Department: Mathematics

Vision Statement:
Our curriculum design is underpinned by the belief that students must 'know more', 'do more' and 'remember more' in order to become successful mathematicians. We invite students to be curious through challenging problem solving and reasoning, linking previous, present and future learning effectively in order to build connections between topics. We strive to build confidence through use of retrieval strategies and effective checking of previous learning.

Strapline: Curiosity, Connections, Confidence

Curriculum Story: Students from year 7 to year 11 follow the 'White Rose' mastery curriculum which is designed to give all students a solid foundation in Mathematics but also challenge students to gain a deeper understanding of concepts through problem solving. This curriculum has been sequenced to promote depth of understanding with continual revisiting of concepts across multiple topics. A truly inclusive curriculum, White rose provides students with the opportunity to access higher level learning and does not limit students, taking the approach that all students should follow a pathway that allows them to access the higher tier exam material throughout.

Skills developed: Students will:
Be confident and able to recall and apply mathematical knowledge in different contexts.
Be able to explain their methods and thinking processes, applying skills in context.
Be fluent in different areas of maths.
Be efficient in applying problem solving and reasoning skills.
Be independent in their thinking and learning.
Have fun with their maths.

Year 7: Foundations.						
Topics	**Why we teach this**	**Links to last topic**	**Links to future topics**	**Key skills developed**	**Cultural capital opportunities**	**Links to whole school curriculum**
Autumn 1 Algebraic Thinking						
Sequences Understand and use algebraic notation. Equality and equivalence.	Helps students to understand number properties without simply applying the operations.	First module. Introduces algebraic notation. Generic rules are introduced and thought about.	Directly links to problem solving activities with addition, subtraction, multiplication and division. Links to the end year 7 proof section. Forms the basis of algebraic work through to GCSE.	-Deepened understanding of four operations -Identifying patterns in maths -Use of algebra to represent models. -Collecting like terms. -Understanding equivalence. -Can identify the rule for sequences and make connections to graphical representations. -Can use and understand a function machine.	Formulae are widely used in Science, Mathematics and Engineering. Substitution is necessary in practical subjects such as DT. Climate control is modelled using algebra.	**TECHNOLOGICAL PROGRESS** **PRECIOUS PLANET**
Autumn 2 Place Value and Proportion.						
Place values and ordering integers and decimals. Fraction, decimal and percentage equivalence.	Place value forms the very basics of mathematical understanding.	- Knowledge obtained in KS2 maths.	Multiplying and dividing fractions Addition and subtraction of fractions. Understanding percentage and fractions of amount	-Ordering numbers. -Representing numbers and understanding intervals. -Range and median. -Place Value. -Fractions, decimals and percentages conversions	Many students were educated in different countries prior to KS3 and the focus is on key words to better prepare students. Our number system is based	**SOCIAL JUSTICE** **CULTURAL DIVERSITY**

					on Arabic systems	
Spring 1 : Applications of Number						
Solving problems with addition and subtraction. Solving problems with multiplication and division. Fractions and percentages of amounts.	Helps students begin to solve problems with number, and form representations which may help them.	Builds on understanding of place values. Fractions are an extended part of number. Builds on place value (tenths, hundredths etc). Also builds on problem solving strategies introduced in Autumn 1.	Follows on directly from Autumn term. Leads into Summer 1 and geometry problems.	Recognise number relationships, including inverse operations. •Construct tables, charts and diagrams. •Develop calculation strategies for increasing different problem-solving activities. •Substitute values into formulae. •Interpret fractions and percentages as operators.	-Rounding and estimation make calculations quick. - Architects use area and accurate drawing when designing buildings.	**ARTISTIC CREATIVITY** **SOCIAL JUSTICE**
Spring 2 : Directed Number and Fractional Thinking.						
Operations and equations with directed number. Addition and Subtraction of fractions	Builds on understanding of fractions as an operator from Spring 1. Fractions are also commonly used in science, geography, DT and many aspects of real life.	-Use of conventional notation and priority for operations. -Forming and solving linear equations -Finding the range and median. Substitution into algebraic formulae.	Directly links to Percentages covered in year 8.	-Select and use appropriate calculation strategies. -Recognise and use number relationships. -Use square and square roots. -Use calculator effectively. Simplify and manipulate algebraic expressions.	Climatologists measure the earth's temperature to check on global warming. We need to keep our polar regions cold to sustain the planet's ambient temperature.	**PRECIOUS PLANET**

