Stage 10 2022-23						
	Autumn Term		Spring Term		Summer Term	
	1	2	1	2	1	2
Key Concepts	1A Number & the number system 1B Calculating 1C Exploring FDP 2D Manipulating algebra	2E Solving equations & Inequalities 1 2F Probability 2G Sequences	3H Investigating properties of shape 3I Analysing statistics 3J Calculating space	4K Proportional reasoning 1 4L Algebraic Graphs 1 4M Algebraic Graphs 2 5N Transformations	5O Vectors 5P Solving equations & Inequalities 2 5Q Proportional reasoning 1	6R Conjecturing
Knowledge & Understanding *(National Curriculum)*	1A Estimate squares and cubes of numbers up to 100 • Estimate powers of numbers up to 10 • Estimate square roots of numbers up to 150 • Estimate cube roots of numbers up to 20 • Know that a0 = 1 131 67 Know that a1/n = n√a 188 70 • Calculate with negative powers 154 68 Calculate	2E Understand the use of a graph to represent an inequality in two variable 198 113-115 • State the (simple) inequality represented by a shaded region on a graph 198 113-115 • Know when to use a dotted line as a boundary for an inequality on a graph 198 113- 115 • Know when to use a solid line as a	3H • Establish the exact values of sinθ and cosθ for θ = 0°, 30°, 45°, 60° and 90° 173 • Establish the exact value of tanθ for θ = 0°, 30°, 45° and 60° 173 • Use unit triangles to find exact solutions for finding a side in a right angled triangle 173, 168 • Use trigonometry to evaluate solutions involving exact values of sin, cos	4K Recognise a graph that illustrates direct proportion 119 92-97 • Recognise a graph that illustrates inverse proportion 119 92-97 • Interpret a graph that illustrates direct proportion 119 92-97 • Interpret a graph that illustrates inverse proportion 119 92-97 • Understand that X is	5O Understand the concept of a vector 174, 219 • Use diagrammatic representation of vectors 219 • Know and use different notations for vectors • Add (subtract) vectors 219 Multiply a vector by a scalar 219 Solve simple geometrical problems involving vectors 219 5P Solve a quadratic	6R 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

	with fractional powers 188 70 1B Use the functionality of a scientific calculator when calculating with roots and powers N44 66 • Choose the required minimum and maximum values when solving a problem involving upper and lower bounds 132, 206 14-16 • Calculate the upper and lower bounds in a given situation 132, 206 14-16 1C • Understand and use notation for recurring decimals 189 24 • Interpret a calculator display involving a recurring decimal • Convert a fraction to a recurring	boundary for an inequality on a graph 198 113-115 • Construct and shade a graph to show a linear inequality of the form y > ax + b, y < ax + b, y ≥ ax + b or y ≤ ax + b 198 113-115 • Construct and shade a graph to show a linear inequality in two variables stated implicitly 198 113-115 • Construct and shade a graph to represent a set of linear inequalities in two variables 198 113-115 • Find the set of integer coordinates that are solutions to a set of inequalities in two variables198 113-115 Use set notation to represent the solution set to an	and tan of 30, 45 and 60 173, 168 • Visualise the diagonals of a cuboid • Visualise triangle that can be created by joining any three vertices of a three dimensional shape • Use Pythagoras' theorem to find the length a given diagonal in a cuboid 217 • Use Pythagoras' theorem to find lengths in three dimensional figures 217 • Use trigonometry to find the angle between a line and a plane 218 3I Understand the limitations of sampling 152, 176 331 - 332 • Use a sample to infer properties of a population 152, 176 331 - 332 • Know	inversely proportional to Y is equivalent to X is proportional to 1/Y 119 92-97 • Interpret equations that describe direct proportion 119 92-97 • Interpret equations that describe inverse proportion 119 92-97 • Solve problems which include finding the multiplier in a situation involving direct proportion 119 92-97 Solve problems which include finding the multiplier in a situation involving inverse proportion 119 92-97 4L Recognise (plot, interpret) graphs of exponential functions 194 150-151 • Plot graphs of non-standard functions •	equation of the form $x^2 + bx + c$ by factorising 157 98-99 • Solve a quadratic equation of the form $ax^2 + bx + c$ by factorising 157 98- 99 • Solve a quadratic equation by rearranging and factorising 157 98-99 • Identify when a quadratic equation cannot be solved by factorising 191 98-99 • Make connections between graphs and quadratic equations of the form $ax^2 + bx + c = 0$ 160 168-169 • Make connections between graphs and quadratic equations of the form $ax^2 + bx + c = dx + e$ 160 168-169 • Find approximate solutions to quadratic equations using a graph 160 168-169 • Deduce roots of quadratic functions	proof183,184 • Create a chain of logical steps to create a proof in a geometrical situation • Identify when a circle theorem 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

	decimal 177,189 24-27 • Recall the recurring decimal equivalents of ninths 24-27 • Set up an equation which can be used to convert a recurring decimal to a fraction 177 24-27 • Convert a recurring decimal of the form 0. $\dot{x}$, 0. $\dot{x}\dot{y}$, 0. $\dot{x}y\dot{z}$to a fraction177 24- 27 • Convert a recurring decimal of the form 0.0$\dot{x}$, 0.0$\dot{x}\dot{y}$, to a fraction 177 24- 27 • Recognise when a situation involves compound interest 164 46- 48 • Set up a compound interest problem164 46- 48 • Calculate the result of a repeated percentage change, including compound interest	inequality 195 2F Apply the product rule for counting 368 • Use a Venn diagram to sort information in a probability problem 127a,127b, 185 196-199, 379 • Use a two-way table to sort information in a probability problem 61 366-367 329, 342 • Use a Venn diagram to calculate theoretical probabilities 127a,127b, 185 196-199, 379 • Use a two-way table to calculate theoretical probabilities 61 329, 342 Calculate conditional probabilities using different representations 377-379	the meaning of the lower quartile and upper quartile 186, 187 340-341 • Find the quartiles for discrete data sets 186, 187 340- 341 • Calculate and interpret the interquartile range 186, 187340-341 • Construct and interpret a box plot for discrete data 187 354 • Use box plots to compare distributions 187 354 • Understand the meaning of cumulative frequency 186 352-354 • Complete a cumulative frequency table 186 352-354 • Construct a cumulative frequency curve 186 352-354 • Use a cumulative frequency curve to estimate the quartiles for grouped continuous	Recognise that the gradient of a curve is not constant 216b • Know that the gradient of a curve is the gradient of the tangent at that point 216b 171 • Calculate (estimate) the gradient at a point on a curve 216b 171 • Interpret the gradient at a point on a curve as the instantaneous rate of change 216b 171-172, 238-241 • Solve problems involving the gradients of graphs in context 171-172, 238-241 • Know that the area under a speed-time graph gives the distance 216a237-238 • Calculate (estimate) the area under a graph 238-241 • Solve problems involving the area under graphs in	algebraically 160 98-99 Solve problems that involve solving a quadratic equation in context 5Q Recognise when to use kinematic formulas Substitute into any given kinematic formulas	

	164 46- 48 • Set up a growth or decay problem46-48 Solve problems involving growth and decay 46-48 2D Add (subtract, multiply, divide) algebraic fractions 210 59-62 • Simplify an algebraic fraction 210a 59-62 • Identify when it is necessary to find two linear expressions to factorise a quadratic expression 157,192 59-64 • Expand the product of two binomials involving surds 207b 75 • Factorise an expression involving the difference of two squares 157,192, 158 58-59 • Factorise a	2G Understand the meaning of a quadratic sequence 213 127 • Find the term in x 2 for a quadratic sequence 213 127 • Find the nth term of a sequence of the form ax2 213 127 • Find the nth term of a sequence of the form ax2 + b 213 127 • Find the nth term of a sequence of the form ax2 + bx + c 213 127 Understand the difference between an arithmetic progression, a quadratic sequence and a geometric progression 123-127	data sets 186 352-354 • Use a cumulative frequency curve to estimate properties of grouped continuous data sets 186 352-354 3J Know the formula for the surface area of a sphere (curved surface area of a cone) 169, 171 296-297 • Use Pythagoras' theorem to find lengths in a pyramid 217 297 • Find the surface area of a sphere (cone, pyramid) 169, 171, 170 296-298 • Identify how to find the surface area of a composite solid 114a, 114b, 169, 171, 170 296-298 • Solve practical problems involving the surface area of solids 114a, 114b, 169, 171, 170 296-	context 238-241 Identify (interpret) roots, intercepts and turning points of quadratic functions graphically 160 183-185 4M Know that perpendicular lines have gradients with a product of -1 208 137-138 • Identify perpendicular lines using algebraic methods 208 137-138 • Know the equation of a circle with centre at the origin 197 151-152 • Identify the equation of a circle from its graph 197 151- 152 • Use the equation of a circle to draw its graph 197 151- 152 • Find the equation of a tangent to circle at a given point 197151- 152, 172 Solve algebraic		

	quadratic expression of the form $ax^2 + bx + c$ 157,192 98-99 • Identify when it is necessary to factorise the numerator and/or denominator in order to simplify an algebraic fraction 210, 210a 59-64 Simplify an algebraic fraction that involves factorisation 210, 210a 59-64		298 • Know the formula for the volume of a sphere (cone, pyramid) 114a, 114b, 169, 171, 170 296-298 • Find the volume of a sphere (cone, pyramid) 114a, 114b, 169, 171, 1702 96-298 • Identify how to find the volume of a composite solid 119, 169,171, 170 296-298 • Solve practical problems involving the volume of solids 119, 169,171, 170 296-298 Solve practical problems involving length, area and volume in similar figures 322-324	problems involving tangents to a circle 151-152, 172 5N Use the centre and scale factor to carry out an enlargement of a 2D shape with a fractional scale factor 148 309- 312 Find the scale factor of an enlargement with fractional scale factor 148 309- 312 • Find the centre of an enlargement with fractional scale factor 148 309-312 • Perform a sequence of transformations on a 2D shape 182 313-314 Find and describe a single transformation given two congruent 2D shapes 48,49,50,148,182 302-314		
Assessment	Teacher/Ass. Test Unit tests	10.1 EXAM Unit tests	Teacher/Ass. Test Unit tests	10.2 EXAM Unit tests	Teacher/Ass. Test Unit tests	10.3 EXAM Unit tests

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 mathematically using symbols, words and diagrams. They draw simple conclusions of their own and explain their reasoning.	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 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

Curriculum Area: Maths			
Subject:			
Year Group	**Basic (Lower Ability End Points)**	**Clear (Middle Ability End Points)**	**Detailed (Higher Ability End Points)**
			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 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	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 explaining features they have selected. They justify their generalisations, arguments or	Pupils critically examine the strategies adopted when investigating within mathematics itself or when using mathematics to analyse tasks. They explain why different 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

Curriculum Area: Maths			
Subject:			
Year Group	**Basic (Lower Ability End Points)**	**Clear (Middle Ability End Points)**	**Detailed (Higher Ability End Points)**
	organised way, using ICT appropriately. They search for a solution by trying out ideas of their own.	solutions, looking for equivalence to different problems with similar structures. They appreciate the difference between mathematical explanation and experimental evidence.	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 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