Stage 11 2022-23						
	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	1A Solving Equations and Inequalities 2 1B Proportional Reasoning 2 1C Conjecturing 1D Investigating properties of shape (From S10)	2E Calculating 2F Solving Equations and Inequalities 1 2G Transformations 2H Algebra	3I Proportional Reasoning 3J Sequences 3K Solving Equations and Inequalities 2 3L Algebraic graphs 1	4M Analysing Statistics 4N Algebraic Graphs 2 4O Vectors	Exam preparation and GCSE Exams	Year 11 GCSE Exams
Knowledge & Understanding *(National Curriculum)*	• 1A Understand the concept of solving simultaneous equations by substitution • Decide whether to use elimination or substitution to solve a pair of simultaneous equations • Solve two linear simultaneous equations in two	• 2E Know that $\sqrt{a \times b}$ ¿ $\sqrt{a} \times \sqrt{b}$ **207b** 73-76 • Identify a factor pair where one factor is square **207b** 73-76 • Use $\sqrt{a \times b}$ ¿ $\sqrt{a} \times \sqrt{b}$ to simplify a surd **207b** 73-76 • Multiply two	• 2I Create a statement describing an identified proportional relationship (e.g. $y \propto x^2$) **42, 199** 92-97 • Create an initial equation describing an identified proportional relationship	• 4M Understand the definition of a histogram **205** 349-351 • Construct and use the horizontal axis of a histogram correctly **205** 349-351 • Know that frequency density = frequency ÷		

	variables by substitution • Solve two linear simultaneous equations in two variables by elimination (multiplication of both equations required) • Derive and solve two simultaneous equations in complex cases • Interpret the solution to a pair of simultaneous equations • Understand the concept of decimal search to solve a complex equation 87-89 • Use decimal search to solve a complex equation 87-89 • Understand the process of interval bisection to locate an approximate solution for a complex equation	binomials involving surds **207b**73-76 Rationalise the denominator of a surd expression **207c** 73-76 • 2F Complete the square for a given quadratic expression **209a, 209b** 100-102 • Apply completing the square to solve a quadratic equation **209b** 100-102 • Know and apply the formula for solving a quadratic equation of the form $ax^2 + bx + c = 0$ **191** 102-105	(e.g. $y = kx^2$) **42, 199** 92-97 • Use given facts to identify the value of the multiplier in a situation involving proportion **42, 199** 92-97 • Create an equation in two variables describing an identified proportional relationship (e.g. $y = 3x^2$) **42, 199** 92-97 Solve problems involving direct and inverse proportion **42, 199** 92-97 • 2J Find a given term in a simple geometric progression **163** 127	class width **205** 349-351 • Identify when it is necessary to calculate the frequency density **205** 349-351 • Construct histograms for grouped data with equal class intervals **205** • Construct histograms for grouped data with unequal class intervals **205** 349-351 • Use a histogram to find missing values in a frequency table **205** 349-351 Use a partially completed histogram and frequency table to complete both **205** 349-351		

	87-89 • Use interval bisection to locate an approximate solution for a complex equation • Rearrange an equation to form an iterative formula **180** 87-89 Use an iterative formula to find approximate solutions to equations **180** 87-89 • Complete the square for a given quadratic expression • Apply completing the square to solve a quadratic equation • Know and apply the formula for solving a quadratic equation of the form $ax^2 + bx + c = 0$ • Solve equations involving fractions that can be	• Solve equations involving fractions that can be rearranged into the form $ax^2 + bx + c = 0$ **191** 102-105 • Solve problems involving quadratic equations Identify when iteration should be used to find approximate solutions to an equation **180** 102-105 • 2G Use the centre and scale factor to carry out an enlargement of a 2D shape with a negative scale factor **181a,**	• Describe a geometric progression **163** 127 • Recognise and use geometric progressions, ar^n, when r is a fraction > 0 or a surd **163** 127 Recognise and use non-standard sequences 123-129 • 2K Choose a quadratic function related to a quadratic inequality 111-112 • Sketch the graph of the related quadratic function • Identify the roots of the related quadratic	• 4N Complete the square for a quadratic function **209a, 209b, 209c** 100-102 • Know that 'in the form $(x + p)^2 - q$' implies that completing the square is required 100-102 • Deduce the turning point of a quadratic function by completing the square **209c** 100-102 • Deduce the roots of a quadratic function by factorising function **209a, 209b, 209c** 98-99 • Deduce the roots of a		

