



The Sutton Academy

# Knowledge Rich Curriculum Plan

Year 9 Support – Powers and Roots.

Lesson/Learning Sequence	Intended Knowledge: <i>Students will know that...</i>	Tiered Vocabulary	Prior Knowledge: <i>In order to know this, students need to already know that...</i>	Assessment
<p><b>To learn how to use numerical index laws.</b></p>	<ul style="list-style-type: none"> <li>• Students will know how to use the basic index law for multiplication with an integer base.</li> <li>• Students will know how to use the basic index law for division with an integer base.</li> <li>• Students will know how to use the basic index law for brackets with an integer base.</li> <li>• Students will know how to interpret the power of 0.</li> </ul> <p><b>Opportunity for challenge:</b></p> <ul style="list-style-type: none"> <li>• Students will know how to use a mixture of the index laws within the same problem.</li> </ul> <p><b>Show students how it works rather than just using tricks.</b></p>	<p><b>Index</b> – An index, or a power, is the small floating number that goes next to a number or letter</p> <p><b>Square</b> – When you are asked to square a number you are being asked to multiply it by itself</p> <p>Square numbers – The result when you multiply a number by itself</p> <p><b>Cube</b> – When you are asked to cube a number you are being asked to multiply it by itself three times!</p> <p><b>Cube Numbers</b> – The result when you cube a number</p> <p><b>Reciprocal</b> – The reciprocal of a number is 1 divided by the number</p>	<ul style="list-style-type: none"> <li>• Students should already know how to find powers and roots for integers</li> </ul>	<p>Mini-Assessment 2</p>
<p><b>To learn how to use the order of operations.</b></p>	<ul style="list-style-type: none"> <li>• Students will know how to know and identify different aspects of BIDMAS.</li> <li>• Students will know how to use BIDMAS to solve a calculation.</li> <li>• Students will know how to use BIDMAS to solve calculations involving indices.</li> <li>• Students will know how to use BIDMAS to solve calculations involving several steps.</li> <li>• Students will know that division and multiplication are interchange operations.</li> <li>• Students will know that when a calculation has only addition and subtract involved that they must calculate from left to right.</li> </ul> <p><b>Opportunity for challenge:</b></p> <ul style="list-style-type: none"> <li>• Students will know how to place brackets in a calculation to obtain a certain answer.</li> </ul>	<p><b>Index (plural indices)</b> – An index, or a power, is the small floating number that goes next to a number or letter</p>	<ul style="list-style-type: none"> <li>• Students need to know how to calculate powers and roots of integer numbers.</li> <li>• Students need to know how to add, subtract, multiply and divide integer numbers.</li> </ul>	<p>Mini-Assessment 2</p>
<p><b>To learn how to convert between standard form and ordinary numbers.</b></p>	<ul style="list-style-type: none"> <li>• Students will know that a number written in standard form is written as <math>a \times 10^n</math>, where <math>1 \leq a &lt; 10</math>.</li> <li>• Students will know how to write large in the form <math>a \times 10^n</math>, where <math>1 \leq a &lt; 10</math>.</li> <li>• Students will know how to write small numbers in the form <math>a \times 10^{-n}</math>, where <math>1 \leq a &lt; 10</math>.</li> <li>• Students will know how to convert large numbers written in standard form back into ordinary numbers.</li> <li>• Students will know how to convert small number written in standard form back into ordinary numbers.</li> </ul> <p><b>Opportunity for challenge:</b></p> <ul style="list-style-type: none"> <li>• Students will know how to order numbers given in standard form by converting to them into ordinary numbers.</li> </ul>	<p><b>Standard form</b> - a way of writing down very large or very small numbers easily, a number is written in standard form when it is written in the form <math>a \times 10^n</math> where <math>1 \leq a &lt; 10</math></p>	<ul style="list-style-type: none"> <li>• Students need to know how to multiply and divide by powers of 10.</li> <li>• Students need to know how to calculate numbers with integer powers.</li> </ul>	<p>Mini-Assessment 2</p>
<p><b>To learn how to round to the nearest 10, 100, 1000 and to a given number of decimal places.</b></p>	<ul style="list-style-type: none"> <li>• Students will know how to round to the nearest 10.</li> <li>• Students will know how to round to the nearest 100.</li> <li>• Students will know how to round to the nearest 1000.</li> <li>• Students will know how to round to the nearest whole number.</li> <li>• Students will know how to round to one decimal place.</li> <li>• Students will know how to round to two decimal places.</li> <li>• Students will know to identify the number they are rounding to, look at the number to the right of it and decide whether to round up or down.</li> <li>• Students will know to round up if the digit to the right is 5-9.</li> <li>• Students will know to round down if the digit to the right is 0-4.</li> </ul>	<p><b>Rounding</b> – making a number simpler but keeping its value close to what it was. The result is less accurate, but easier to use</p>	<ul style="list-style-type: none"> <li>• Students need to know how to identify the place value of a digit within a number.</li> </ul>	<p>Mini-Assessment 2</p>

