Stage 8 2022-23						
	Autumn Term		**Spring Term**		**Summer Term**	
	1	**2**	**1**	**2**	**1**	**2**
Key Concepts	1A Numbers & the number system. 1B Calculating 2C Exploring & Calculating FDP	2DManipulating Algebra 3E Solving equations & Inequalities	3F Probability 3G Sequences 4H Algebraic graphs	4I Investigating angles 4J Statistics-Averages 5K Statistics-Graphs	5L Calculating space 5M Proportional reasoning 1	6N Proportional reasoning 2 6O Visualising and Constructing
Knowledge & Understanding *(National Curriculum)*	1A • Understand the meaning of prime factor **N30b 36** • Write a number as a product of its prime factors **N30b 36** • Use a Venn diagram to sort information **P6** • Use prime factorisations to find the highest common factor	2D • Know the multiplication (division, power, zero) law of indices **131** 30-32 • Understand that negative powers can arise **154 higher book pg 68** • Substitute positive and negative numbers into	3F • List all elements in a combination of sets using a Venn diagram **127a, 127b 358-359** • List outcomes of an event systematically **58** • Use a table to list all outcomes of an event 348-350 • List outcomes of an event using a grid (two-way	4I • Establish the fact that angles in a triangle must total 180° **G17170-171** • Use the fact that angles in a triangle total 180° to work out the total of the angles in any polygon **G19 180-182** • Establish the size of an interior angle in a regular polygon **G19 180-**	5L • Calculate the radius (diameter) of a circle when the circumference is known **118** • Calculate the radius (diameter) of a circle when the area is known **117** • Calculate the area of composite shapes that include sections of a circle 256-259 • Know the formula for finding the	6N • Understand the meaning of a compound unit **142 201-203** • Know the connection between speed, distance and time **142 201-203** • Solve problems involving speed **142 201-203** Identify when it is necessary to convert quantities in order to use a

	of two numbers **N31a** 39-41 • Use prime factorisations to find the lowest common multiple of two numbers **N31b** **39-41** • Know how to identify any significant figure in any number **N38** **21** • Approximate by rounding to any significant figure in any number **N38** **21-22** • Write a large (small) number in standard form **N45a, N45b** **32** • Interpret a large (small) number written in standard form **N45a, N45b** **32**	formulae **A10** **118-121** • Multiply two linear expressions of the form (x + a) (x + b) **A18** **94** • Multiply two linear expressions of the form (x ± a) (x ± b) **A18** **94** Expand the expression $(x \pm a)^2$ **A18** **94** 3E • e aware of common scientific formulae • Know the meaning of the 'subject' of a formula 121 • Change the subject of a formula when one and two	table) **61** 348-350 • Use frequency trees to record outcomes of probability experiments **57** **353-354** • Make conclusions about probabilities based on frequency trees **57** **353-354** • Construct theoretical possibility spaces for combined experiments with equally likely outcomes **126** 348-350 • Calculate probabilities using a possibility space **126** 348-350 • Use theoretical probability to calculate	**182** • Know the total of the exterior angles in any polygon **G19** **182-183** Establish the size of an exterior angle in a regular polygon **G19** **182-183** 4J • Find the modal class of set of grouped data **130a, 130b** **323-325** • Find the class containing the median of a set of data **130a, 130b** **323-325** • Find the midpoint of a class **130a, 130b** **323-325** • Calculate an estimate of the mean from a grouped frequency table **130b** **323-325** • Estimate the	volume of a right prism (cylinder) **119** **263-264** • Calculate the volume of a right prism (cylinder)) **119** **263-264** • Calculate exactly with multiples of π • Know Pythagoras' theorem **150a, 150b** **217-221** • Identify the hypotenuse in a right-angled triangle **150a, 150b** **217-221** • Know when to apply Pythagoras' theorem **150a, 150b** **217-221** • Calculate the hypotenuse of a right-angled triangle using Pythagoras' theorem **150a, 150b** **217-221** Calculate one of the shorter sides in a right-angled triangle using Pythagoras' theorem **150a, 150b**	sensible unit of measure **142** **201-203** 6O • Know the vocabulary of enlargement **148** **294-299** • Find the centre of enlargement **148** **294-299** • Find the scale factor of an enlargement **148** **294-299** • Use the centre and scale factor to carry out an enlargement with positive integer (fractional) scale factor **148** **294-299** • Know and understand the vocabulary of plans and elevations **51** **264-267** • Interpret plans and elevations

