 – fractions, decimals and percentages</b></p> <ul style="list-style-type: none"> <li>Fractions, decimals and percentages are just different ways of expressing a proportion of a value</li> </ul> <p><b>Unit 7 – percentages</b></p> <ul style="list-style-type: none"> <li>Recognise the decimal multipliers for percentage increase or decrease</li> <li>Know the difference between simple and compound interest</li> </ul> <p><b>Unit 8 – probability, sets and Venn diagrams</b></p> <ul style="list-style-type: none"> <li>Know that <math>P(\text{Not } A) = 1 - P(A)</math></li> <li>know what is meant by relative frequency</li> <li>Understand why relative frequency is sometimes used as an estimate for probability</li> </ul>	<p><b>Unit 9 – algebra (KS3 review)</b></p> <ul style="list-style-type: none"> <li>know the difference between expressions, equations, formulae, inequalities and terms</li> </ul> <p><b>Unit 10 – quadratics</b></p> <ul style="list-style-type: none"> <li>know the key features of quadratic graphs</li> <li>Know what is meant by expand and factorise</li> </ul> <p><b>Unit 11 – quadratic graphs</b></p> <ul style="list-style-type: none"> <li>Recognise quadratic graphs</li> <li>Understand the concept of intercepts, line of symmetry and turning points of graphs of quadratic functions</li> </ul> <p><b>Unit 12 – simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Recognise a pair of simultaneous equation</li> </ul>	<p><b>Unit 13 – transformations</b></p> <ul style="list-style-type: none"> <li>Know that translation needs a vector.</li> <li>Know that reflection needs a line of symmetry.</li> <li>Know that rotation needs direction and size.</li> <li>Know that enlargement needs a scale factor and centre.</li> </ul> <p><b>Unit 14 – 2D shapes including circle geometry</b></p> <ul style="list-style-type: none"> <li>Know the formula for the area of triangles, parallelograms, and trapezia</li> <li>Know the formula for finding circumference and area of circles</li> <li>Recognise the centre, radius, chord, diameter, circumference, tangent, arc, sector and segment of circles</li> </ul> <p><b>Unit 15 – Pythagoras' Theorem review</b></p>	<p><b>Unit 18 – compound measure and direct and indirect proportion</b></p> <ul style="list-style-type: none"> <li>Know that <math>\text{Speed} = \text{Distance} \div \text{Time}</math></li> <li><math>\text{Density} = \text{Mass} \div \text{Volume}</math></li> <li><math>\text{Pressure} = \text{Force} \div \text{Area}</math></li> <li>Recognise the link between gradient and proportion</li> <li>Recognise direct and inverse proportion graphs</li> </ul> <p><b>Unit 19 – similarity and Trigonometry</b></p> <ul style="list-style-type: none"> <li>know the meaning of similarity</li> <li>Understand the link between similar triangles and trigonometry</li> <li>Know the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>;</li> <li>Know the exact value of <math>\tan \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math></li> </ul>	<p><b>Unit 20 – averages and range</b></p> <ul style="list-style-type: none"> <li>Know the difference between mean, median, mode and range</li> </ul> <p><b>Unit 21 – data collection and sampling</b></p> <ul style="list-style-type: none"> <li>Know different methods of data collection including surveys, questionnaires and the use of secondary data</li> <li>Know the difference between a sample and a population</li> <li>Know different types of sampling</li> </ul> <p><b>Unit 22 – presenting data including scatter graphs</b></p> <ul style="list-style-type: none"> <li>Recognise and know the difference between pictograms, bar charts (including comparative and stacked), pie charts and line graphs for time series data</li> <li>Know and recognise the different types of correlation</li> </ul>

		<ul style="list-style-type: none"> <li>know the multiplication rule for independent and dependent events</li> <li>know when events are mutually exclusive</li> </ul>		<ul style="list-style-type: none"> <li>Recall Pythagoras theorem formula by understanding that the square of the hypotenuse is equal to the sum of the squares of the other two sides</li> </ul> <p><b>Unit 16 – 3D shapes</b></p> <ul style="list-style-type: none"> <li>Recognise the vocabulary associated with 3D solids</li> </ul> <p><b>Unit 17 – volume and surface area</b></p> <ul style="list-style-type: none"> <li>Know the difference between volume and surface area</li> <li>Know the formulae for volume of cuboids and other right prisms (including cylinders), volume of spheres, pyramids and cones</li> </ul>		<ul style="list-style-type: none"> <li>Know that correlation does not imply causality</li> </ul>
<p><b>Procedural knowledge</b></p> <p><b>“Methods”</b></p>	<p><b>Unit 1 – factors, multiples and primes</b></p> <ul style="list-style-type: none"> <li>Find the factors and multiples of a number</li> <li>Find prime numbers</li> <li>Find the prime factors of a number</li> <li>Determine highest common factor (HCF) by prime factorisation</li> <li>Determine the lowest common multiple (LCM) by prime factorisation</li> </ul> <p><b>Unit 2 – powers and roots</b></p> <ul style="list-style-type: none"> <li>Recognise powers of 2, 3, 4, 5</li> <li>use positive integer powers and associated real roots (square, cube and higher)</li> </ul> <p><b>Unit 3 – indices</b></p> <ul style="list-style-type: none"> <li>Use the rules of indices with integer values</li> </ul> <p>-Multiplying numbers in index form -Dividing numbers in index form -Raising a power by a power -Negative powers -The power of zero -The power of 1</p> <p><b>Unit 4 – standard form</b></p> <ul style="list-style-type: none"> <li>Multiply and divide numbers by any power of 10</li> <li>Convert numbers to and from standard form</li> </ul>	<p><b>Unit 6 – fractions, decimals and percentages</b></p> <ul style="list-style-type: none"> <li>Recognise when fractions are equivalent</li> <li>Convert between improper fractions and mixed numbers</li> <li>Apply the four rules of number to fractions</li> <li>Find fractions of a quantity</li> <li>Convert between fractions, decimals and percentages</li> </ul> <p><b>Unit 7 – percentages</b></p> <ul style="list-style-type: none"> <li>Increase and decrease by a given percentage</li> <li>Express one number as a percentage of another, including percentage changes</li> <li>Find the original quantity using its final amount</li> </ul> <p><b>Unit 8 – probability, sets and Venn diagrams</b></p> <ul style="list-style-type: none"> <li>Find the probability of a single event when there are equally likely events</li> <li>Compare theoretical probability with result obtained by experiments</li> <li>Use the addition law for probability,</li> <li>Create and use frequency diagrams</li> </ul>	<p><b>Unit 9 – algebra (KS3 review)</b></p> <ul style="list-style-type: none"> <li>Simplify expressions</li> <li>Substitute into formulae</li> <li>Form simple expressions</li> <li>Form and solve linear equations in one variable</li> <li>Use algebraic notation, understanding input and output</li> <li>Simplify more complex algebraic expressions, including using powers multiplied over a single bracket</li> <li>Use reasoning to show whether two expressions are equivalent, so developing their understanding of an identity</li> <li>Rearrange formulae where the subject appears twice</li> </ul> <p><b>Unit 10 – quadratics</b></p> <ul style="list-style-type: none"> <li>Expand products of two binomials</li> <li>Factorise quadratic expressions of the form <math>x^2 + bx + c</math></li> <li>Recognise and factorise expressions in the form difference of two squares</li> <li>Solve quadratic equations of the form <math>x^2 + bx + c</math> by factorising</li> </ul> <p><b>Unit 11 – quadratic graphs</b></p>	<p><b>Unit 13 – transformations</b></p> <ul style="list-style-type: none"> <li>Translate a shape by a given vector</li> <li>Reflect a shape in a given line, including on a coordinate grid with lines defined algebraically</li> <li>Rotate a shape about a given centre</li> <li>Enlarge shapes, with or without a coordinate grid</li> <li>Find the centre of enlargement given a shape and its image</li> <li>Describe a single transformation using correct mathematical language</li> </ul> <p><b>Unit 14 – 2D shapes including circle geometry</b></p> <ul style="list-style-type: none"> <li>Round numbers to a given number of decimal places (review)</li> <li>Calculate the area of triangles, parallelograms, and trapezia</li> <li>Calculate the area of composite 2D shapes made of the above.</li> <li>Find the circumference and area of a circle</li> <li>Find the perimeter of composite 2D shapes</li> <li>Calculate the length of an arc and sector area of a circle</li> </ul>	<p><b>Unit 18 – compound measure and direct and indirect proportion</b></p> <ul style="list-style-type: none"> <li>Use and apply compound units such as density and pressure and Speed/distance/time</li> <li>Solve problems using unitary method</li> <li>Solve problems involving direct and inverse proportion in numerical and algebraic contexts</li> <li>Solve problems involving inverse proportion in contexts such as speed, distance and time</li> </ul> <p><b>Unit 19 – similarity and Trigonometry</b></p> <ul style="list-style-type: none"> <li>Find missing sides in pairs of similar shapes, including similar triangles</li> <li>Use the trigonometric ratios sin, cos and tan</li> <li>Derive and use the exact values of sin <math>\theta</math> and cos <math>\theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of tan <math>\theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math></li> </ul>	<p><b>Unit 20 – averages and range</b></p> <ul style="list-style-type: none"> <li>Calculate the mean, median and mode and range from a list</li> <li>Make comparisons between sets of data using summary statistics</li> <li>Calculate the mean, median and mode and range from a frequency table and charts</li> <li>Find estimates of the mean, median and range of grouped data</li> </ul> <p><b>Unit 21 – data collection and sampling</b></p> <ul style="list-style-type: none"> <li>Explore methods of data collection including surveys, questionnaires and the use of secondary data</li> <li>Classify and tabulate data</li> <li>Find the sizes of groups in a stratified sample</li> <li>Estimate population size using capture recapture sampling</li> </ul> <p><b>Unit 22 – presenting data including scatter graphs</b></p> <ul style="list-style-type: none"> <li>Interpret and construct: pictograms, bar charts (including comparative and stacked), pie charts, and line graphs for time series data</li> <li>Identify trends within time series</li> </ul>

	<ul style="list-style-type: none"> <li>Perform calculations involving standard form</li> <li>use a calculator when appropriate to calculate with standard form</li> </ul> <p><b>Unit 5 – sequences</b></p> <ul style="list-style-type: none"> <li>Find a formula for the nth term of arithmetic sequences</li> <li>Find a formula for the nth term of geometric sequences</li> </ul>	<ul style="list-style-type: none"> <li>Construct Venn diagrams and two-way tables to solve probability problems</li> <li>Construct tree diagrams to solve probability problems</li> </ul>	<ul style="list-style-type: none"> <li>Draw quadratic graphs</li> <li>Use quadratic graphs to find the approximate solution to quadratic equations</li> <li>Identify intercepts, and using symmetry, the turning points of graphs of quadratic functions</li> </ul> <p><b>Unit 12 – simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Solve simultaneous equations graphically</li> <li>Solve simultaneous equations algebraically</li> </ul>	<p><b>Unit 15 – Pythagoras’ Theorem review</b></p> <ul style="list-style-type: none"> <li>Find missing sides in right-angled triangles given the other two sides</li> <li>Identify whether a triangle is right-angled by considering the lengths of its sides</li> </ul> <p><b>Unit 16 – 3D shapes</b></p> <ul style="list-style-type: none"> <li>Interpret and construct plans and elevations of 3D solids</li> </ul> <p><b>Unit 17 – volume and surface area</b></p> <ul style="list-style-type: none"> <li>Convert between volume units</li> <li>Use formulae to calculate volume of cuboids and other right prisms (including cylinders), the surface area and volume of spheres, pyramids, cones and simple composite solids</li> </ul>	<ul style="list-style-type: none"> <li>Recognise when graphs and charts can be misleading</li> <li>Plot to identify correlation</li> <li>Draw (by eye) lines of best fit</li> <li>Interpret the graphs to make estimates, knowing the limitations of this</li> </ul>	
<p><b>Conditional knowledge</b></p> <p><b>“Strategies”</b></p>	<p><b>Unit 1 – factors, multiples and primes</b></p> <ul style="list-style-type: none"> <li>Solve problems involving highest common factor (HCF) and lowest common multiple (LCM)</li> </ul> <p><b>Unit 2 – powers and roots</b></p> <ul style="list-style-type: none"> <li>Solve area and volume problems involving squares and cubes</li> </ul> <p><b>Unit 3 – indices</b></p> <ul style="list-style-type: none"> <li>Apply all laws of indices with integer values</li> </ul> <p><b>Unit 4 – standard form</b></p> <ul style="list-style-type: none"> <li>Solve problems with numbers in standard form</li> </ul> <p><b>Unit 5 – sequences</b></p> <ul style="list-style-type: none"> <li>Solve problems involving sequences</li> </ul>	<p><b>Unit 6 – fractions, decimals and percentages</b></p> <ul style="list-style-type: none"> <li>Solve problems involving fractions</li> </ul> <p><b>Unit 7 – percentages</b></p> <ul style="list-style-type: none"> <li>Solve problems involving growth and decay including compound interest problems</li> </ul> <p><b>Unit 8 – probability, sets and Venn diagrams</b></p> <ul style="list-style-type: none"> <li>Use Venn diagrams to solve probability problems</li> <li>Construct Venn diagrams and two-way tables to solve probability problems</li> <li>Construct tree diagrams to solve probability problems</li> </ul>	<p><b>Unit 9 – algebra (KS3 review)</b></p> <ul style="list-style-type: none"> <li>Form and solve linear equations</li> </ul> <p><b>Unit 10 – quadratics</b></p> <ul style="list-style-type: none"> <li>Solve simple problems involving quadratics</li> </ul> <p><b>Unit 11 – quadratic graphs</b></p> <ul style="list-style-type: none"> <li>Apply key features of quadratics to recognise a given quadratic graph</li> </ul> <p><b>Unit 12 – simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Form and solve simultaneous equations to solve problems</li> </ul>	<p><b>Unit 13 – transformations</b></p> <ul style="list-style-type: none"> <li>Recognise and describe a single transformation using correct mathematical language</li> </ul> <p><b>Unit 14 – 2D shapes including circle geometry</b></p> <ul style="list-style-type: none"> <li>Solve problems involving circles</li> </ul> <p><b>Unit 15 – Pythagoras’ Theorem review</b></p> <ul style="list-style-type: none"> <li>Model practical situations with right-angled triangles and so find missing lengths</li> </ul> <p><b>Unit 16 – 3D shapes</b></p> <ul style="list-style-type: none"> <li>Solve problems involving 3D shapes with plans and elevations</li> </ul> <p><b>Unit 17 – volume and surface area</b></p> <ul style="list-style-type: none"> <li>Solve problems with volume and surface area</li> </ul>	<p><b>Unit 18 – compound measure and direct and indirect proportion</b></p> <ul style="list-style-type: none"> <li>Solve formal problems involving direct and inverse proportion</li> </ul> <p><b>Unit 19 – similarity and Trigonometry</b></p> <ul style="list-style-type: none"> <li>Use trigonometry to solve problems involving right-angled triangles</li> </ul>	<p><b>Unit 20 – averages and range</b></p> <ul style="list-style-type: none"> <li>solve problems involving averages and range</li> </ul> <p><b>Unit 21 – data collection and sampling</b></p> <ul style="list-style-type: none"> <li>Recognise and solve problems involving capture recapture sampling</li> </ul> <p><b>Unit 22 – presenting data including scatter graphs</b></p> <ul style="list-style-type: none"> <li>Using the line of best fit to interpolate results</li> </ul>

HIGHER	<p><b>Declarative knowledge</b></p> <p>“I know that ...”</p>	<p><b>Unit 1 – powers and roots</b></p> <ul style="list-style-type: none"> <li>Understand the meaning of powers and roots</li> </ul> <p><b>Unit 2 – surds and irrational numbers</b></p> <ul style="list-style-type: none"> <li>know the difference between rational and irrational numbers</li> </ul> <p><b>Unit 3 – indices</b></p> <ul style="list-style-type: none"> <li>Know the rules for indices involving fractional indices</li> </ul> <p><b>Unit 4 – standard form</b></p> <ul style="list-style-type: none"> <li>Know the rules for writing a number in standard form</li> </ul> <p><b>Unit 5 – sequences</b></p> <ul style="list-style-type: none"> <li>Recognise and describe arithmetic, geometric, quadratic sequences and Fibonacci-type sequences</li> </ul>	<p><b>Unit 6 – fractions, decimals and percentages</b></p> <ul style="list-style-type: none"> <li>Fractions, decimals and percentages are just different ways of expressing a proportion of a value</li> </ul> <p><b>Unit 7 – percentages</b></p> <ul style="list-style-type: none"> <li>Recognise the decimal multipliers for percentage increase or decrease</li> <li>Know the difference between simple and compound interest</li> </ul> <p><b>Unit 8 – probability, sets and Venn diagrams</b></p> <ul style="list-style-type: none"> <li>Know that <math>P(\text{Not } A) = 1 - P(A)</math></li> <li>Know what is meant by relative frequency</li> <li>Understand why relative frequency is sometimes used as an estimate for probability</li> <li>Understand the multiplication rule for independent and dependent events</li> <li>know what is meant by conditional probability</li> <li>know when events are mutually exclusive</li> </ul>	<p><b>Unit 9 – quadratics</b></p> <ul style="list-style-type: none"> <li>Recognise quadratic functions</li> <li>Know the difference between expand and factorise</li> </ul> <p><b>Unit 10 – quadratic graphs</b></p> <ul style="list-style-type: none"> <li>Recognise quadratic graphs</li> <li>Understand the concept of intercepts, line of symmetry and turning points of graphs of quadratic functions</li> </ul> <p><b>Unit 11 – algebraic fractions</b></p> <ul style="list-style-type: none"> <li>Know the rules for multiplying and dividing algebraic fractions</li> <li>Know the rules for adding and subtracting fractions</li> </ul> <p><b>Unit 12 – simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Recognise a pair of simultaneous equation</li> </ul>	<p><b>Unit 13 – transformations</b></p> <ul style="list-style-type: none"> <li>Know that translation needs a vector.</li> <li>Know that reflection needs a line of symmetry.</li> <li>Know that rotation needs direction and size.</li> <li>Know that enlargement needs a scale factor and centre.</li> </ul> <p><b>Unit 14 – 2D shapes including circle geometry</b></p> <ul style="list-style-type: none"> <li>Know the formula for finding circumference and area of circles</li> <li>Recognise the centre, radius, chord, diameter, circumference, tangent, arc, sector and segment of circles</li> <li>Recognise the equation of a circle, centre the origin</li> </ul> <p><b>Unit 15 – Pythagoras’ Theorem review</b></p> <ul style="list-style-type: none"> <li>Recall Pythagoras theorem formula by understanding that the square of the hypotenuse is equal to the sum of the squares of the other two sides</li> </ul> <p><b>Unit 16 – 3D shapes</b></p> <ul style="list-style-type: none"> <li>Recognise the vocabulary associated with 3D solids</li> </ul> <p><b>Unit 17 – volume and surface area</b></p> <ul style="list-style-type: none"> <li>Know the difference between volume and surface area</li> <li>Know the formulae for volume of cuboids and other right prisms (including cylinders), volume of spheres, pyramids and cones</li> </ul>	<p><b>Unit 18 – compound measure and direct and indirect proportion</b></p> <ul style="list-style-type: none"> <li>Know that <math>\text{Speed} = \text{Distance} \div \text{Time}</math></li> <li><math>\text{Density} = \text{Mass} \div \text{Volume}</math></li> <li><math>\text{Pressure} = \text{Force} \div \text{Area}</math></li> <li>Recognise the link between gradient and proportion</li> <li>Recognise direct and inverse proportion graphs</li> </ul> <p><b>Unit 19 – similarity and Trigonometry</b></p> <ul style="list-style-type: none"> <li>know the meaning of similarity</li> <li>Understand the link between similar triangles and trigonometry</li> <li>Know the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>;</li> <li>Know the exact value of <math>\tan \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math></li> </ul> <p><b>Unit 20 – further trigonometry</b></p> <ul style="list-style-type: none"> <li>Know the sine and cosine rules to find missing sides and angles in any triangle</li> <li>Know the formula <math>\frac{1}{2}ab\sin C</math> to find the area of a triangle</li> </ul>	<p><b>Unit 21 – averages and range</b></p> <ul style="list-style-type: none"> <li>Know the difference between mean, median, mode and range</li> </ul> <p><b>Unit 22 – data collection and sampling</b></p> <ul style="list-style-type: none"> <li>Know different methods of data collection including surveys, questionnaires and the use of secondary data</li> <li>Know the difference between a sample and a population</li> <li>Know different types of sampling</li> </ul> <p><b>Unit 23 – presenting data including scatter graphs</b></p> <ul style="list-style-type: none"> <li>Recognise and know the difference between pictograms, bar charts (including comparative and stacked), pie charts and line graphs for time series data</li> <li>Know and recognise the different types of correlation</li> <li>Know that correlation does not imply causality</li> </ul> <p><b>Unit 24 – further statistical diagrams</b></p> <ul style="list-style-type: none"> <li>Know the formula for calculating frequency density for histograms</li> <li>Know the formula for calculating interquartile range for cumulative frequency diagrams and box plots</li> </ul>
	<p><b>Procedural knowledge</b></p> <p>“Methods”</p>	<p><b>Unit 1 – powers and roots</b></p> <ul style="list-style-type: none"> <li>Recognise powers of 2, 3, 4, 5</li> <li>use positive integer powers and associated real roots (square, cube and higher)</li> </ul> <p><b>Unit 2 – surds and irrational numbers</b></p> <ul style="list-style-type: none"> <li>Change recurring decimals into their corresponding fractions and vice versa</li> <li>Simplify surds</li> </ul>	<p><b>Unit 6 – fractions, decimals and percentages</b></p> <ul style="list-style-type: none"> <li>Recognise when fractions are equivalent</li> <li>Convert between improper fractions and mixed numbers</li> <li>Apply the four rules of number to fractions</li> <li>Find fractions of a quantity</li> <li>Convert between fractions, decimals and percentages</li> </ul>	<p><b>Unit 9 – quadratics</b></p> <ul style="list-style-type: none"> <li>Expand products of two binomials</li> <li>Factorise quadratic expressions of the form <math>x^2 + bx + c</math></li> <li>Factorise quadratic expressions of the form <math>ax^2 + bx + c</math> where <math>a &gt; 1</math></li> <li>Recognise and factorise expressions in the form difference of two squares</li> </ul>	<p><b>Unit 13 – transformations</b></p> <ul style="list-style-type: none"> <li>Translate a shape by a given vector</li> <li>Reflect a shape in a given line, including on a coordinate grid with lines defined algebraically</li> <li>Rotate a shape about a given centre</li> <li>Enlarge shapes, with or without a coordinate</li> </ul>	<p><b>Unit 18 – compound measure and direct and indirect proportion</b></p> <ul style="list-style-type: none"> <li>Use and apply compound units such as density and pressure and Speed/distance/time</li> <li>Solve problems using unitary method</li> <li>Solve problems involving direct and inverse proportion in numerical and algebraic contexts</li> </ul>	<p><b>Unit 21 – averages and range</b></p> <ul style="list-style-type: none"> <li>Calculate the mean, median and mode and range from a list</li> <li>Make comparisons between sets of data using summary statistics</li> <li>Calculate the mean, median and mode and range from a frequency table and charts</li> <li>Find estimates of the mean, median and range of grouped data</li> </ul>

	<ul style="list-style-type: none"> <li>Rationalise denominators</li> </ul> <p><b>Unit 3 – indices</b></p> <ul style="list-style-type: none"> <li>Use the rules of indices</li> <li>-multiplying numbers in index form</li> <li>-dividing numbers in index form</li> <li>-raising a power by a power</li> <li>-negative powers</li> <li>-the power of zero</li> <li>-the power of 1</li> <li>-fractional indices</li> </ul> <p><b>Unit 4 – standard form</b></p> <ul style="list-style-type: none"> <li>Multiply and divide numbers by any power of 10</li> <li>Convert numbers to and from standard form</li> <li>Perform calculations involving standard form</li> <li>use a calculator when appropriate to calculate with standard form</li> </ul> <p><b>Unit 5 – sequences</b></p> <ul style="list-style-type: none"> <li>deduce expressions to calculate the nth term of arithmetic and geometric sequences including quadratic sequences</li> </ul>	<p><b>Unit 7 – percentages</b></p> <ul style="list-style-type: none"> <li>Increase and decrease by a given percentage</li> <li>Express one number as a percentage of another, including percentage changes</li> <li>Find the original quantity using its final amount</li> </ul> <p><b>Unit 8 – probability, sets and Venn diagrams</b></p> <ul style="list-style-type: none"> <li>Compare theoretical probability with result obtained by experiments</li> <li>Use Venn diagrams to solve probability problems</li> <li>Construct Venn diagrams and two-way tables to solve probability problems</li> <li>Use the addition law for probability</li> <li>Create and use frequency diagrams</li> <li>Construct tree diagrams to solve probability problems</li> <li>Calculate conditional probabilities</li> <li>Construct and use Venn diagrams to include those with three regions</li> </ul>	<ul style="list-style-type: none"> <li>Solve quadratic equations of the form <math>x^2 + bx + c</math> by factorising</li> <li>Complete the square of a quadratic expression</li> <li>Rearrange and solve quadratic equations by factorisation, completing the square or the use of the quadratic formula</li> </ul> <p><b>Unit 10 – quadratic graphs</b></p> <ul style="list-style-type: none"> <li>Draw quadratic graphs</li> <li>Use quadratic graphs to find the approximate solution to quadratic equations</li> <li>Identify intercepts, and using symmetry, the turning points of graphs of quadratic functions</li> <li>Sketch graphs of quadratic functions, finding the turning point by completing the square</li> </ul> <p><b>Unit 11 – algebraic fractions</b></p> <ul style="list-style-type: none"> <li>Simplify algebraic fractions</li> <li>Manipulate algebraic fractions, including:             <ul style="list-style-type: none"> <li>Multiplication</li> <li>Division</li> <li>Addition</li> <li>Subtraction</li> <li>Solving</li> </ul> </li> </ul> <p><b>Unit 12 – simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Solve simultaneous equations graphically (review)</li> <li>Solve simultaneous equations algebraically (review)</li> <li>Set up and solve two simultaneous equations where one is linear and one is quadratic</li> </ul>	<ul style="list-style-type: none"> <li>grid including using fractional and negative scale factors</li> <li>Find the centre of enlargement given a shape and its image</li> <li>Describe a single transformation using correct mathematical language</li> <li>Describe the changes and invariance achieved by combining reflections, rotations and translations</li> </ul> <p><b>Unit 14 – 2D shapes including circle geometry</b></p> <ul style="list-style-type: none"> <li>Calculate the length of an arc and sector area of a circle</li> <li>Use the equation of a circle, centre the origin</li> <li>Find the equation of a tangent to a circle at a given point</li> <li>Solve simultaneous equations with circles</li> </ul> <p><b>Unit 15 – Pythagoras’ Theorem review</b></p> <ul style="list-style-type: none"> <li>Find missing sides in right-angled triangles given the other two sides</li> <li>Identify whether a triangle is right-angled by considering the lengths of its sides</li> </ul> <p><b>Unit 16 – 3D shapes</b></p> <ul style="list-style-type: none"> <li>Interpret and construct plans and elevations of 3D solids</li> </ul> <p><b>Unit 17 – volume and surface area</b></p> <ul style="list-style-type: none"> <li>Convert between volume units</li> <li>Use formulae to calculate volume of cuboids and other right prisms (including cylinders), the surface area and volume of spheres, pyramids, cones and simple composite solids</li> </ul>	<ul style="list-style-type: none"> <li>Solve problems involving a quantity directly or inversely proportional to a power or a root of another quantity</li> <li>Solve problems involving inverse proportion in contexts such as speed, distance and time</li> </ul> <p><b>Unit 19 – similarity and Trigonometry</b></p> <ul style="list-style-type: none"> <li>Find missing sides in pairs of similar shapes, including similar triangles</li> <li>Use the trigonometric ratios sin, cos and tan</li> <li>Derive and use the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of <math>\tan \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math></li> </ul> <p><b>Unit 20 – further trigonometry</b></p> <ul style="list-style-type: none"> <li>Use the sine and cosine rule to find missing sides and angles in any triangle</li> <li>Find the area of a triangle using the formula <math>\text{Area} = \frac{1}{2}ab\sin C</math></li> </ul>	<p><b>Unit 22 – data collection and sampling</b></p> <ul style="list-style-type: none"> <li>Explore methods of data collection including surveys, questionnaires and the use of secondary data</li> <li>Classify and tabulate data</li> <li>Find the sizes of groups in a stratified sample</li> <li>Estimate population size using capture recapture sampling</li> </ul> <p><b>Unit 23 – presenting data including scatter graphs</b></p> <ul style="list-style-type: none"> <li>Interpret and construct: pictograms, bar charts (including comparative and stacked), pie charts, and line graphs for time series data</li> <li>Identify trends within time series</li> <li>Recognise when graphs and charts can be misleading</li> <li>Plot to identify correlation</li> <li>Draw (by eye) lines of best fit</li> <li>Interpret the graphs to make estimates, knowing the limitations of this</li> </ul> <p><b>Unit 24 – further statistical diagrams</b></p> <ul style="list-style-type: none"> <li>Construct and interpret histograms with equal and unequal class intervals</li> <li>Plot and interpret cumulative frequency diagrams</li> <li>Draw and interpret box plots</li> </ul>
