

Subject	Mathematics (KS4)	Year group	10 Pathway 2
Subject Intent	<p>In Pathway 2, the intent is to build on the subject specific knowledge learnt in KS3, promoting solving problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps.</p> <p>There is a maturity to the maths, meaning there are clear links between the subjects taught, why they are being taught and how best to take advantage of this in an exam. Students are taught the skills of calculating, using the number system, accuracy, algebra, fraction, properties of shapes, percentages, sequences, ratio and proportion, units and scales, measuring shapes, number properties, functionals and graphs, constructions, transformations and trigonometry, algebraic methods, statistical measures, 3D shapes and probability. These maths are explicitly taught in Y10, and then revised, secured and embedded in Y11.</p>		

Term	Topic	Core learning	Key concepts	Sequencing
Autumn 1	Calculating	<ul style="list-style-type: none"> • Order of operations • Decimals 	<ul style="list-style-type: none"> • Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals (BIDMAS) • Apply multiplication, including formal written methods, to decimals • Apply division, including formal written methods, to decimals 	<p>Building on.....</p> <p>Students' ability to calculate accurately using BIDMAS as well as calculating with decimals as taught in Y9 Autumn 1.</p> <p>Building towards...</p> <p>Extension and challenging questions that include calculating with decimals. As well as BIDMAS questions that focus on the extension.</p>

Autumn 1	The number system	<ul style="list-style-type: none"> Using the number system effectively Understanding standard form 	<p>Understand and use place value for integers and decimals of any size</p> <ul style="list-style-type: none"> Order positive and negative integers and decimals Use the symbols =, ≠, <, >, ≤, ≥ Use the number line as a model for ordering of the real numbers Order positive and negative integers Understand and use place value when calculating with decimals Recognise and use relationships between operations, including inverse operations Interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer 	<p>Building on.....</p> <p>Taking students basic knowledge of notation, including less than, greater than and equal to and checking they are able to implement this. As well as their ability to multiply and divide by powers of 10. Taught in Y7 Autumn 2.</p> <p>Building towards...</p> <p>Understanding how standard form works and how to convert between ordinary numbers and standard form, then to calculate with standard form focussing on all four operations and application in problem solving.</p>
Autumn 1	Accuracy	<ul style="list-style-type: none"> Significance Approximation 	<ul style="list-style-type: none"> Round numbers and measures to an appropriate degree of accuracy Estimate answers Check calculations using approximation and estimation, including answers obtained using technology 	<p>Building on.....</p> <p>Students' ability to round to various degrees of accuracy. E.g. 1-3 d.p as taught in Y7 Autumn 2.</p> <p>Building towards...</p> <p>Applying their ability to round to contextualised problems such as giving answers to various types</p>

				of questions in various forms of rounding. This includes estimations of calculations as well as limits of accuracy and, particularly to solve problems in these topics.
Autumn 1	3D shapes	<ul style="list-style-type: none"> • Prisms • Constructing plans and elevations 	<ul style="list-style-type: none"> • Use standard units of measure and related concepts (length, area, volume) • Know and apply formulae to calculate volumes of cuboids and other right prisms (including cylinders) • Construct and interpret plans and elevations of 3D shapes 	<p>Building on.....</p> <p>Properties of 3D shapes, defining a prism, volume/surface area of cuboids and nets of 3D shapes as taught in Y8 Autumn 1 and 2 and Y9 Autumn 1.</p> <p>Building towards...</p> <p>Finding the surface area and volume of 3D compound/composite shapes.</p>
Autumn 2	Starting algebra	<ul style="list-style-type: none"> • Working with more complex equations • Solving equations with brackets 	<ul style="list-style-type: none"> • Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation) • Derive an equation, solve the equation, and interpret the solution • Simplify and manipulate algebraic expressions by multiplying a single term over a bracket 	<p>Building on.....</p> <p>Understanding algebraic terminology and students ability to collect like terms and multiply various terms taught in Y9 Autumn 2. Also building on students ability to take a sentence expressing something (words formulae) that can then be formed into either an expression or equation taught in Y7 Summer 2.</p>