				-Move freely between representations. -Use of inequality and equality symbols.	Negative numbers are used in temperatures and by oceanographers when cataloguing the seas.	
Summer 1 Lines and Angles						
Constructing, measuring and geometric notation. Developing geometric reasoning.	Lines and Angles are used heavily in the construction and design industries. Having a good understanding of shape properties can help solve many problems. Leads into problem solving with shapes in year 8 SUM1.	- Builds on KS2 understanding of shape properties.	Links directly to year 8 Summer 1 topic on problem solving with lines and angles.	-Language and properties associated with 2D shapes. -Begin to reason deductively. -Draw and measure line segments and angles in geometric figures. -Describe, sketch and draw using conventional means. -Construct and interpret pie charts. -Identify and construct angles. -Derive and apply angle properties.	- Architects use accurate drawings when designing buildings and other structures. Measuring and using scales is a practical skill used in all aspects of life: baking, decorating etc. Angles used in architecture, design, building, room design.	**ARTISTIC CREATIVITY**
Summer 2 Reasoning with Number						
Developing number sense. Sets and probability.	Having a good understanding of number problems enables students to answer problems quickly, both in other	- Builds on all topics during year 7. Enables students to apply their	Forms the basis for numerical work ongoing through the course of their academic study.	Consolidate numerical and mathematical capability from previous KS. Select appropriate strategies.	– Understanding finances can prevent debt. - Calculations are required in many subjects	**SOCIAL JUSTICE**

Prime numbers and proof.	subjects and out in the real world. Proof builds a deeper understanding of number properties and helps to solidify understanding.	knowledge to problems.		Begin to reason deductively. Record, describe and analyse frequency of outcomes. Understand probability. Use integer powers and associated roots.	from geography, to DT to science. - LCM and HCF are used in production costing and optimization.	

Year 8:
Widening the scope of mathematics.

Topics	Why we teach this	Links to last topic	Links to future topics	Key skills developed	Cultural capital opportunities	Links to whole school curriculum
Autumn 1 – Proportional Reasoning.						
Ratio and Scale. Multiplicative Change. Multiplying and Dividing Fractions.	Multiplicative reasoning builds on skills developed in year 7 and KS2. And help students set up and solve problems.	It offers a chance for students to consolidate and extend their knowledge of the number system from KS2. And select appropriate strategies to solve problems.	-Probability -Scale drawings -Solving equations -Direct and Indirect proportion.	-Make connections between number relationships, algebraic and graphic representations -Scale factors, scale diagrams and maps. -Understand multiplicative relationships. -Divide into ratios. -Working in measures and formulating proportional relationships.	Map reading/creating. Architects use scale drawings. Golden ratio has been used throughout history, to create some beautiful designs. Ratio is used in money conversions and recipes.	**PRECIOUS PLANET** **ARTISTIC CREATIVITY**
Autumn 2 – Representations.						
Working in the Cartesian Plane. Representing Data. Tables and Probability.	For students to gain a conceptual understanding of representations before they are asked to solve problems.	To help students understand the connections between algebra and representations of data and gain a conception understanding before they are asked to complete problem-solving activities.	Students can explore gradient but the focus is using equations to draw lines, this leads into year 9.	--Direct and inverse proportion -Understand linear and simple quadratic functions. -Substitutions into formulae and expressions. -Construct, use and interpret charts, tables, diagrams and graphs. -Describe relationships between two variables. -Record, describe and analyse the outcomes of probability experiments.	Data processing is used in science when conducting experiments to identify trends and predict behaviour. Distance-time graphs Speed/distance/time problems. Data analysis is used by the government to ensure that the appropriate services are available for given communities.	**TECHNOLOGICAL PROGRESS** **CIVIC RESPONSIBILITY**