<p>Conditional knowledge</p> <p>“Strategies”</p>	<p><b>Unit 1 – powers and roots</b></p> <ul style="list-style-type: none"> <li>Solve area and volume problems involving squares and cubes</li> </ul>	<p><b>Unit 6 – fractions, decimals and percentages</b></p> <ul style="list-style-type: none"> <li>Solve problems involving fractions</li> </ul> <p><b>Unit 7 – percentages</b></p>	<p><b>Unit 9 – quadratics</b></p> <ul style="list-style-type: none"> <li>Use the quadratic formula to solve quadratic equations</li> <li>Complete the square to find the turning point of a quadratic function</li> </ul>	<p><b>Unit 13 – transformations</b></p> <ul style="list-style-type: none"> <li>Recognise and describe a single transformation using correct mathematical language</li> </ul>	<p><b>Unit 18 – compound measure and direct and indirect proportion</b></p> <ul style="list-style-type: none"> <li>Solve formal problems involving direct and inverse proportion</li> </ul>	<p><b>Unit 21 – averages and range</b></p> <ul style="list-style-type: none"> <li>solve problems involving averages and range</li> </ul> <p><b>Unit 22 – data collection and sampling</b></p>

	<p><b>Unit 2 – surds and irrational numbers</b></p> <ul style="list-style-type: none"> <li>Solve problems involving surds</li> </ul> <p><b>Unit 3 – indices</b></p> <ul style="list-style-type: none"> <li>Solve complex equations with indices</li> </ul> <p><b>Unit 4 – standard form</b></p> <ul style="list-style-type: none"> <li>Solve problems with numbers in standard form</li> </ul> <p><b>Unit 5 – sequences</b></p> <ul style="list-style-type: none"> <li>Solve problems involving sequences</li> </ul>	<ul style="list-style-type: none"> <li>Solve problems involving growth and decay including compound interest problems</li> </ul> <p><b>Unit 8 – probability, sets and Venn diagrams</b></p> <ul style="list-style-type: none"> <li>Construct Venn diagrams and two-way tables to solve probability problems</li> <li>Construct tree diagrams to solve probability problems</li> <li>Solve more complex problems involving tree diagrams</li> </ul>	<ul style="list-style-type: none"> <li>Form and solve equations involving quadratics</li> </ul> <p><b>Unit 10 – quadratic graphs</b></p> <ul style="list-style-type: none"> <li>Apply key features of quadratics to recognise a given quadratic graph</li> </ul> <p><b>Unit 11 – algebraic fractions</b></p> <ul style="list-style-type: none"> <li>Solve problems involving algebraic fractions</li> </ul> <p><b>Unit 12 – simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Form and solve simultaneous equations to solve problems</li> </ul>	<ul style="list-style-type: none"> <li>Recognise and describe the changes and invariance achieved by combining reflections, rotations and translations</li> </ul> <p><b>Unit 14 – 2D shapes including circle geometry</b></p> <ul style="list-style-type: none"> <li>Solve problems with area and circumference</li> <li>Solve problems with sector and arc length</li> </ul> <p><b>Unit 15 – Pythagoras’ Theorem review</b></p> <ul style="list-style-type: none"> <li>Model practical situations with right-angled triangles and so find missing lengths</li> </ul> <p><b>Unit 16 – 3D shapes</b></p> <ul style="list-style-type: none"> <li>Solve problems involving 3D shapes with plans and elevations</li> </ul> <p><b>Unit 17 – volume and surface area</b></p> <ul style="list-style-type: none"> <li>Solve problems with volume and surface area</li> </ul>	<p><b>Unit 19 – similarity and Trigonometry</b></p> <ul style="list-style-type: none"> <li>Use trigonometry to solve problems involving right-angled triangles</li> </ul> <p><b>Unit 20 – further trigonometry</b></p> <ul style="list-style-type: none"> <li>Solve problems using the sine and cosine rule in a variety of contexts</li> </ul>	<ul style="list-style-type: none"> <li>Recognise and solve problems involving capture recapture sampling</li> </ul> <p><b>Unit 23 – presenting data including scatter graphs</b></p> <ul style="list-style-type: none"> <li>Using the line of best fit to interpolate results</li> </ul> <p><b>Unit 24 – further statistical diagrams</b></p> <ul style="list-style-type: none"> <li>Use the median and interquartile range to compare distributions</li> </ul>
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**YEAR 11 (OCL LTP 2023-24)**

In our students' final year of study, we begin by drawing on all of the knowledge and skills they have developed over their 4 years with us to introduce some of the most challenging GCSE content, including vectors, construction and loci, and geometric reasoning at foundation tier, and trigonometric graphs, algebraic proof, and functions at higher tier. Students are now refining and fully developing their **problem-solving** and **mathematical reasoning** skills in preparation for their exam. In the periods of revision that are scheduled, teachers identify gaps in knowledge and underdeveloped skills in their students, and revisit elements of the KS4 curriculum accordingly. Often, these areas of weakness will not be in **fluency**, but in students' ability to **reason mathematically** with the knowledge they have, or **problem-solve** in unseen situations. They will use this time to hone these core concepts fully.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<b>Relevant core concepts (strands)</b>	<b>Geometry and measures</b>	<b>Algebra</b>	<b>Algebra</b>			
<b>Relevant end points</b>	-use language and properties precisely to analyse 2-D and 3-D shapes  -begin to model situations mathematically and express the results using a range of formal mathematical representations	-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships  -develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems	-use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships  -develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems			