	rearranged into the form $ax^2 + bx + c = 0$ • Solve problems involving quadratic equations Identify when iteration should be used to find approximate solutions to an equation • 1B Understand why speed, density and pressure are known as compound units • Know the definition of density (pressure, population density, speed) • Solve problems involving density (pressure, speed) • Convert between units of density Recognise when to use kinematic formulas	**181b** 311-312 Find the scale factor and centre of an enlargement with negative scale factor **181a, 181b** 311-312 • 2H Understand the meaning of a function 173-178 • Know the notation for composite functions **215** 173-178 • Find the inverse of a given function **214a, 214b** 173-178 • Solve problems involving inverse functions **214a, 214b** 173-178 Solve problems involving	function **98, 160** • Use the graph the find, and state, the solution to a quadratic inequality **162** • Make an appropriate substitution when solving simultaneous equations in two variables where one is quadratic **211** • Manipulate and solve the resulting quadratic equation to find the values for one variable **211** 111-112 • Find the values of the second variable by substitution111-112 Make connections	quadratic function using the completed square form function **209a, 209b, 209c** 100-102 • Apply the concept of average rate of change in numerical, algebraic and graphical contexts **216b** 238-241 • Apply the concept of instantaneous rate of change in numerical, algebraic and graphical contexts **216b** 238-241 • • Solve practical problems involving quadratic		

	Substitute into any given kinematic formulas Use and interpret all kinematic formulas • 1C Know the criteria for triangles to be congruent (SSS, SAS, ASA, RHS) • Identify congruent triangles • Use known facts to form conjectures about lines and angles in geometrical situations • Use known facts to derive further information in geometrical situations • Test conjectures using known facts • Know the structure of a simple mathematical proof • Use known facts to create simple proofs • Explain why the	composite functions **215** 173-178	between simultaneous equations and graphs **211** 111-112 • 2L Plot the graph of an exponential function, y = k^x, for positive values of k **194** 150-151 • Understand that trigonometric values can be found for angles of any size 152-157 • Plot the graphs of the trigonometric functions, y = sin x, y = cos x and y = tan x **195** 152-157 • Know the key features of exponential and trigonometric	functions and rates of change 238-241 • 4O Understand how to create and present a proof involving vectors **174, 219** 273-280 • Make deductions about situations involving vectors that are multiples of other vectors **174, 219** 273-280 • Make deductions about situations involving vectors expressed using ratios **174, 219** 273-280 Make deductions about situations involving vectors		

	base angles in an isosceles triangle must be equal Explain the connections between Pythagorean triples • Know the conditions for creating a right angle with three points on the circumference of a circle **183,184** 221-228 • Know that 'the angle in a semicircle is a right angle' (and others – see pedagogical notes) **183,184** 221-228 • Form a conjecture from a geometrical situation • Set up a proof**183,184** • Create a chain of logical steps to create a proof in a geometrical situation • Identify when a circle theorem		graphs **194, 195** 150-157 • Know the effects of transforming the graph $y = f(x)$: $f(x)$, $f(ax)$, $af(x)$, $f(x) + a$, $f(x + a)$, $y = f(-x)$ and $y = -f(x)$ **196b** 154-160 Solve problems involving the transformation of graphs **196b** 154-160	and parallel lines **174, 219** 273-280		