	• Calculate with positive indices (roots) using written methods **N25 32-33** Calculate with negative indices in the context of standard form **N45a, N45b 32-33** 1B • Know how to square (or cube) a negative number **N19b, N25 119-121** • Substitute negative numbers into expressions **A10, N19a, N19b 119-121** • Enter negative numbers into a calculator **N44** • **119-121** • Interpret a calculator	steps are required **A13a, A13b 121-124** • Check the solution to an equation by substitution • Understand the meaning of the four inequality symbols **A20a 107** • Choose the correct inequality symbol for a particular situation **A20a 107-108** • Represent practical situations as inequalities • Find the set of integers that are solutions to an inequality **A20a 108-110** • Use set notation	expected outcomes **59 352** Use experimental probability to calculate expected outcomes **125 352** 3G • Generate a sequence from a term-to-term rule **A11a 127** • Understand the meaning of a position-to-term rule **A11b 130** • Use a position-to-term rule to generate a sequence **A11b 130-131** Use the nth term of a sequence to deduce if a given number is in a sequence **A11c, 102 132-133** 4H • Plot graphs of	range from a grouped frequency table **130a, 130b 323-325** • Analyse and compare sets of data 326 • Appreciate the limitations of different statistics (mean, median, mode, range) **62** • Choose appropriate statistics to describe a set of data Justify choice of statistics to describe a set of data 5K • Know the meaning of continuous data **63 310-311** • Interpret a grouped frequency table for continuous data **65a 313-314**	**217-221** 5M • Identify ratio in a real-life context **38 64** • Write a ratio to describe a situation **38 66-67** • Identify proportion in a situation **38, 106 162** • Find a relevant multiplier in a situation involving proportion **38, 106 161** • Use fractions fluently in situations involving ratio or proportion **38, 106 161-167** • Understand the connections between ratios and fractions **10767-68** • Recognise a graph that illustrates direct proportion **42,199 161-167**	**51 264-267** • Use the concept of scaling in diagrams **G15 209-212** • Measure and state a specified bearing **124 213-214** • Construct a scale diagram involving bearings **124 215-216** • Use bearings to solve geometrical problems **124 216** Construct triangles (SSS, SAS, ASA, AAA) **47, 147 232-235**

	display when working with negative numbers **N44** • Understand how to use the order of operations including powers and roots **N20** Use a calculator to evaluate numerical expressions involving powers (roots) **N44** 2C • Identify if a fraction is terminating or recurring **N32 56-59** • Recall some decimal and fraction equivalents (e.g. tenths, fifths, eighths) **N32 57-58**	to list a set of integers 358 • Use a formal method to solve an inequality with unknowns on both sides **A20b** • Use a formal method to solve an inequality involving brackets **A20b** • Know how to deal with negative number terms in an inequality • Know how to show a range of values that solve an inequality on a number line **138** • Know when to use an open or closed circle at the end of a range of values	functions of the form y = mx + c (x ± y = c, ax ± by = c) **159a, 159b 138-139** • Understand the concept of the gradient of a straight line **97, 159a, 159b 140-141** • Find the gradient of a straight line on a unit grid **159b 140-142 143** • Find the y-intercept of a straight line **159a, 159b 143** • Find the equation of a line through one point with a given gradient **159a, 159b143-144** • Find the equation of a line through two given points	• Construct a grouped frequency table for continuous data **65a 313-314** • Construct histograms for grouped data with equal class intervals **205 in higher book for unequal** • Interpret histograms for grouped data with equal class intervals **205 313-314** Construct and use the horizontal axis of a histogram correctly **205 313-314**	Recognise a graph that illustrates inverse proportion **42,199 161-167**	

	• Write a decimal as a fraction **N32 59** • Write a fraction in its lowest terms by cancelling common factors **N23c 42** • Identify when a fraction can be scaled to tenths or hundredths **N32** • Convert a fraction to a decimal by scaling (when possible) **N32 57-59** • Use a calculator to change any fraction to a decimal **N44 56-57** • Write a decimal as a percentage **N32 77-80** • Write a fraction	shown on a number line **138** Use a number line to find the set of values that are true for two inequalities **138 110-111**	**159a, 159b 145** • Sketch a linear graph **96 143-145** • Distinguish between a linear and quadratic graph **96, 98** • Plot graphs of quadratic functions of the form $y = x^2 \pm c$ **98 146-148** • Sketch a simple quadratic graph **98** • Plot and interpret graphs of piece-wise linear functions in real contexts 155-156 Plot and interpret distance-time graphs (speed-time graphs) **216a 205-208**			

	as a percentage **N32 77-80** • Recognise when a fraction (percentage) should be interpreted as a number • Recognise when a fraction (percentage) should be interpreted as a operator • Identify the multiplier for a percentage increase or decrease when the percentage is greater than 100% **R9b 81** • Use calculators to increase an amount by a percentage greater than 100% **R9b 81-**					

	82 • Solve problems involving percentage change **109 83-84** • Solve original value problems when working with percentages **110 85** • Solve financial problems including simple interest **111 86-87** • Understand the meaning of giving an exact solution Solve problems that require exact calculation with fractions					
Assessment	Teacher/Ass. Test Unit tests	8.1 EXAM Unit tests	Teacher/Ass. Test Unit tests	8.2 EXAM Unit tests	Teacher/Ass. Test Unit tests	8.3 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