Lesson/Learning Sequence	Intended Knowledge: <i>Students will know that...</i>	Tiered Vocabulary	Prior Knowledge: <i>In order to know this, students need to already know that...</i>	Assessment
	<ul style="list-style-type: none"> <li>• Students will know that to round up they must add one to the number they are rounding to.</li> <li>• Students will know that to round down they must not subtract one from the number they are rounding to.</li> <li>• Students will know that their rounded value will be similar to their original value – they can use this to check answers.</li> </ul>			
<b>To learn how to round to a given number of significant figures.</b>	<ul style="list-style-type: none"> <li>• Students will know that significant figures are the digits in a number that contribute to the degree of accuracy of the value and that we start counting significant figures at the first non-zero digit – the digit with the most value.</li> <li>• Students will know that non-zero digits are always significant.</li> <li>• Students will know that zeros between non-zero digits are always significant.</li> <li>• Students will know that leading zeros are never significant.</li> <li>• Students will know how to round to one significant figure.</li> <li>• Students will know how to round to two significant figures.</li> <li>• Students will know that their rounded value will be similar to their original value – they can use this to check answers.</li> </ul>	<p><b>Significant</b> – sufficiently important to be worthy of attention</p> <p><b>Significant figures</b> – the digits in a number that contribute to the degree of accuracy of the value and that we start counting significant figures at the first nonzero digit</p>	<ul style="list-style-type: none"> <li>• Students need to know how to identify the place value of a digit within a number.</li> <li>• Students need to know how to round to the nearest 10, 100 and 1000.</li> <li>• Students need to know how to round to the nearest decimal place.</li> <li>• Students need to know the basic rules of rounding up and down.</li> </ul>	Mini-Assessment 2
<b>To learn how to determine bounds and error intervals.</b>	<ul style="list-style-type: none"> <li>• Students will know how to find the upper and lower bounds of numbers given to varying degrees of accuracy.</li> <li>• Students will know that the upper bound is rounded and they would actually everything up to but not including the upper bound.</li> <li>• Students will know how to use inequality notation to specify simple error intervals due to rounding.</li> </ul> <p><b>Opportunity for challenge:</b></p> <ul style="list-style-type: none"> <li>• Students will know how to use inequality notation to specify simple error intervals due to truncation.</li> </ul>	<p><b>Upper bound</b> – an element greater than or equal to all the elements in a given set</p> <p><b>Lower bound</b> – an element less than or equal to all the elements in a given set</p> <p><b>Error interval</b> – an expression written using inequalities that shows the range of possible values that a number could have been before it was rounded or truncated.</p> <p><b>Inequality</b> – a symbol which makes a non-equal comparison between two numbers or other mathematical expressions e.g. <math>&gt;</math>, <math>&lt;</math>, <math>\geq</math> and <math>\leq</math></p>	<ul style="list-style-type: none"> <li>• Students need to know how to round to varying degrees of accuracy.</li> <li>• Students need to know how to use inequality notation.</li> </ul>	Mini-Assessment 2
<b>To learn how to estimate.</b>	<ul style="list-style-type: none"> <li>• Students will know that to estimate a calculation they must first round each number to one significant figure and then use the order of operations to calculate.</li> <li>• Students will know how to estimate calculations involving fractions when the denominator rounds to an integer.</li> <li>• Students will know how to estimate calculations involving fractions when the denominator rounds to 0.5.</li> </ul>	<p><b>Estimate</b> – an approximate calculation or judgement of the value, number, quantity, or extent of something.</p>	<ul style="list-style-type: none"> <li>• Students will need to know how to round to one significant figure.</li> <li>• Students will need to know how to carry out calculations using the order of operations.</li> <li>• Students will need to know how to divide integers by decimals.</li> </ul>	Mini-Assessment 2