<b>Declarative knowledge</b>  "Facts and formulae"	<b>Unit 23 – vectors</b> <ul style="list-style-type: none"> <li>Know and recognise vector notation</li> <li>Identify parallel vectors</li> <li>Know properties of shapes</li> </ul> <b>Unit 24 – Geometric Reasoning</b> <ul style="list-style-type: none"> <li>Know properties of shapes</li> <li>Know the formula for angles in polygons</li> <li>Identify types of angles produced by parallel lines</li> </ul> <b>Unit 25 – Bearings</b> <ul style="list-style-type: none"> <li>Know bearings notation</li> <li>Know angle facts</li> </ul> <b>Unit 26 - Congruency</b> <ul style="list-style-type: none"> <li>Know the congruency rules</li> <li>Recognise congruent shapes</li> <li>Be aware of conditions for congruency</li> </ul>	<b>Unit 27 – linear graphs</b> <ul style="list-style-type: none"> <li>Know how to find midpoints and end points</li> <li>know how to create a table of values</li> <li>know the key features of a straight line</li> <li>know the relationship between parallel gradients</li> </ul> <b>Unit 28 – Inequalities</b> <ul style="list-style-type: none"> <li>Know and recognise inequality notation</li> <li>Know how to represent inequalities on a number line</li> </ul> <b>Unit 29 – non-linear graphs</b> <ul style="list-style-type: none"> <li>Recognise different types of non-linear graphs and know their key features</li> </ul>	<b>Topic: REVISION</b>	<b>Topic: REVISION</b>	<b>Topic: REVISION</b>	
<b>Procedural knowledge</b>  "Methods"	<b>Unit 23 – vectors</b> <ul style="list-style-type: none"> <li>Use scalar multiples</li> <li>To use vector addition and subtraction</li> </ul> <b>Unit 24 – Geometric Reasoning</b> <ul style="list-style-type: none"> <li>Derive simple proofs in rectilinear figures</li> <li>Use the formula for interior and exterior angles in polygons</li> </ul>	<b>Unit 27 – linear graphs</b> <ul style="list-style-type: none"> <li>Form and solve linear equations</li> <li>Plot linear graphs</li> <li>Interpret gradients and y-intercepts</li> <li>Rearrange formula</li> <li>Find the equation of a straight line</li> </ul>				

		<ul style="list-style-type: none"> <li>Find the values of unknown angles in parallel lines</li> </ul> <p><b>Unit 25 – Bearings</b></p> <ul style="list-style-type: none"> <li>Use bearings to calculate angles and locations</li> </ul> <p><b>Unit 26 – Congruency</b></p> <ul style="list-style-type: none"> <li>Prove triangles are congruent using congruency rules</li> </ul>	<ul style="list-style-type: none"> <li>Find the equation of parallel lines</li> </ul> <p><b>Unit 28 – Inequalities</b></p> <ul style="list-style-type: none"> <li>Solve inequalities with one unknown</li> <li>Solve inequalities with two unknowns</li> <li>Solve double inequalities</li> </ul> <p><b>Unit 29 – non-linear graphs</b></p> <ul style="list-style-type: none"> <li>Create tables of values and plot non-linear graphs such as polynomials and reciprocal graphs</li> <li>Sketch non-linear graphs</li> </ul>				
	<p>Conditional knowledge</p> <p>“Strategies”</p>	<p><b>Unit 23 – vectors</b></p> <ul style="list-style-type: none"> <li>Explore commutativity</li> </ul> <p><b>Unit 24 – Geometric Reasoning</b></p> <ul style="list-style-type: none"> <li>Solve problems with angles in polygons</li> </ul> <p><b>Unit 25 – Bearings</b></p> <ul style="list-style-type: none"> <li>Solve problems with bearings</li> </ul> <p><b>Unit 26 – Congruency</b></p> <ul style="list-style-type: none"> <li>Solve problems with congruency</li> </ul>	<p><b>Unit 27 – linear graphs</b></p> <ul style="list-style-type: none"> <li>Prove two equations are parallel</li> <li>Problem solving with linear equations</li> </ul> <p><b>Unit 28 – inequalities</b></p> <ul style="list-style-type: none"> <li>Solve problems with inequalities</li> </ul> <p><b>Unit 29 – non-linear graphs</b></p> <ul style="list-style-type: none"> <li>Interpret real life contexts graphically such as currency conversion, temperature increase and decrease, population and flow rates.</li> </ul>				
HIGHER	<p>Declarative knowledge</p> <p>“I know that...”</p>	<p><b>Unit 25 – vectors</b></p> <ul style="list-style-type: none"> <li>Know and recognise vector notation</li> <li>Identify parallel vectors</li> <li>Know properties of shapes</li> </ul> <p><b>Unit 26 – Geometric Reasoning</b></p> <ul style="list-style-type: none"> <li>Know properties of shapes</li> <li>Know the formula for angles in polygons</li> <li>Identify types of angles produced by parallel lines</li> </ul> <p><b>Unit 27 – Circle Theorems</b></p> <ul style="list-style-type: none"> <li>Know and recognise all circle theorems</li> </ul> <p><b>Unit 28 – Bearings</b></p> <ul style="list-style-type: none"> <li>Know bearings notation</li> </ul>	<p><b>Unit 30 – linear graphs</b></p> <ul style="list-style-type: none"> <li>Know how to find midpoints and end points</li> <li>know how to create a table of values</li> <li>know the key features of a straight line</li> <li>know the relationship between parallel and perpendicular gradients</li> </ul> <p><b>Unit 31 – Inequalities</b></p> <ul style="list-style-type: none"> <li>Know and recognise inequality notation</li> <li>Know how to represent inequalities on a number line</li> <li>Recognise quadratic inequalities</li> </ul>	<p><b>Unit 34 – Algebraic proof and reasoning</b></p> <ul style="list-style-type: none"> <li>Know how to represent types of numbers algebraically i.e. odd/square/consecutive</li> </ul> <p><b>Unit 35 – recurrence relations</b></p> <ul style="list-style-type: none"> <li>Understand what iteration means</li> <li>Know what a continuous function looks like</li> <li>Recognise a sign change in a solution as a root</li> </ul> <p><b>Unit 36 – functions</b></p> <ul style="list-style-type: none"> <li>Recognise and use function notation</li> <li>Understand input and output</li> </ul>	<p>Topic: REVISION</p>	<p>Topic: REVISION</p>	

	<p><b>Unit 29 - Congruency</b></p> <ul style="list-style-type: none"> <li>• Know the congruency rules</li> <li>• Recognise congruent shapes</li> <li>• Be aware of conditions for congruency</li> </ul>	<p><b>Unit 32 – non-linear graphs</b></p> <ul style="list-style-type: none"> <li>• Recognise different types of non-linear graphs and know their key features</li> </ul> <p><b>Unit 33 – Trig graphs</b></p> <ul style="list-style-type: none"> <li>• Know the exact values for trigonometric functions</li> <li>• Recognise trig graphs</li> <li>• Know the key features of trig graphs</li> </ul>	<ul style="list-style-type: none"> <li>• Use function notation for composite and inverse functions</li> </ul> <p><b>Unit 37 – transformations of graphs</b></p> <ul style="list-style-type: none"> <li>• Know the rules and effects of transforming a graph in both the x and y direction.</li> <li>• Recognise reflections and translations of graphs</li> </ul> <p><b>Unit 38 – further graphs</b></p> <ul style="list-style-type: none"> <li>• Know how to find areas of trapeziums and other polygons</li> </ul>			