				<p>Building towards...</p> <p>Solving equations with variables on both sides, deriving equations, changing the subject of formulae with increasing difficulty and working with identities.</p>
Autumn 2	Fractions	<ul style="list-style-type: none"> • Working with mixed numbers • Dividing fractions 	<ul style="list-style-type: none"> • Apply addition, subtraction, and multiplication, including formal written methods to improper fractions and mixed numbers • Use division, including formal written methods, applied to proper and improper fractions 	<p>Building on.....</p> <p>Students ability to simplify and find equivalent fractions. To apply four operations to fractions and order them using equal/not equal and less than/greater than symbols. Taught in Y9/Y8 Spring 1 and Y7 Autumn 2.</p> <p>Building towards...</p> <p>Applying four operations to mixed number fractions and extending this by applying this skill to contextualised problems E.g. finding areas of 2D shapes using fractions, spot the mistake, fraction of amounts etc.</p>
Autumn 2	Properties of shapes	<ul style="list-style-type: none"> • Angles in parallel lines • Angles in 	<ul style="list-style-type: none"> • Understand and use alternate and corresponding angles on parallel lines • Use the sum of angles in a triangle (e.g. to 	<p>Building on.....</p> <p>Understanding of basic angle facts and notation,</p>

		polygons	deduce and use the angle sum in any polygon, and to derive properties of regular polygons)	<p>such as the notation used to identify angles ($\angle ABC$) and how to find them.</p> <p>Understanding of properties of a circle.</p> <p>Taught in Y7 Spring 2.</p> <p>Building towards...</p> <p>Ability to find missing angles in parallel lines and polygons, recalling angle facts to use as reasoning and formulae.</p> <p>Using proof to define congruence between polygons</p>
Spring 1	Percentages	<ul style="list-style-type: none"> ● Applying % increase and decrease ● Finding % change ● Reverse % ● Repeated % increase and decrease 	<ul style="list-style-type: none"> • Define percentage as 'number of parts per hundred' • Express one quantity as a percentage of another • Compare two quantities using percentages • Interpret percentages as operators • Order decimals and fractions • Work interchangeably with terminating decimals and their corresponding fractions • Interpret percentages as a fraction or a decimal, interpret these multiplicatively • Work with percentages greater than 100% • Solve problems involving percentage change, including: percentage increase/decrease and simple interest in financial mathematics • Solve problems involving percentage change, including original value problems 	<p>Building on.....</p> <p>Students ability to multiply and divide by powers of 10 (10, 100, 1000) etc.</p> <p>Taught in Y7 Autumn 2.</p> <p>Students ability to simplify, find equivalent and order fractions. Taught in Y9 Spring 1.</p> <p>Building towards...</p> <p>Compound interest and applying this in contextual problems. Reverse % and extended application of % increase and decrease and converting recurring</p>

			<ul style="list-style-type: none"> • Interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively • Set up, solve and interpret the answers in growth and decay problems, including compound interest 	decimals to fractions.
Spring 1	Sequences	<ul style="list-style-type: none"> • Linear sequences • Special sequence 	<ul style="list-style-type: none"> • Recognise and use sequences of simple arithmetic progressions • Generate terms of a sequence from a term-to-term rule or a position-to-term rule • Deduce expressions to calculate the nth term of linear sequences • Recognise and use sequences of triangular, square and cube numbers and Fibonacci type sequences • Generate terms of a sequence from a term-to-term rule or a position-to-term rule 	<p>Building on.....</p> <p>Students ability to recognise patterns in visual and number sequences, including finding missing patterns/numbers and some exploration of the nth term of linear sequences. Taught in Y9 Autumn 2.</p> <p>Building towards...</p> <p>Finding the nth term of various types of number sequences, including linear and quadratic and to be able to use and generate cubic and geometric sequences.</p>
Spring 1	Ratio and proportion	<ul style="list-style-type: none"> • Sharing a given ratio • Working with proportional quantities 	<ul style="list-style-type: none"> • Divide a given quantity into two parts in a given part:part or part:whole ratio • Express the division of a quantity into two parts as a ratio • Apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations) 	<p>Building on.....</p> <p>Students ability to interpret the notation and meaning of ratios.</p> <p>Students' ability to simplify ratios and share a value</p>

			<ul style="list-style-type: none"> • Relate ratios to fractions <p>Working with proportional quantities</p> <ul style="list-style-type: none"> • Understand and use proportion as equality of ratios • Solve problems involving direct proportion • Use compound units such as rates of pay and unit pricing 	<p>amongst a given ratio.</p> <p>Taught in Y8 Summer 1 and Y9 Summer 2.</p> <p>Building towards...</p> <p>Working with ratios and applying this skill to problems in a context. Working with direct and inverse proportion and understanding the difference and putting direct and inverse proportions into a formula.</p>
Spring 2	Units and scales	<ul style="list-style-type: none"> • Scale drawings • Compound units 	<ul style="list-style-type: none"> • Use scale factors, scale drawings and maps • Use ratio notation • Interpret maps and scale drawings • Measure line segments and angles in geometric figures • Use standard compound measures • Use and change freely between compound units (e.g. speed, rates of pay, prices) 	<p>Building on.....</p> <p>Students' ability to convert between units of length, mass and time. Taught in Y7 Spring 2.</p> <p>Building towards...</p> <p>Scaled Drawings, bearings and converting between units of area and volume. Finding compound units like speed, distance and time as well as density, mass and volume and applying this skill in problems.</p>

Spring 2	Measuring shapes	<ul style="list-style-type: none"> • Area of a circle • Pythagoras' theorem 	<ul style="list-style-type: none"> • Know the formula: area of a circle = πr^2 • Calculate areas of circles and composite shapes • Know the formula for Pythagoras' theorem $a^2 + b^2 = c^2$; apply it to find lengths in right-angled triangles in two dimensional figures 	<p>Building on.....</p> <p>Students ability to find area and perimeter of regular polygons. Taught in Y9 Autumn 1. Students' ability to find the circumference of circles. Taught in Y9 Autumn 1.</p> <p>Building towards...</p> <p>Learning Pythagoras theorem and its application in problem solving as well as finding missing lengths in cuboids using 3D pythagoras. Identifying properties of a circle in order to find the length of arcs and areas of sectors.</p>
Spring 2	Number properties	<ul style="list-style-type: none"> • Index notation • Prime factorisation 	<ul style="list-style-type: none"> • Use positive integer powers and associated real roots (square, cube and higher) • Recognise powers of 2, 3, 4, 5 • Calculate with positive Integer indices • Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem 	<p>Building on.....</p> <p>Students ability to recall factors and multiples of numbers. Students' ability to recall prime numbers. Students' ability to recognise roots and powers of positive integers. All taught in Y7, 8 and 9 Spring 2.</p>

				<p>Building towards...</p> <p>Prime factorisation and its applications, including using products of primes to find the HCF/LCM. Learning all the laws of indices and applying them to worded problems.</p>
Summer 1	Functions and Graphs	<ul style="list-style-type: none"> • The equation of a straight line • Plotting quadratic and cubic graphs 	<ul style="list-style-type: none"> • Plot graphs of equations that correspond to straight-line graphs in the coordinate plane • Identify and interpret gradients and intercepts of linear functions graphically and algebraically • Recognise, sketch and interpret graphs of linear functions • Recognise, sketch and interpret graphs of quadratic functions and simple cubic functions • Find approximate solutions to quadratic equations using a graph 	<p>Building on.....</p> <p>Students ability to build scales on x-axis and y-axis. Evenly space them out with even distribution. Understanding the direct relationships between two variables and being familiar with variables that are commonly plotted on graphs. (E.g. distance and time, speed and time etc). Taught in Y9 Summer 1.</p> <p>Building towards...</p> <p>Finding the equations of straight lines, plotting and sketching quadratic and cubic graphs, recognising various types of graphs and the equations associated with them (reciprocal, sin,</p>