Spring 1 – Algebraic Techniques.						
Brackets, equations and inequalities. Sequences Indices.	Builds on understanding gained from year 7. Helps students to spot patterns and solve problems.	It builds on an understanding of algebraic notation from year 7.	Leads into quadratic graphs and factorisation in year 9. As well as standard form calculations in SPR2 of year 8.	-Identify variables and express relationships algebraically. -Begin to model situations mathematically. -Substitute values into formulae – including scientific. -Simplify and manipulate algebraic expressions. -Generate and recognise sequences. -Interpret algebraic notation including indices	Use of scientific formulae, substitution used in geography, and science. Use of formulae in medicine. Using equations and inequalities to solve real life problems, where we are not given all variables in a problem.	**TECHNOLOGICAL PROGRESS**
Spring 2 – Developing Number.						
Fractions and Percentages. Standard form. Number sense.	Fractions and percentages are among some of the most used maths, from recipes to interest rates.	Follows on from work on indices in previous term. Builds on understanding of fraction equivalences from year 7.	Links to interest calculations, and depreciation calculations within maths. Percentage increase and decrease in science.	-Develop mathematical knowledge to interpret and solve problems including finance. -Work interchangeably with terminating decimals and their corresponding fractions. -Define and interpret percentages. -Use integer powers and real roots. -Standard form.	Percentages are used in daily life, credit cards, loans, saving accounts. Standard form is used by scientists to calculate with very large and very small numbers. Rounding and estimation makes money calculations quick, and helps prevent bad money decisions.	**ETHICAL ENTERPRISE** **PRECIOUS PLANET**

				-Standard units of mass, length, time, money etc. -Round numbers. -Approximation.		
Summer 1 – Developing Geometry						
Angles in parallel lines and polygons. Area of trapezia and circles. Line symmetry and reflection.	To help students understand the world around them.	It builds on year 7 knowledge of angle sums and helps students to see the sum of angles in other polygons.	Rotations and translations covered in year 9.	-Apply properties of angles at a point, straight line and vertically opposite angles. -Understand and use relationships between parallel lines, alternate and corresponding angles. -Derive and use sum of angles in a triangle and regular polygons. -Derive and apply formulae to calculate and solve problems. -Calculate problems with perimeters of 2d shapes. -Describe, sketch and draw using conventional terms and notations.	-Area problems are used extensively in the building industry. - Line symmetry and reflection is used in science to understand how the human eye works. -Help students understand the way nature works, and why certain shapes are abundant in the natural world.	**ARTISTIC CREATIVITY** **PRECIOUS PLANET**
Summer 2 – Reasoning with data.						
The data handling cycle. Measures of location.	To allows students time to gather data and information and create their own theories to be tested.	Charts have been used in year 7 an earlier in year 8. The focus is to compare the different representations.	Links to data processing for grouped averages which comes in year 9.	-Describe, interpret and compare distributions of single variables. -Consider spread (range and outliers) and central	• Data and statistics are used in business, in news, by the government, in schools.	**ETHICAL ENTERPRISE**

	Data processing and statistics are one of the most used branches of mathematics.	And to select which average to use.		tendency (mean, mode and median) -Construct and interpret tables, charts and diagrams. -Describe and compare observed distributions.		

Year 9: Modelling and predicting						
Topics	**Why we teach this**	**Links to last topic**	**Links to future topics**	**Key skills developed**	**Cultural capital opportunities**	**Links to whole school curriculum**
Autumn 1 Reasoning with algebra						
-Coordinates -Linear graphs -Forming and solving equations -Testing conjectures	Co-ordinates and graphs form the basis for the analysis of the equation of a straight line. Forming and solving equations solidifies number work skills. Testing conjectures builds understanding of mathematical concepts.	Solving equations. - Number properties. -Basic linear graphs.	Deductions (spr2) Solving ratio problems (Sum2) Developing algebra module (Year 10)	- Use of a coordinate grid including plotting, reading and midpoints -Graphical presentation of proportion -Greater depth understanding of number properties.	- Students are exposed to a variety of graphs, much like in newspapers. - Students learn to construct and argue mathematically.	- **TECHNOLOGICAL PROGRESS** **PRECIOUS PLANET**
Autumn 2 Constructing in 2- and 3-dimensions.						
- 3-dimensional shapes - Constructions and congruency.	Builds an understanding of shape and space. Congruence leads into similar shapes and Pythagoras' Theory. This eventually leads into trigonometry in year 10.	Builds on understanding of area from year 7 and year 8. Builds on construction of triangles from year 8.	Trigonometry (year 10) Angles and bearings (year 10)	- Understanding plans and elevations. -Using and compass and ruler for constructions. -Constructing loci. -Substitute values into formulae -Use inverse operations to change the subject	Understanding scale drawings for maps (geography) Modelling real life situations using algebra/geometry Enabling students to measure and construct accurately using equipment that they may not have access to at home	**ARTISTIC CREATIVITY**