	can be used to help solve a geometrical problem **183,184** 221-228 • Use a combination of known and derived facts to solve a geometrical problem 221-228 Justify solutions to geometrical problems • 1D Apply Pythagoras' theorem in two dimensions • Know the trigonometric ratios, sinθ = opp/hyp, cosθ = adj/hyp, tanθ = opp/adj • Choose an appropriate trigonometric ratio that can be used in a given two-dimensional situation Set up and solve a trigonometric equation to find a					

	missing side or angle in a right-angled triangle • Visualise the diagonals of a cuboid **217, 218** 256-257 • Visualise triangle that can be created by joining any three vertices of a three dimensional shape **217, 218** 256-257 • Use Pythagoras' theorem to find the length a given diagonal in a cuboid **217** 256-257 • Use Pythagoras' theorem to find lengths in three dimensional figures **217** 256-257 • Use trigonometry to find the angle between a line and a plane **218** 269-272 • Solve practical problems involving lengths and angles in					

	three dimensional figures 269-272 • Know the labelling conventions for non-right angled triangles 262-265 • Derive the sine rule **201** 262-265 • Know the cosine rule **202** 262-265 • Identify when the sine (cosine) rule is needed to solve a problem **201,202** 262-265 • Set up and use the sine (cosine) rule to find a missing side in a non-right angled triangle**201,202** 262-265 • Set up and use the sine (cosine) rule to find a missing length in a non-right angled triangle**201,202** 262-265 • Recognise the ambiguous case when using the sine rule **201** 262-265 Solve problems					

	involving bearings **124** 262-265					
Assessment	Teacher/Ass. Test Unit tests	EXAM practice Unit tests	MockGCSE Exams	Unit tests	External exams	External Exams

Curriculum Area: Maths			
Subject:			
Year Group	**Basic (Lower Ability End Points)**	**Clear (Middle Ability End Points)**	**Detailed (Higher Ability End Points)**
7	Pupils use mathematics as an integral part of classroom activities. They represent their work with objects or pictures and discuss it. They recognise and use a simple pattern or relationship.	Pupils develop their own strategies for solving problems and use these strategies both in working within mathematics and in applying mathematics to practical contexts. When solving problems, with or without ICT, they check their results are reasonable by considering the context. They look for patterns and relationships, presenting information and results in a clear and organised way, using ICT appropriately. They search for a solution by trying out ideas of their own.	Pupils carry out substantial tasks and solve quite complex problems by independently and systematically breaking them down into smaller, more manageable tasks. They interpret, discuss and synthesise information presented in a variety of mathematical forms, relating findings to the original context. Their written and spoken language explains and informs their use of diagrams. They begin to give mathematical justifications, making connections between the current situation and situations they have encountered before.
8	Pupils select the mathematics they use in some classroom activities. They discuss their work using mathematical language and are beginning to represent it using symbols and simple diagrams. They explain why an answer is correct.	In order to explore mathematical situations, carry out tasks or tackle problems, pupils identify the mathematical aspects and obtain necessary information. They calculate accurately, using ICT where appropriate. They check their working and results, considering whether these are sensible. They show understanding of situations by describing them	Starting from problems or contexts that have been presented to them, pupils explore the effects of varying values and look for invariance in models and representations, working with and without ICT. They progressively refine or extend the mathematics used, giving reasons for their choice of mathematical presentation and

