Year 11F Term 3 - Fractions, indices and standard form

Year group: 11	Subject: Fractions, indices and standard form
Prior learning- linked to National curriculum	**Fractions:** Topics covered at KS3 that will be built upon: 1. Simplifying fractions by finding common factors in the numerator and denominator. 2. Adding, subtracting, multiplying, and dividing fractions, including mixed numbers. 3. Converting between fractions, decimals, and percentages. 4. Understanding of equivalent fractions and simplifying fractions to their lowest terms. 5. Finding fractions of amounts and expressing ratios as fractions. 6. Understanding of place value, including decimal places and significant figures. 7. Basic arithmetic operations with decimals, including rounding to a given number of decimal places. 8. Knowledge of prime factors and how to use them to simplify fractions. 9. Understanding of recurring decimals and how to convert them to fractions. 10. Solving problems involving fractions in real-life situations, such as scaling recipes and calculating distances using maps. These prior knowledge areas will provide a good foundation for Year 11 students to build upon as they study more advanced topics in fractions, such as multiplying and dividing algebraic fractions, manipulating fractions with powers, and solving problems involving fractions in context. **Indices:** Topics covered at KS3 that will be built upon: 1. Basic arithmetic operations, including addition, subtraction, multiplication, and division. 2. Knowledge of place value and powers of 10. 3. Understanding of factors, multiples, and prime numbers. 4. Basic algebraic skills, such as working with variables and solving simple equations. 5. Knowledge of square roots and how to use them to simplify expressions involving indices.

	6. Basic knowledge of negative numbers and how to use them in calculations involving indices. 7. Understanding of the laws of indices, including the product, quotient, and power rules. 8. Ability to simplify expressions involving indices, including those with fractional and negative indices. These prior knowledge areas will provide a strong foundation for Year 11 students to build upon as they study more advanced topics in indices, such as solving equations with indices and applying the laws of indices to more complex expressions. **<u>Standard Form:</u>** Topics covered at KS3 that will be built upon: 1. Basic arithmetic operations, including addition, subtraction, multiplication, and division. 2. Understanding of place value and powers of 10. 3. Basic knowledge of fractions and decimals, including their equivalent forms. 4. Knowledge of significant figures and how to use them to round numbers to a specified degree of accuracy. 5. Understanding of the order of operations and how to apply it to calculations involving standard form. These prior knowledge areas will provide a strong foundation for Year 11 students to build upon as they study more advanced topics in standard form, such as manipulating expressions involving standard form, solving problems involving standard form in real-life situations, and using standard form in scientific notation.
Rationale	**<u>Fractions:</u>** 1. Foundation for Advanced Maths: Fractions are a fundamental building block in mathematics and are essential for many advanced topics, such as algebra, trigonometry, and calculus. It is crucial that students have a strong foundation in fractions to be successful in these more advanced areas of mathematics. 2. Everyday Life Applications: Fractions are used in everyday life in many situations, including cooking, construction, and finance. Understanding fractions is essential for practical applications such as scaling recipes, measuring ingredients, calculating distances on maps, and working with financial ratios.

	3. Standardised Tests: Fractions are a common topic in standardised tests such as GCSEs and A-levels. Students who have a good understanding of fractions will have an advantage when taking these exams, as they will be better equipped to answer questions involving fractions. 4. Problem-solving skills: Fractions require problem-solving skills, which are transferable to many areas of life. Learning how to work with fractions can help students develop their analytical skills and problem-solving abilities. 5. Preparation for Further Education and Careers: Many university courses and careers require a strong understanding of fractions. Examples include engineering, finance, and sciences such as physics and chemistry. By teaching fractions in Year 11, students will be better prepared for the rigours of further education and the demands of the workforce. **Indices:** 1. Foundation for Higher Mathematics: Indices are a fundamental concept in higher mathematics, including calculus, probability, and statistics. A strong understanding of indices in Year 11 can provide students with a solid foundation for pursuing higher-level mathematics in the future. 2. Real-World Applications: Indices are used in many real-world situations, including compound interest, population growth, and radioactive decay. Teaching indices can provide students with practical skills that are relevant to their everyday lives and can help them navigate the world around them. 3. Enhancing Problem-Solving Skills: Indices require critical thinking skills and problem-solving abilities. Teaching indices in Year 11 can enhance students' critical thinking skills and prepare them for the demands of higher education and the workforce. 4. Preparing for Standardised Tests: Indices are a common topic on standardised tests, including the GCSE maths exam. Teaching indices in Year 11 can prepare students for these tests and improve their chances of success.