Spring 1 Reasoning with number.						
-Numbers -Using percentages -Maths and money.	To continue to build on understanding of number with and without a calculator. To solidify understanding of number before the start of the GCSE SOW and introduction of SURD and exact form answers.	-Standard form (Spring year 8). -Prime factorisation (Summer year 7)	-Year 10 Spring 2 – proportions and proportional change. -Year 10 – Summer 2 – using number.	-Comparing and calculating in standard form. -How to simplify problems using surds, factors, multiples, and fractions. -How to calculate percentage change. -How to calculate reverse percentage problems. -Working fluently with money.	Enabling students to solve problems involving money, including bank interests.	**SOCIAL JUSTICE**
Spring 2 Reasoning with Geometry.						
-Deduction - Rotation and translation - Pythagoras' theorem	Builds on earlier understanding of 2d shapes. Introduces Pythagors' Theorem, which lets students become familiar with the language and skills required for trigonometry (year 10).	- Autumn 2 – constructions in 2d shapes. -Year 8 Summer 1 – geometric reasoning -Builds on previous half terms understanding of surd and conjectures.	Trigonometry (Year 10 Autumn 1) Vectors (Year 11)	-Use of mathematical equipment -Understanding of congruence in triangles -Use of Pythagoras theorem -Knowledge of angle facts for polygons and properties of shapes.	Understanding problems with shape and space. Look at construction techniques of the Greeks and Romans.	**SOCIAL JUSTICE**

Summer 1 Reasoning with Proportion						
-Enlargement and similarity. -Solving ratio and proportion problems. -Rates	Enlargement and similarity are used in construction work, as well as media projections. Follows on from previous work on geometry, and Autumn one work on the graphs of proportion. Links made between the topics to broaden mathematical understanding.	- Reflections, rotations and translations. -Working with a cartesian grid.	-Similar shapes leads into trigonometry. -Equation of proportion.	- Enlarge shapes. -Using mathematical equipment for constructions. -Calculations with surds. -Effective use of a calculator.	Compound units are used in both geography and science. Map and scale reading is important when visiting new places.	**TECHNOLOGICAL PROGRESS**
Summer 2 Representations and Revision						
- Probability - Algebraic representation - Revision and retrieval	Helps to understand the world around us. Builds on previous understanding of entire key stage.	- Autumn 1 work on equations. -Autumn 2 – year 8 – work on probability	Solving simultaneous linear equations algebraically (Autumn 2 year 10)	- Language of probability. -Problem solving -Rearranging formula -understanding representations	Understand negatives of gambling (PSHE links).	**SOCIAL JUSTICE**

Year 10:

Building on the solid foundation from KS3, Year 10 is to provide the core content of the GCSE specification.

Topics	Why we teach this	Links to last topic	Links to future topics	Key skills developed	Cultural capital opportunities	Links to whole school curriculum
Autumn 1 Abstract and visual use of algebra with real world applications						
Unit 1: Congruence Similarity and Enlargement	Extend students' experiences and looks more formally at dealing with topics such as similar triangles	KS3 enlargement KS3 Similarity	Geometric reasoning Transforming and constructing	Enlarge a shape Identify similar shapes and establish similarity **Explore areas and volumes of similar shapes** Congruency	Russian Dolls Pyramids in Giza, Egypt Scale Drawings and models in Engineering	**PRECIOUS PLANET**
Unit 2 Trigonometry	To enable pupil to solve problems in a real-world context using right-angled triangles	Rearrange simple formulae and equations Recall basic angle facts. Understand when to leave an answer in surd form. Plot coordinates in all four quadrants and draw axes.	Angles and bearings Geometric Reasoning Show that …	Sine Cosine Tangent Pythagoeas's Theorem **3D Trigonometry** **Area of non-right angles triangles** **Sine rule** **Cosine rule**	Surveying building and calculating lengths and angles. Astronomy to calculate size of distant objects. How ancient Egyptians measures right angles exactly using knots in rope.	**TECHNOLOGICAL PROGRESS**