Curriculum Area: Maths			
Subject:			
Year Group	**Basic (Lower Ability End Points)**	**Clear (Middle Ability End Points)**	**Detailed (Higher Ability End Points)**
		mathematically using symbols, words and diagrams. They draw simple conclusions of their own and explain their reasoning.	explaining features they have selected. They justify their generalisations, arguments or solutions, looking for equivalence to different problems with similar structures. They appreciate the difference between mathematical explanation and experimental evidence.
9	Pupils try different approaches and find ways of overcoming difficulties that arise when they are solving problems. They are beginning to organise their work and check results. Pupils discuss their mathematical work and are beginning to explain their thinking. They use and interpret mathematical symbols and diagrams. Pupils show that they understand a general statement by finding particular examples that match it.	Pupils carry out substantial tasks and solve quite complex problems by independently and systematically breaking them down into smaller, more manageable tasks. They interpret, discuss and synthesise information presented in a variety of mathematical forms, relating findings to the original context. Their written and spoken language explains and informs their use of diagrams. They begin to give mathematical justifications, making connections between the current situation and situations they have encountered before.	Pupils develop and follow alternative approaches. They compare and evaluate representations of a situation, introducing and using a range of mathematical techniques. They reflect on their own lines of enquiry when exploring mathematical tasks. They communicate mathematical or statistical meaning to different audiences through precise and consistent use of symbols that is sustained throughout the work. They examine generalisations or solutions reached in an activity and make further progress in the activity as a result. They comment constructively on the reasoning and logic, the process employed and the results obtained.
10	Pupils develop their own strategies for solving problems and use these strategies both in working within mathematics and in applying mathematics to practical contexts. When	Starting from problems or contexts that have been presented to them, pupils explore the effects of varying values and look for invariance in models and representations, working with	Pupils critically examine the strategies adopted when investigating within mathematics itself or when using mathematics to analyse tasks. They explain why different

Curriculum Area: Maths			
Subject:			
Year Group	**Basic (Lower Ability End Points)**	**Clear (Middle Ability End Points)**	**Detailed (Higher Ability End Points)**
	solving problems, with or without ICT, they check their results are reasonable by considering the context. They look for patterns and relationships, presenting information and results in a clear and organised way, using ICT appropriately. They search for a solution by trying out ideas of their own.	and without ICT. They progressively refine or extend the mathematics used, giving reasons for their choice of mathematical presentation and explaining features they have selected. They justify their generalisations, arguments or solutions, looking for equivalence to different problems with similar structures. They appreciate the difference between mathematical explanation and experimental evidence.	strategies were used, considering the elegance and efficiency of alternative lines of enquiry or procedures. They apply the mathematics they know in a wide range of familiar and unfamiliar contexts. They use mathematical language and symbols effectively in presenting a convincing, reasoned argument. Their reports include mathematical justifications, distinguishing between evidence and proof and explaining their solutions to problems involving a number of features or variables
11	In order to explore mathematical situations, carry out tasks or tackle problems, pupils identify the mathematical aspects and obtain necessary information. They calculate accurately, using ICT where appropriate. They check their working and results, considering whether these are sensible. They show understanding of situations by describing them mathematically using symbols, words and diagrams. They draw simple conclusions of their own and explain their reasoning.	Pupils develop and follow alternative approaches. They compare and evaluate representations of a situation, introducing and using a range of mathematical techniques. They reflect on their own lines of enquiry when exploring mathematical tasks. They communicate mathematical or statistical meaning to different audiences through precise and consistent use of symbols that is sustained throughout the work. They examine generalisations or solutions reached in an activity and make further progress in the activity as a result. They comment constructively on the reasoning and logic, the process employed and the results obtained.	Pupils perform procedures accurately. They interpret, communicate complex information accurately and make deductions and inferences and draw conclusions. Pupils can construct substantial chains of reasoning, including convincing arguments and formal proofs. They generate efficient strategies to solve complex mathematical and non-mathematical problems by translating them into a series of mathematical processes. Pupils make and use connections, which may not be immediately obvious, between different parts of mathematics and interpret results in the context of the given problem. They critically evaluate methods, arguments, results and the

Curriculum Area: Maths			
Subject:			
Year Group	**Basic (Lower Ability End Points)**	**Clear (Middle Ability End Points)**	**Detailed (Higher Ability End Points)**
			assumptions made.

LITERACY Pupils will develop their spelling of key mathematical words. This will be monitored using spelling tests at the start and end of each unit. This will be SPAG marked. Pupils will be given opportunities to write in sentences and paragraphs when suited to the topic.

Why this? Why now?	Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programme of study for key stage 3 is organised into apparently distinct domains, but pupils should build on key stage 2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge in science, geography, computing and other subjects. The structure is designed to bridge between KS2 and KS4, building both within and between key topic areas. The structure also builds the complexity levels within topics and gives a greater variation in the challenge given to pupils.
Skills & Characteristics	**Resilience** Pupils will increase their resilience during the course through learning new concepts, using prior knowledge to develop mathematical fluency and applying skills to a variety of situations and problems. Pupils will be challenged in all lessons and will show that they have learned from mistakes through a variety of tasks including connect exercises. The challenge activities will have the aim of developing both skills and high aspirations in both this subject and life beyond. Resilience will also be developed within the Key maths skills below (fluency, reasoning and problem solving). **Collaboration**

	Pupils will be given the opportunity to work together to develop and share their ideas on topics, discuss misconceptions and how these topics can be used in real-life situations. **Creativity** Pupils will develop creativity through a variety of problem solving activities within each topic, working on independent tasks beyond the classroom such as Mangahigh activities, and apply the key skills (fluency, reasoning and problem solving). **Skills Builder** COMMUNICATION = Listening & Speaking Pupils are expected to actively listen so that they can follow instructions and pick out misconceptions. (LISTENING) CREATIVE PROBLEM SOLVING = Problem Solving & Creativity Problem solving is an important part of Mathematics and ensures that they develop their mathematical thinking and helps build resilience. (PROBLEM SOLVING) SELF-MANAGEMENT: Staying Positive & Aiming High All pupils attempt Bronze/Silver/Gold tasks and choose their starting point and aim for one or two steps of progress within each lesson. (AIMING HIGH) COLLABORATION: Leadership & Teamwork Pupils are expected to collaborate on many tasks, supporting each other to help all to progress. (TEAMWORK) **Develop fluency** consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots select and use appropriate calculation strategies to solve increasingly complex problems use algebra to generalise the structure of arithmetic, including to formulate mathematical relationships substitute values in expressions, rearrange and simplify expressions, and solve equations move freely between different numerical, algebraic, graphical and diagrammatic representations [for example, equivalent fractions, fractions and decimals, and equations and graphs]

	👉develop algebraic and graphical fluency, including understanding linear and simple quadratic functions 👉use language and properties precisely to analyse numbers, algebraic expressions, 2-Dand 3-D shapes, probability and statistics. **Reason mathematically** 👉extend their understanding of the number system; make connections between number relationships, and their algebraic and graphical representations 👉extend and formalise their knowledge of ratio and proportion in working with measures and geometry, and in formulating proportional relations algebraically 👉identify variables and express relations between variables algebraically and graphically 👉make and test conjectures about patterns and relationships; look for proofs or counter- examples 👉begin to reason deductively in geometry, number and algebra, including using geometrical constructions 👉interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning 👉explore what can and cannot be inferred in statistical and probabilistic settings, and begin to express their arguments formally. **Solve problems** 👉develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems 👉develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics 👉begin to model situations mathematically and express the results using a range of formal mathematical representations 👉select appropriate concepts, methods and techniques to apply to unfamiliar and non- routine problems.
Aspirations & Careers	All pupils should be numerate and able to use mathematics at both work and in everyday life beyond school. Mathematics is fundamental to future success and closely linked with financial success. It enhances their ability to infer, problem solve, think logically, spot patterns as well as navigate through their chosen career with a well-equipped vocabulary. Furthermore, mathematics empowers our pupils to operate in the modern world. CDI: 1, 11

	CEIAG AMSP days Careers Fairs Career themed lessons Finance lessons (CDI: 13) **Cultural Capital** Maths challenges Mangahigh challenges Mathematics in the real world Organising trips, days out and other events **Extracurricular** Stretch and challenge club Chess & games club Homework club