<p><b>Procedural knowledge</b></p> <p>“Methods”</p>	<p><b>Unit 25 – vectors</b></p> <ul style="list-style-type: none"> <li>• Use scalar multiples</li> <li>• Split vectors into ratios</li> <li>• To use vector addition and subtraction</li> </ul> <p><b>Unit 26 – Geometric Reasoning</b></p> <ul style="list-style-type: none"> <li>• Derive simple proofs in rectilinear figures</li> <li>• Use the formula for interior and exterior angles in polygons</li> <li>• Find the values of unknown angles in parallel lines</li> </ul> <p><b>Unit 27 – Circle Theorems</b></p> <ul style="list-style-type: none"> <li>• Prove and use all circle theorems</li> </ul> <p><b>Unit 28 – Bearings</b></p> <ul style="list-style-type: none"> <li>• Use bearings to calculate angles and</li> </ul> <p><b>Unit 29 - Congruency</b></p> <ul style="list-style-type: none"> <li>• Prove triangles are congruent using congruency rules</li> </ul>	<p><b>Unit 30 – linear graphs</b></p> <ul style="list-style-type: none"> <li>• Plot linear graphs.</li> <li>• Interpret gradients and y-intercepts</li> <li>• Rearrange formula</li> <li>• Find the equation of a straight line</li> <li>• Find the equation of parallel or perpendicular lines</li> </ul> <p><b>Unit 31 – Inequalities</b></p> <ul style="list-style-type: none"> <li>• Solve inequalities with one unknown</li> <li>• Solve inequalities with two unknowns</li> <li>• Solve double inequalities</li> <li>• Represent inequalities and regions graphically</li> <li>• Solve quadratic inequalities</li> </ul> <p><b>Unit 32 – non-linear graphs</b></p> <ul style="list-style-type: none"> <li>• Create tables of values and plot non-linear graphs such as polynomials and reciprocal graphs</li> <li>• Sketch non-linear graphs</li> </ul> <p><b>Unit 33 – Trig graphs</b></p> <ul style="list-style-type: none"> <li>• Plot trig graphs</li> <li>• Solve simple trig equations</li> </ul>	<p><b>Unit 34 – algebraic proof</b></p> <ul style="list-style-type: none"> <li>• Use algebraic techniques such as expanding and factorising</li> </ul> <p><b>Unit 35 – recurrence relations</b></p> <ul style="list-style-type: none"> <li>• To be able to substitute into an iterative formula</li> <li>• Be able to use the ‘ANS’ button on a calculator</li> <li>• Substitute into formulas to find roots</li> <li>• Use trial and improvement to use the decimal search method</li> </ul> <p><b>Unit 36 – functions</b></p> <ul style="list-style-type: none"> <li>• Rearrange a formula to find an inverse function</li> <li>• Use numerical and algebraic substitution to find composite functions</li> <li>• Form and solve function equations</li> </ul> <p><b>Unit 37 – transformations of graphs</b></p> <ul style="list-style-type: none"> <li>• Sketch a translated or reflected graph.</li> <li>• Interpret transformations of graphs written in function notations and cartesian form.</li> <li>• Identify a translation or reflection on a given graph.</li> </ul> <p><b>Unit 38 – further graphs</b></p> <ul style="list-style-type: none"> <li>• Draw tangents</li> <li>• Calculate gradients</li> <li>• Calculate areas under curves</li> </ul>			

<p>Conditional knowledge</p> <p>“Strategies”</p>	<p><b>Unit 25 – vectors</b></p> <ul style="list-style-type: none"> <li>Apply vector knowledge to determine colinear points</li> <li>Explore commutativity</li> <li>Solve vector geometry problems</li> </ul> <p><b>Unit 26 – Geometric Reasoning</b></p> <ul style="list-style-type: none"> <li>Prove the formula for sum of angles in a polygon</li> <li>Solve problems with angles in polygons</li> </ul> <p><b>Unit 27 – Circle Theorems</b></p> <ul style="list-style-type: none"> <li>Solve problems with circle theorems</li> </ul> <p><b>Unit 28 – Bearings</b></p> <ul style="list-style-type: none"> <li>Solve problems with bearings</li> </ul> <p><b>Unit 29 - Congruency</b></p> <ul style="list-style-type: none"> <li>Solve problems and use more complex proofs with congruence</li> </ul>	<p><b>Unit 30 – linear graphs</b></p> <ul style="list-style-type: none"> <li>Prove two equations are parallel or perpendicular</li> <li>Problem solving with linear equations</li> </ul> <p><b>Unit 31 – inequalities</b></p> <ul style="list-style-type: none"> <li>Solve problems with inequalities including regions.</li> </ul> <p><b>Unit 32 – non-linear graphs</b></p> <ul style="list-style-type: none"> <li>Interpret real life contexts graphically such as currency conversion, temperature increase and decrease, population and flow rates.</li> </ul> <p><b>Unit 33 – Trig graphs</b></p> <ul style="list-style-type: none"> <li>Apply key features of trig graphs to evaluate the sine, cosine and tangent of angles greater than <math>90^\circ</math>.</li> </ul>	<p><b>Unit 34 – algebraic proof</b></p> <ul style="list-style-type: none"> <li>Critique and develop mathematical arguments</li> <li>Use mathematical techniques to prove characteristics</li> </ul> <p><b>Unit 35 – recurrence relations</b></p> <ul style="list-style-type: none"> <li>Understand how iteration finds roots to equations</li> </ul> <p><b>Unit 36 – functions</b></p> <ul style="list-style-type: none"> <li>Apply quadratic knowledge and difficult rearranging to solve function problems</li> </ul> <p><b>Unit 37 – transformations of graphs</b></p> <ul style="list-style-type: none"> <li>Justify how a graphs transformation relates to its algebraic representation.</li> <li>Problem solving with transformations of graphs, i.e., multiple transformations in one.</li> </ul> <p><b>Unit 38 – further graphs</b></p> <ul style="list-style-type: none"> <li>Interpret gradients of real-life graphs</li> <li>Interpret areas of real-life graphs</li> </ul>			
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