• Autumn 2 Study of relationships in Maths						
Unit 3 Representing Solutions of Equations and Inequalities	To enable students to solve equations and inequalities	Inequality signs Negative numbers Decimals Index Laws Number Lines	Multiplicative reasoning Quadratic equations More Algebra	• Solving Equations • Solving Inequalities • Generalising patterns with mathematics	Use of formulae in medicine. Using equations and inequalities to solve real life problems, where we are not given all variables in a problem	**TECHNOLOGICAL PROGRESS**
Unit 4 Simultaneous Equations	Enable students to set up and solve a set of equations with two unknowns.	Solving one and two step equations.	Algebraic Reasoning Show that…	Solve a pair of simultaneous equations. Elimination methos Substitution method Graphical method	Solving difficult problems involving speed, distance time to calculate two missing variables from two sets of information.	**TECHNOLOGICAL PROGRESS**
Spring 1 Visualisation of mathematics and geometry						
Unit 5 Angles and Bearings	Reinforce trigonometry and Pythagoras. Apply mathematics to model real-life situations	Pythagoras's Theorem Trigonometry	Vectors Geometric Reasoning Transforming and Constructing	Cardinal directions Scale diagrams Bearings	Air and maritime navigation	**ARTISTIC CREATIVITY**
Unit 6 Working with Circles	Surface area and volume of spheres and cones **Higher students can enhance their knowledge and skills of working with area and volume ratios**	Similar Shapes Fractions Pythagoras's Theorem	More circle theorems Geometric Reasoning Show that …	Arc lengths and areas of sectors. Circle Theorems Surface areas and volumes of 3D shapes.	Circles in nature. Links to manufacturing (cylinders: drinks can etc.)	**ARTISTIC CREATIVITY**

Unit 7 Vectors	Develop skills in geometric proof Make links to prior knowledge of properties of shape and parallel lines	Pythagoras's Theorem Addition/Subtraction Translation	Transformation of graphs Geometric Reasoning Show that…	Describe translations as 2D vectors Addition and subtraction of vectors Multiplication of vectors by a scalar, Use vectors to construct geometric arguments and proofs	Forces in three dimensions Proof of circle theorems Speed, velocity, acceleration problems	**TECHNOLOGICAL PROGRESS**
Spring 2 Introducing use of mathematics into the financial world.						
Unit 8 Ratios and Fractions	Reasoning and understanding notation to support the solution of increasingly complex problems	KS3 Ratio and Fraction	Using graphs Multiplicative reasoning Show that…	Comparing using ratio Sharing in a given ratio Currency conversion **Area/volume ratio problems**	Mixing paint Best buy problems	**ETHICAL ENTERPRISE**
Unit 9 Percentages and Interest	Use of mathematics within a financial context is essential for life beyond school.	Fractions and percentages. Percentages of amounts. Maths and money	Multiplicative reasoning Show that …	Percentage increase/decrease Repeated percentage change Finding the original amount.	Saving money Shopping in the sales Inflationary pressure	**ETHICAL ENTERPRISE**

Unit 10 Probability	Measure how likely something is to happen so risk can be calculated	Sets and probability	Listing and describing	Calculating probability Represent probabilities in diagrams	Insurance Premiums	**ETHICAL ENTERPRISE**
Summer 1 Collecting and displaying data and handing numbers.						
Unit 11 Collecting, Representing and Interpreting Data	To give the skills to collect, display and interpret data.	Data handling cycle Measures of location	Show that …	Collecting data Displaying data Measures of location Interpreting data Correlation	Science Business Finance	**ETHICAL ENTERPRISE**
Unit 12 Non-Calculator Methods	To calculate using irrational numbers and to access errors due to rounding.	Fractions Number sense Number	Show that …	Irrational numbers Surds Rounding Upper and lower bounds	Pythagoras discovering irrational numbers Engineering tolerances	**TECHNOLOGICAL PROGRESS**
Summer 2 Use of mathematics to study the properties and motion of objects.						
Unit 13 Types of Number and Sequences	Recognise patterns and use them to predict what will happen in the future.	Sequences Algebraic techniques (Sequences)	Algebraic reasoning Show that…	Prime factor decomposition Arithmetic and Geometric sequences Nth terms of linear and quadratic sequences	Modelling a real life sequence Engineering Pandemic projections	TECHNOLOGICAL PROGRESS

Unit 14 Indices and Roots	Recognise square and cube numbers. Calculation of indices with any number as the power and to use standard form.	Algebraic techniques (indices)	Algebraic reasoning Show that …	Higher powers and roots. Fractional and negative indices Standard form	Astronomy Virology Simple pendulum Newton's law of gravitation	TECHNOLOGICAL PROGRESS
Unit 15 Manipulating Expressions	Simplify expressions such as factorising quadratics to prepare for algebraic proof.	Equality and equivalence Brackets, equations and inequalities Forming and solving equations	Expanding and factorising Algebraic reasoning Show that…	Algebraic fractions Argument and proof	Engineering Electronics	TECHNOLOGICAL PROGRESS

Year 11 2023 - 2024 Increasing confidence in the use of mathematics in every-day life.						
Topics	**Why we teach this**	**Links to last topic**	**Links to future topics**	**Key skills developed**	**Cultural capital opportunities**	**Links to whole school curriculum**
Autumn 1 [Use of mathematics in Science and Engineering which improve our quality of life]						
Unit 1: Gradients and Lines	This block builds on earlier study of straight-line graphs. Students plat straight lines from a given equation, find and interpret the equation of a straight line from a variety of situations.	Straight line graphs Graphical solution to simultaneous equation Equations of perpendicular lines	Geometric reasoning Show that…	Plot and interpret graphs Interpret equations of a straight line Find the equation of a straight line Determine whether a point is on a line **Equations of perpendicular lines**	Techniques for graphical presentation are used throughout the sciences, social sciences, finance etc. Most companies produce an annual report which involves graphs and the interpretation of the data they hold.	**TECHNOLOGICAL PROGRESS**
Unit 2: Non-Linear Graphs	Develop knowledge of non-linear graphs, looking at quadratic, cubic and reciprocal graphs so they recognise different shapes. Graphically, we look at finding the roots of quadratics and revisit algebraic methods.	Linear graphs Quadratic graphs Solving equations	Functions Equation of tangent to a circle Algebraic reasoning Show that…	Recognise, sketch and interpret graphs of functions. Plot and interpret graphs Find approximate solutions using a graph. Identify and interpret roots of quadratic functions	Satellite dishes are parabolic in nature which have a quadratic equation governing their shape. The 'focus' of a parabola is the place where all reflected signals concentrate which is shy they are useful at receiving signals from a large area.	**TECHNOLOGICAL PROGRESS**

Unit 3: Using Graphs	Revision of conversion graphs and reflection in straight lines. Real life graphs are studied, including speed/distance/time construction and interpretation. Higher tier also investigate area under curves.	Conversion graphs Reflections Representing solutions of equations	Geometric reasoning Transforming and constructing Show that…	Plot and interpret graphs of non-standard functions in real context. Approximation of solutions to kinematic problems involving distance, speed and acceleration. **Estimate the area under a curve**	Kinematics is the study of motion. By considering real life situations we can determine speed/distance/time values in the future. Area under a velocity-time graph give you displacement	**TECHNOLOGICAL PROGRESS**
Autumn 2 [Formalising algebraic techniques]						
Unit 4: Expanding and Factorising	Review the expanding and factorising with a single bracket before moving onto quadratics. Development of conceptual understanding encouraged throughout. Context questions included to revisit areas such as area and Pythagoras' theorem	Expanding and factorising with a single bracket Area Pythagoras' theorem	Algebraic reasoning Show that…	Expand binomials Factorise quadratics **Solve quadratic equations** **Complete the square** **Use of the quadratic formula**	Natural disasters can strike at any time. However their behaviour can be predicted with mathematical model involving binomials. Solving quadratic equations has a wide range of uses in the fields of engineering and science.	**TECHNOLOGICAL PROGRESS**
Unit 5: Changing the Subject	Build on study of changing he subject. Reviews solving equations and inequalities before moving on to rearrangement of both familiar and unfamiliar formulae. Higher tier students are introduced to solving equations by iteration	Changing the subject Solving equations and inequalities	Algebraic reasoning Show that…	Solve linear equations Solve inequalities Change the subject of a formula **Solve equations by iteration**	Formula exist to help us calculate quantities from several component variable. By changing the subject, we can calculate a missing component.	**TECHNOLOGICAL PROGRESS**