	5. Promoting Mathematical Fluency: Mastery of indices is an essential component of mathematical fluency, which is the ability to perform mathematical operations with ease and accuracy. Teaching indices in Year 11 can help students develop this important skill. **<u>Standard Form:</u>** 1. Foundation for Higher Mathematics: Standard form is a fundamental concept in higher mathematics, including algebra, calculus, and physics. A strong understanding of standard form at GCSE can provide students with a solid foundation for pursuing higher-level mathematics in the future. 2. Real-World Applications: Standard form is used in many real-world situations, including astronomical distances, molecular weights, and electrical resistance. Teaching standard form can provide students with practical skills that are relevant to their everyday lives and can help them navigate the world around them. 3. Enhancing Problem-Solving Skills: Standard form requires critical thinking skills and problem-solving abilities. Teaching standard form at GCSE can enhance students' critical thinking skills and prepare them for the demands of higher education and the workforce. 4. Preparing for Standardised Tests: Standard form is a common topic on standardised tests, including the GCSE maths exam. Teaching standard form at GCSE can prepare students for these tests and improve their chances of success. 5. Promoting Mathematical Fluency: Mastery of standard form is an essential component of mathematical fluency, which is the ability to perform mathematical operations with ease and accuracy. Teaching standard form at GCSE can help students develop this important skill.
Vocabulary:	**<u>Fractions:</u>** 1. Numerator: The top number in a fraction, which represents the part of the whole. 2. Denominator: The bottom number in a fraction, which represents the whole. 3. Equivalent fractions: Fractions that represent the same value, but may have different numerators and denominators. 4. Simplifying fractions: Reducing a fraction to its simplest form by dividing the numerator and denominator by their greatest common factor.

	5. Adding and subtracting fractions: Combining or taking away parts of the whole represented by fractions with different denominators. 6. Multiplying and dividing fractions: Finding a fraction that represents the product or quotient of two or more fractions. 7. Improper fractions: Fractions where the numerator is greater than or equal to the denominator. 8. Mixed numbers: Numbers that combine a whole number and a fraction. 9. Reciprocal: The inverse of a fraction, obtained by interchanging the numerator and denominator. 10. Decimal equivalent: The decimal representation of a fraction, obtained by dividing the numerator by the denominator. **Indices:** 1. Exponent: The small raised number in an expression that indicates how many times the base is multiplied by itself. 2. Base: The large number in an expression that is multiplied by itself a number of times indicated by the exponent. 3. Power: The result of multiplying a base by itself a certain number of times indicated by the exponent. 4. Product rule: The rule for multiplying two or more terms with the same base by adding their exponents. 5. Quotient rule: The rule for dividing two terms with the same base by subtracting their exponents. 6. Zero exponent rule: The rule that any base raised to the power of zero equals 1. 7. Negative exponent rule: The rule that any base raised to a negative exponent equals 1 divided by the base raised to the positive exponent. **Standard Form:** 1. Standard form: A way of expressing numbers using powers of 10 that simplifies calculations with very large or very small numbers. 2. Index: The power of 10 in a number expressed in standard form. 3. Mantissa: The decimal part of a number expressed in standard form. 4. Significant figures: The meaningful digits in a number that express its precision. 5. Rounding: The process of approximating a number to a certain number of significant figures. 6. Multiplying and dividing in standard form: The rules for multiplying or dividing numbers expressed in standard form.

	7. Adding and subtracting in standard form: The rules for adding or subtracting numbers expressed in standard form with the same index. 8. Orders of magnitude: A measure of the relative size of a number expressed in powers of 10. 9. Scientific notation: A way of expressing very large or very small numbers using a base and an exponent of 10.
Cultural Capital:	**<u>Fractions:</u>** 1. Understanding of Historical Context: Fractions have a rich history dating back to ancient civilizations such as the Egyptians and Babylonians. Teaching fractions can provide students with an understanding of this historical context and the evolution of mathematical concepts over time. 2. Appreciation of Diverse Perspectives: Fraction concepts are used in different ways in different cultures, such as the use of fractions in measuring time in ancient China. Teaching fractions can provide students with an appreciation for diverse cultural perspectives on mathematics. 3. Enhancing Critical Thinking Skills: Fractions require critical thinking skills and problem-solving abilities. Teaching fractions can enhance students' critical thinking skills and prepare them for the demands of higher education and the workforce. 4. Preparing for International Education: Fractions are a universal mathematical concept that is used in international education systems. Teaching fractions can provide students with a foundation that is relevant and transferable to international education systems. 5. Understanding of Real-World Applications: Fractions are used in many real-world situations, including cooking, construction, and finance. Teaching fractions can provide students with practical skills that are relevant to their everyday lives and can help them navigate the world around them. **<u>Indices:</u>** 1. Understanding of Historical Context: Exponential functions and logarithms, which involve indices, have a rich history dating back to the work of mathematicians such as John Napier and Leonhard Euler. Teaching indices can provide students with an understanding of this historical context and the evolution of mathematical concepts over time.

	2. Appreciation of Diverse Perspectives: The use of logarithmic scales and exponential growth is present in many fields, such as finance, science, and technology. Teaching indices can provide students with an appreciation for diverse cultural perspectives on the applications of logarithmic and exponential functions. 3. Enhancing Critical Thinking Skills: Indices require critical thinking skills and problem-solving abilities. Teaching indices can enhance students' critical thinking skills and prepare them for the demands of higher education and the workforce. 4. Preparing for International Education: Exponential functions and logarithms are a universal mathematical concept that is used in international education systems. Teaching indices can provide students with a foundation that is relevant and transferable to international education systems. 5. Understanding of Real-World Applications: Indices are used in many real-world situations, including population growth, interest rates, and decibel levels. Teaching indices can provide students with practical skills that are relevant to their everyday lives and can help them navigate the world around them. **Standard Form:** 1. Understanding of Historical Context: Standard form has a rich history dating back to ancient civilizations such as the Babylonians, who used a base-60 number system. Teaching standard form can provide students with an understanding of this historical context and the evolution of mathematical concepts over time. 2. Appreciation of Diverse Perspectives: Standard form is used in many different fields, including science, engineering, and finance. Teaching standard form can provide students with an appreciation for diverse cultural perspectives on the applications of scientific notation and engineering notation. 3. Enhancing Critical Thinking Skills: Standard form requires critical thinking skills and problem-solving abilities. Teaching standard form can enhance students' critical thinking skills and prepare them for the demands of higher education and the workforce.

	4. Preparing for International Education: Standard form is a universal mathematical concept that is used in international education systems. Teaching standard form can provide students with a foundation that is relevant and transferable to international education systems. 5. Understanding of Real-World Applications: Standard form is used in many real-world situations, including astronomical distances, molecular weights, and electrical resistance. Teaching standard form can provide students with practical skills that are relevant to their everyday lives and can help them navigate the world around them.
Key assessments- name the assessments	**<u>Fractions:</u>** Multiply and Divide fractions **<u>Indices:</u>** Laws of Indices **<u>Standard Form:</u>** Multiply and Divide in Standard Form Add and Subtract in Standard Form 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 fractions, indices and standard form. Mastered students will be able to calculate fractions, indices and standard form fluently as well as interpret and analyse the results. Furthermore in fractions, indices and standard form, they will be able to solve problems involving each of these topics.