Subject: Mathematics **Curriculum Map - Foundation** **KS4**

Principles of a mastery curriculum in mathematics	The KS4 curriculum builds on the KS3 mastery model. The aim of the mastery approach is that, over time, all students develop secure and connected factual knowledge, procedural fluency and conceptual understanding. The KS4 SOW has been adapted from the Edexcel SOW to suit our school. The students are taught the SOW over 2 years and use the *Edexcel GCSE* textbooks. These focus on developing key skills along with reasoning and problem-solving techniques. Students are able to solve problems because they have developed knowledge regarding the, 'that', 'how' and 'why' related to that topic. • Factual knowledge – knowledge *'that'* • Procedural fluency – knowledge *'how'* • Conceptual understanding – knowledge *'why'* Essential Lesson Components are: • Thinking Mathematically – *helping the students to decide what to do when they are not sure about how to start* • Key Concepts – *key concept/objective identified and required prior knowledge, interleaving and misconceptions built into lesson* • Motivating Students' Learning – *the why we are learning this and how does it relate to other concepts* • Supporting Reasoning – *use of activities and discussion to sharpen students' reasoning and the links between other topics (interleaving)* • Intelligent Practice – *time spent on a sequence of lessons to ensure factual knowledge, procedural fluency and conceptual understanding are achieved by the end of the topic* • Concrete-Pictorial-Abstract – *multiple representations of concepts should be used to both support and extend understanding* • Mathematical Language - *precise language and vocabulary is introduced, used and reinforced throughout so students are able to express themselves clearly and accurately.* • Differentiation – *teach to the top with the same outcome for all but consider how to scaffold to support those who need it.* • Assessment – *Quick starts, class tests and Examinations based on GCSE graded questions.*
	Y10 Autumn 1

Content/Skills *Procedural Knowledge – 'Know What'*	**<u>Unit 1 – Calculations 1</u>** Pupils are taught to • Use place value when calculating with decimals. • Order positive and negative integers and decimals using the symbols = ≠ < > ≤ ≥ • Round to a number of decimal places or significant figures. • Add and subtract positive and negative integers and decimals. • Multiply and divide positive and negative integers and decimals. • Use BIDMAS in multi-stage calculations. **<u>Unit 5 – Fractions, Decimals and Percentages</u>** Pupils are taught to • Convert between terminating decimals and their corresponding fractions. • Compare decimals and fractions using the symbols < and > • Find fractions and percentages of amounts. • Add and subtract simple fractions and mixed numbers. • Multiply and divide simple fractions and mixed numbers. • Convert between fractions, decimals, and percentages. **<u>Unit 3 – Angles and Polygons</u>** Pupils are taught to • Describe and apply the properties of angles at a point, on a line, and at intersecting and parallel lines. • Derive and use the sum of angles in a triangle. • Derive and apply the properties and definitions of special types of quadrilaterals. • Solve geometrical problems on coordinate axes. • Identify and use congruency and similarity. • Deduce and use the angle sum in any polygon and derive properties of regular polygons.
	Y10 Autumn 2
Content/Skills	**<u>Unit 6 – Formulae and Functions</u>**

Procedural Knowledge – 'Know What'	Pupils are taught to • Substitute numerical values into formulae and expressions. • Rearrange formulae to change the subject. • Identify inequalities, equations, formulae and identities. • Expand double brackets. • Factorise quadratic expressions of the form $x^2 + bx + c$ and the difference of two squares **Unit 7 – Working in 2D** Pupils are taught to • Use standard units of measure for length. E.g. mm, cm, m, km. • Measure line segments and angles. • Use bearings. • Interpret maps and scale drawings. • Know and apply formulae to calculate the area of triangles, parallelograms, and trapezia. • Identify, describe, and construct reflections, rotations, translations, and enlargements. **Unit 9 – Measures and Accuracy** Pupils are taught to • Round numbers and measures to an appropriate degree of accuracy. • Use approximation to make estimates. • Check calculations using approximation and estimation. • Use standard units of length, mass, volume, capacity, time, and area. • Use inequality notation to state error intervals and interpret limits of accuracy.
	Y10 Spring 1
Content/Skills	**Unit 13 – Factors, Powers and Roots** Pupils are taught to

Procedural Knowledge – 'Know What'	• Use mathematical language to describe factors, multiples, and primes. • Use Venn digrams or factor trees to systematically list the prime factors of a number. • Use prime factor decomposition to calculate the HCF and LCM of two or more numbers. • Write the HCF and LCM using product notation. • Calculate positive integer powers and their roots. • Recognise powers of 2, 3, 4, and 5. **Unit 10a - Linear Equations** Pupils are taught to • Use the balance method to solve simple linear equations (one step and two step) • Derive and solve simple linear equations • Solve linear equations involving brackets • Solve linear equations with unknowns on both sides • Solve linear equations involving fractions • Derive and solve linear equations (with unknowns both sides and brackets and fractions anywhere)
	Y10 Spring 2
Content/Skills	**Unit 14a – Linear Graphs & Functions** Pupils are taught to

Procedural Knowledge – 'Know What'	• Plot straight line graphs – vertical, horizontal and diagonal • Decide whether a given point lies on a graph • Use graphs to solve real life problems • Understand and identify gradient and intercept graphically and algebraically & identify parallel lines • Use one point and gradient to find equation of a line • Use two points to find the gradient, and the equation of a line • Interpret the gradient as rate of change **Unit 8 – Probability** Pupils are taught to • Use experimental data to estimate probabilities and expected frequencies. • Calculate theoretical probabilities and expected frequencies using the idea of equally likely events. • Compare theoretical probabilities with experimental probabilities. • Recognise mutually exclusive events and exhaustive events and know that the probabilities of mutually exclusive exhaustive events sum to 1. **Unit 10b & 14b - Simultaneous Equations & Inequalities, and Kinematic Graphs** Pupils are taught to • Derive and solve two linear simultaneous equations in two variables (by elimination) • Solve simultaneous equations graphically (find approximate solutions) • Solve linear inequalities in one variable and represent the solution on a number line • Plot and interpret kinematic graphs (speed-time or distance-time) • Calculate the gradient of kinematic graphs to find speed/acceleration
	Y10 Summer 1
Content/Skills *Procedural*	**Unit 11 – Circles and Construction** Pupils are taught to • Identify and apply circle definitions, properties, and formulae.

