Scheme of Learning: Year 10 Summer Term

Topic Sequence: Number

13	14
Non-calculator methods	Index Numbers and Standard Form

Topic Overview: Index numbers *and Standard Form*

Students recap their knowledge of indices, the rules for manipulating and simplifying them, including exploring negative and fractional indices. Students then use this knowledge to further study Standard Form. Students have already been introduced to standard form in Year 7. The use of context is important to help students make sense of the need for the notation and its uses.

Learning Sequence:

Square and cube numbers (R): Revisiting square and cube numbers and linking to area and volume. Application also to Pythagoras' theorem

Calculate higher powers and roots: The key point of this step is to ensure students are familiar with the notation of index numbers. The higher tier requires students to estimate higher powers and roots.

The addition and subtraction rules for indices (R): It is helpful to look at questions with both numerical and algebraic bases, and also to include questions that involve both the addition and subtraction of indices. Negative results could be included here if appropriate, but these are covered in detail in the next step. It is always worth reminding students that a and a^1 are equivalent.

Understand and use the power zero and negative indices: The common misconception that a number raised to the power zero gives the result zero needs to be addressed and revisited often. Similarly, students often confuse negative indices with negative numbers, so deriving the rules to provide meaning is a helpful strategy, as is comparing with earlier experience of standard form. It is useful to link to the previous step, using $a^m \div a^n = a^{m-n}$ where $m - n \leq 0$

The multiplying rule for indices: Students investigate the indices as 'powers of powers' and using this law in conjunction with the other laws

Understand and use fractional indices (H): As well as covering the meaning of indices that are unit fractions, this step extends understanding to look at non-unit fractions though 'reversing' the powers of powers law. Familiarity with square, cube and higher roots is vital here

Learn how to convert in and out of standard form: Students will now write large numbers in standard form. Students should be exposed to correct examples in the form $A \times 10n$ where A is a number between 1 and 10 and n is an integer. It is important to look at how standard form works rather than just counting zeros. Once negative powers are understood, students can explore the patterns and connections between decimal numbers and standard form.

Learn how to multiply numbers that are in standard form: Students will explore the use of commutativity to multiply numbers given in standard form. Their earlier work on indices and dealing with answers like 30×10^7 should have prepared them for this step.

Learn how to divide numbers that are in standard form: Students to learn from the last step and apply the inverse for dividing in standard form. Students must be able to address misconceptions to do with how to write a final answer and also apply knowledge of equivalent fractions to problems

Learn how to add and subtract numbers that are in standard form: Students will compare strategies for addition and subtraction without a calculator. There is a risk of just adding the numbers and adding the powers separately and students may prefer to always convert to ordinary numbers. Even when the powers of 10 are the same, there can be problems such as $3 \times 10^4 + 8 \times 104 = 11 \times 10^4$ where the answer needs changing as covered last step.

Apply standard form to problem solving: Students will order numbers given in words, standard form and ordinary form. Strategies for comparing numbers, such as considering the exponent of 10 as an initial check should be discussed. Next, students shall apply what they have learnt in this topic to exam style questions.

Sequence of Learning:	
1	Square and cube numbers
2	Calculate higher powers and roots
3	Addition and Subtraction rules for indices (R)
4	Power zero and negative indices
5	The multiplying rule for indices
6	Understand and use fractional indices
7	*Learn how to convert in and out of standard form*
8	*Learn how to multiply numbers that are in standard form*
9	*Learn how to divide numbers that are in standard form*
10	*Learn how to add and subtract numbers that are in standard form*
11	*Apply standard form to problem solving.*

Topic Resources:	
Knowledge Maps:	Index Numbers *Standard Form*

Assessment:	
Knowledge:	2x 20 mark end of topic assessment
Application of Knowledge:	Termly summative assessment

Supportive Reading:	
Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide