Maths - Year 11H - Term 3 - Formulae, Algebraic Fractions, Surds, Functions and Proofs

Year group: 11	Subject: Formulae, Algebraic Fractions, Surds, Functions and Proofs
Prior learning- linked to National curriculum	Topics covered at KS3 that will be built upon: **Formulae:** Understanding the concept of a formula, using formulas to calculate the perimeter, area, and volume of simple shapes such as rectangles, triangles, and cubes. **Algebraic fractions:** Simplifying algebraic fractions by finding common factors and cancelling, adding and subtracting algebraic fractions with like denominators. **Surds:** Understanding the concept of irrational numbers, simplifying surds by finding the square roots of perfect squares, and performing basic operations with surds such as addition, subtraction, and multiplication. **Functions:** Understanding the concept of a function as a rule that assigns one value to another, representing functions using tables, graphs, and simple algebraic notation such as $y = mx + c$. **Proofs:** Understanding the idea of mathematical proof and the importance of logical reasoning, using basic deductive reasoning to solve simple geometric problems, and recognizing common proof techniques such as direct proof, contradiction, and induction. Having a solid foundation in these concepts in KS3 can help students to build upon their knowledge and skills in later stages of their mathematical education.
Rationale	Formulae, algebraic fractions, surds, functions, and proofs are all important concepts. They are essential for building a strong foundation in mathematics and preparing students for further study in the subject. **Formulae** are important because they allow us to represent real-world relationships between variables in a concise and efficient way. For example, the formula for the area of a circle, $A = \pi r^2$, allows us to calculate the area of any circle knowing only the radius. Similarly, the formula for the volume of a sphere, $V = 4/3\pi r^3$, allows us to calculate the volume of any sphere knowing only the radius. Learning how to manipulate and use formulae is a key skill that is used extensively in many areas of mathematics and science.

	Algebraic fractions are expressions that involve fractions and variables. They are used extensively in algebraic manipulation and problem-solving. For example, algebraic fractions are used to solve equations and inequalities, and to understand more complex concepts such as functions and calculus. **Surds** are irrational numbers that cannot be expressed exactly as a ratio of two integers. They arise naturally in many mathematical contexts, such as in the calculation of the diagonal of a square with side length 1. Learning how to work with surds is an important skill that is required in many areas of mathematics, including trigonometry and calculus. **Functions** are mathematical objects that relate inputs to outputs. They are used extensively in many areas of mathematics and science, including physics, engineering, and computer science. Learning how to work with functions is important for developing mathematical fluency and problem-solving skills. **Proofs** are a fundamental part of mathematics. They allow us to establish the truth of mathematical statements with certainty. Learning how to construct and understand mathematical proofs is an essential skill for anyone who wishes to study mathematics at a higher level. In summary, the study of formulae, algebraic fractions, surds, functions, and proofs at GCSE is important for building a strong foundation in mathematics and preparing students for further study in the subject. These concepts provide essential tools for problem-solving and reasoning, and are used extensively in many areas of mathematics and science.
Vocabulary:	**Formulae:** equation, variable, relationship, manipulation, problem-solving, context, real-world **Algebraic fractions:** expression, fraction, variable, manipulation, problem-solving, equation, algebra, simplify **Surds:** irrational, number, root, square, rationalise **Functions:** inputs, outputs, relationship, object, inverse, composite **Proofs:** certainty, truth, statement, reasoning.

Cultural Capital:	Teaching algebra can develop cultural capital in a number of ways, including: 1. Logical reasoning: Algebra is based on logical reasoning and deduction, and teaching algebra can help students develop critical thinking and problem-solving skills. By learning to manipulate equations and solve problems using algebraic techniques, students develop a strong foundation in logical reasoning that can be applied in other fields. 2. Problem-solving: Algebra is used in a wide range of fields, including science, engineering, finance, and economics. By teaching algebra, students learn to analyse complex problems, identify relevant information, and develop solutions using algebraic techniques. This helps them develop problem-solving skills that are essential in many different areas. 3. Communication skills: Algebra involves the use of symbols and notation to represent mathematical concepts, and teaching algebra can help students develop strong communication skills. By learning to read and interpret algebraic expressions, students develop the ability to communicate complex ideas in a clear and concise manner. 4. Cultural awareness: Algebra has a long history, and teaching algebra can help students develop cultural awareness and empathy. By exploring the contributions of mathematicians from different cultures and time periods, students gain a better understanding of how mathematical knowledge has evolved over time and the role of different cultures in shaping it. This can help students develop a broader perspective and a deeper appreciation for the cultural significance of mathematics.
Key assessments- name the assessments	**Formulae:** Rearranging formulae **Algebraic Fractions:** Simplifying algebraic fractions Solving equations involving algebraic fractions **Surds:** Simplify expressions involving Surds Rationalise the denominator

	<u>Functions:</u> Inverse and composite functions **<u>Proofs:</u>** Proof Unit wrapper covering the above topics
What do children know/ can do now (EDSM)	As previously mentioned, students would have seen the basics of these topics, therefore Emerging students will still only be familiar with the basics of calculating formulae, algebraic fractions, surds, functions, and proofs. Mastered students will be able to calculate formulae, algebraic fractions, surds, functions, and proofs form fluently as well as interpret and analyse the results. Furthermore in formulae, algebraic fractions, surds, functions, and proofs, they will be able to solve problems involving each of these topics.