Knowledge – 'Know What'	• Construct triangles. • Use the standard ruler and compass constructions. • Solve loci problems. **Unit 10c & 18a - Quadratic Equations and Graphs** Pupils are taught to • Solve quadratic equations algebraically by factorising • Draw a quadratic graph • Identify and interpret roots, intercepts and turning points of a quadratic graphs • Solve a quadratic equation by finding approximate solutions using a graph (such as $x^2+5x+6=2$) • Solve quadratic equations from a context like a javelin being thrown **Unit 12 – Proportion, Ratio and Percentage Change** Pupils are taught to • Use fractions and percentages to describe a proportion. • Divide a quantity in a given ratio and reduce a ratio to its simplest form. • Use scale factors, scale diagrams, and maps. • Solve problems involving percentage change.
	Y10 Summer 2
Content/Skills *Procedural Knowledge – 'Know What'*	**Unit 17 – Calculations with Roots and Indices** Pupils are taught to • Calculate with roots and integer indices. • Calculate exactly with fractions and multiples of π. • Calculate with and interpret numbers written in standard form.
	Y11 Autumn 1
Content/Skills *Procedural Knowledge – 'Know What'*	**Unit 19 – Pythagoras and Trigonometry** Pupils are taught to • Use the formulae for Pythagoras' theorem. • Use the trigonometric ratios and apply them to find angles and lengths in right-angled triangles.

	• Know the exact values of sinθ and cosθ for θ = 0, 30, 45, 60 and 90. • Know the exact values of tanθ for θ = 0, 30, 45 and 60. • Write column vectors and draw vector diagrams. • Add, subtract, and find multiples of vectors. **Unit 22 – Units and Proportionality** Pupils are taught to • Calculate with standard and compound units • Compare lengths, areas, and volumes of similar shapes. • Solve direct and inverse proportion problems. • Describe direct and inverse proportion relationships using equations. • Interpret the gradient of a straight line graph as a rate of change. • Set up, solve, and interpret growth and decay problems. **Unit 18b – Graphs 2** Pupils are taught to • Recognise, sketch and interpret graphs of linear, quadratic and simple cubic functions • Recognise, sketch and interpret the reciprocal function y = 1/x (and asymptotes) • Plot and interpret real life graphs (and the trends they show)
	Y11 Autumn 2
Content/Skills *Procedural*	**Unit 16 – Groups and Bivariate Data** Pupils are taught to • Interpret and construct tables, graphs, and charts for discrete, continuous, and grouped data.

Knowledge – 'Know What'	• Use median, mean, modal class and range to interpret and compare distributions. • Use correlation to describe scatter graphs but know that it does not imply causation. • Draw estimated lines of best fit and make predictions but understand their limitations. • Interpret and construct line graphs for time series data. **<u>Unit 15 - Working in 3D</u>** Pupils are taught to • Identify the numbers of faces, edges, and vertices of 3D shapes. • Construct and interpret plans and elevations of 3D shapes. • Use standard units for volume, cm^3, m^3. • Calculate the volume of cuboids, cylinders, and other prisms. • Apply the formulae for volume and surface area of spheres, pyramids, cones, and composite solids.
	Y11 Spring 1
Content/Skills *Procedural Knowledge – 'Know What'*	**<u>Unit 20 - Combined Events</u>** Pupils are taught to • Use Venn diagrams to record outcomes and calculate probabilities of events. • Construct possibility spaces and use these to calculate probabilities. • Use tree diagrams to show the frequencies or probabilities of two events. • Use tree diagrams to calculate the probability of independent and dependent events.
	Y11 Spring 2
Content/Skills *Procedural Knowledge – 'Know What'*	**<u>Unit 21 - Sequences</u>** Pupils are taught to • Find terms of a linear sequence using a term-to-term or position-to-term rule. • Recognise special types of sequence and find terms using either a term-to-term or position-to-term rule. • Find terms of a quadratic sequence using a term-to-term or position-to-term rule.

Term	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Assessment			Year 10 Exam 1			Year 10 Exam 2
		Year 11 Exam 1	Year 11 Exam 2			

Literacy, Numeracy, SMSC & Character	Throughout our mathematics curriculum students are expected to show the character trait of resilience when problem solving. When problem solving teachers will know when to give hints and when to encourage that extra bit of struggle to get to an answer. When this is done well the students achieve an amazing sense of accomplishment and they develop their problem-solving resilience which is not only needed in their maths exams but also in the wider world of work, later on. We have an expectation that our students will communicate their mathematics well, both orally and in written form. It isn't enough to be "good at working stuff out" in the modern world, solutions to problems must be well communicated. We also expect that students will display the character trait of empathy in lessons. Students often find contributing to maths lessons daunting if they are not sure of their answer or method and other students need to respect all contributions, even if they are incorrect. Often progress is made by understanding another person's incorrect answer.