				exponential, circle)
Summer 1	Constructions	<ul style="list-style-type: none"> • Constructions with a pair of compasses • Loci 	<ul style="list-style-type: none"> • Use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle) • Use these to construct given figures • Know that the perpendicular distance from a point to a line is the shortest distance to the line <p>Loci</p> <ul style="list-style-type: none"> • Use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle) • use these to construct given figures and solve loci problems • know that the perpendicular distance from a point to a line is the shortest distance to the line 	<p>Building on.....</p> <p>Basic constructions using ruler and protractor, meaning drawing 2D shapes accurately using angles and lengths with a protractor and ruler. Taught in Y8 Spring 2.</p> <p>Building towards...</p> <p>Constructions using a compass and the various facts that go with knowing these constructions. Loci using constructions, mainly constructing a perpendicular line to a line from a point.</p>
Summer 1	Transformations & Trigonometry	<ul style="list-style-type: none"> • Similarity 	<p>Similarity</p> <ul style="list-style-type: none"> • Identify, describe and construct congruent and similar shapes, including on coordinate axes by considering rotation, reflection, 	<p>Building on.....</p> <p>Understanding on how to work with Cartesian coordinates in all four quadrants.</p>

			<p>translation and enlargement</p> <ul style="list-style-type: none"> • Use scale factors • Compare lengths and areas • Make links to similarity and scale factors • Apply the concepts of congruence and similarity, including the relationships between lengths in similar figures 	<p>Working with all four transformations. Taught in Y9 Autumn 2.</p> <p>Building towards...</p> <p>Identifying similarity and congruence between shapes, using facts about shapes and solving problems using this proof.</p> <p>Learning and applying trigonometric ratios, remembering and using trigonometric values and the ability to recognise 3D space and apply trigonometric ratios to find missing sides and angles. Lastly using perpendicular bisectors to find the centre of rotation.</p>
Summer 2	Algebraic methods	<ul style="list-style-type: none"> • Linear inequalities • Solving pairs of equations by substitution • Solving simultaneous equations by elimination 	<ul style="list-style-type: none"> • Understand and use the concepts and vocabulary of inequalities • Use the symbols $<$, $>$, \leq, \geq • Solve linear inequalities in one variable; represent the solution set on a number line • Solve two simultaneous equations in two variables (linear/linear) algebraically • Derive two simultaneous equations, solve the equations and interpret the solution • Solve two simultaneous equations in two variables (linear/linear) algebraically 	<p>Building on.....</p> <p>Students' knowledge and understanding of mathematical symbols such as $<$ and $>$. Taught in Y9 Autumn 2.</p> <p>Building towards...</p> <p>Solving simultaneous equations using three different methods,</p>

			<ul style="list-style-type: none"> Derive two simultaneous equations, solve the equations and interpret the solution 	substitutions, elimination and graphically.
Summer 2	Statistical measures	<ul style="list-style-type: none"> Using grouped frequency tables 	<p>Using grouped frequency tables</p> <ul style="list-style-type: none"> Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode) and spread (range) 	<p>Building on.....</p> <p>Students' knowledge of four averages and their fundamental differences, uses in different applications and pros and cons of each as taught in Y7 Summer 1 and Y8 Summer 2.</p> <p>Also building on students ability to use a simple frequency table as taught in Y7 Spring 1.</p> <p>Building towards...</p> <p>Application of continuous data</p>
Summer 2	Probability	<ul style="list-style-type: none"> Combined events 	<ul style="list-style-type: none"> Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams Generate theoretical sample spaces for combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities 	<p>Building on.....</p> <p>Using appropriate language in probability, and recording probability statistics using appropriate tools (tables, scales, words). As taught in Y7, Y8 and Y9 Spring 1.</p> <p>Building towards...</p> <p>Estimating practical probability, Applying the multiplication rule and the</p>

				<p>addition rule (AND/OR rules) to find probabilities of combined and mutually exclusive events respectively.</p> <p>Understanding and interpreting the application of a Venn for probability both displayed graphically as a Venn diagram and the notation used to describe that Venn diagram (Union/Intersection).</p>
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