Unit 6: Functions	Functions describe situations where one quantity determines another. Because we continually make theories about dependencies between quantities in nature and society, functions are important tools in the construction of mathematical models.	Quadratic functions and graphs Trigonometric functions	Algebraic reasoning Geometric reasoning Show that…	Function machines Substitution into expressions and formulae. Function Notation **Composite and inverse functions** **Graphs of quadratic functions** Trigonometric functions	Compound interest Gravitational force of attraction Predicting natural disasters Curing diseases Economics Aeronautical engineering	**ETHICAL ENTERPRISE**
Spring 1 [Mathematical reasoning]						
Unit 7: Multiplicative Reasoning	Development of multiplicative reasoning in a variety of contexts, from simple scale factors to complex equations involving proportion. Link inverse proportion to pressure and density. Review ratio problems	Scale factors Direct and inverse proportion Ratio problems	Show that…	Direct proportion Pressure and density Inverse proportion Ratio	Compound measures such as speed, pressure and density. Best buys Recipes	**TECHNOLOGICAL PROGRESS**
Unit 8: Geometric Reasoning	Consolidate angle facts and develop complex chains of reasoning to solve geometric problems.	Angle facts **Circle theorems** Vectors Pythagoras' theorem Trigonometry	Show that…	Proving geometric facts	Construction of buildings Calculating the height of aircraft Interior design Measuring orbits and planetary motion	**ARTISTIC CREATIVITY** **TECHNOLOGICAL PROGRESS**

Unit 9: Algebraic Reasoning	Develop algebraic reasoning by looking at more complex situations. Making links using sequences and rules to make inferences.	Sequences Algebraic techniques Simultaneous equations Inequalities	Show that…	Simplify complex expressions Nth terms **Formal algebraic proof** **Inequalities in two variables**	Numerical proofs such as Goldbach's conjecture and Fermat's last theorem Generalising a pattern and predicting the future.	**TECHNOLOGICAL PROGRESS**
Spring 2 [Deeper thinking and understanding]						
Unit 10: Transforming and Constructing	Exploration of transformation and constructions, relating these to symmetry and properties of shapes where appropriate. Emphasis on describing and performing transformation as using the language promoted deeper thinking and understanding. Higher tier students extend their learning to explore invariance and look at the transformation of trigonometric graphs.	Transformations Constructions Trigonometric graphs	Show that…	Plan and describe a series of transformations of shapes Solve loci problems Understand and use trigonometric graphs Sketch and identify transformations of the graphs of given functions	Construction Civil engineering Town planning Electrical engineering	**TECHNOLOGICAL PROGRESS**
Unit 11: Listing and Describing	Students look at organisation information, with Higher tier students extending this to include the product rule for counting. Links are made to probability and other aspects of Data Handling such as describing and comparing distributions and scatter diagrams. Plans and elevations are also revised.	Data handling Statistical diagrams Plans and elevations	Show that…	Work with organised lists Product rule for counting Revision of common statistical and probability techniques	Insurance and the calculation of risk Business applications requiring the interpretation of data Construction	**TECHNOLOGICAL PROGRESS** **ETHICAL ENTERPRISE**

Unit 12: Show that	Examples of communication in various areas of mathematics are provided in order to highlight gaps in knowledge that need addressing in the run up to the examinations. "Show that" is used to encourage students to communicate in a clear mathematical fashion, and this skill should be transferred to their writing of solutions to any type of question.	Number Algebra Geometry Handling data Vectors Congruent triangles		Show that with: • Number • Algebra • Shape • Angles • Data • Vectors • Congruent triangles Formal proof with congruent triangles	Consolidation of mathematical techniques and building confidence and fluency.	**TECHNOLOGICAL PROGRESS**
Summer 1 [Revision]						
Summer 2 [Public Examinations]						