Lesson/Learning Sequence	Intended Knowledge: <i>Students will know that...</i>	Tiered Vocabulary	Prior Knowledge: <i>In order to know this, students need to already know that...</i>	Assessment
To learn how to use a calculator.	<ul style="list-style-type: none"> <li>• Students will know how to use a calculator to solve calculations with all 4 operations.</li> <li>• Students will know that a calculator uses the order of operations.</li> <li>• Students will know how to input fractions into the calculator.</li> <li>• Students will know how to convert fractions to decimals using the standard to decimal button.</li> <li>• Students will know how to calculate numbers with powers.</li> <li>• Students will know how to calculate the roots of numbers.</li> <li>• Students will know how to use a calculator to solve more complex problems involving a mixture of fractions, powers and root.</li> <li>• Students will know how to write the values from the calculator display.</li> <li>• Students will know how to rounded their answers to a given degree of accuracy.</li> <li>• Students will know how to convert in and out of standard form using a calculator.</li> </ul>		<ul style="list-style-type: none"> <li>• Students need to know how to round to a given degree of accuracy.</li> <li>• Students need to know how to convert between standard form and ordinary numbers.</li> </ul>	Mini-Assessment 2
To learn how to the highest common factor of two numbers.	<ul style="list-style-type: none"> <li>• Students will know that a factor is a number that divides another number, leaving no remainder.</li> <li>• Students will know how to list all the factors of a number systematically, starting with 1 and itself.</li> <li>• Students will know how to select the correct number from a list of numbers when given descriptions of a number such as 'a factor of ', 'an even factor of', etc.</li> <li>• Students will know that the highest common factor of two numbers refers to the highest numbers that both numbers are divisible by.</li> <li>• Students will know how to find the highest common factor (HCF) of two numbers by listing.</li> </ul>	<p><b>Common</b> – shared by, coming from, or done by two or more people, groups, or things.</p> <p><b>Prime Number</b> – In maths, prime numbers are whole numbers greater than 1, that have only two factors: 1 and the number itself.</p> <p><b>Factor</b> – A factor is a number that divides into a given number without leaving a remainder</p> <p><b>Highest Common Factor</b> – the largest number that both or all of the numbers can be divided by</p>	<ul style="list-style-type: none"> <li>• Students need to know how multiply and divide integers.</li> <li>• Students will know the difference between odd and even numbers.</li> </ul>	Mini-Assessment 2
To learn how to lowest common multiple of two numbers.	<ul style="list-style-type: none"> <li>• Students will know that a multiple is the product of a number and an integer.</li> <li>• Students will know how to list multiples of a numbers, starting with the number itself.</li> <li>• Students will know how to select the correct number from a list of numbers when given descriptions of a number such as 'a multiple of', 'an odd multiple of', etc.</li> <li>• Students will know that the lowest common multiple is the lowest product of each number with an integer.</li> <li>• Students will know how to find the lowest common multiple (LCM) of two numbers by listing.</li> </ul> <p><b>Opportunity for challenge:</b></p> <ul style="list-style-type: none"> <li>• Students will know how to solve a real-life LCM problem.</li> </ul>	<p><b>Multiple</b> – A multiple is a number in the given number's multiplication tables</p> <p><b>Lowest Common Multiple</b> – the smallest number that is in both numbers' times tables</p>	<ul style="list-style-type: none"> <li>• Students need to know how multiply and divide integers.</li> <li>• Students will know the difference between odd and even numbers.</li> </ul>	Mini-Assessment 2
To learn how to find the product of prime factors.	<ul style="list-style-type: none"> <li>• Students will know that a prime number has exactly two factors – 1 and itself.</li> <li>• Students will recognise and recall the first 10 prime numbers.</li> <li>• Students will know how to identify prime numbers from a list by eliminating values known to be non-prime eg even numbers (apart from 2) or multiples of 5.</li> <li>• Students will know how to find the product of prime factors of positive integers.</li> <li>• Students will know how to find the product of prime factors giving their answer in index form.</li> <li>• Students will know that the product of prime factors is unique for every number.</li> <li>• Students will know that to check the product of prime factors they multiply their prime factors together and they should get the original number.</li> </ul>	<p><b>Prime Number</b> – In maths, prime numbers are whole numbers greater than 1, that have only two factors: 1 and the number itself.</p> <p><b>Product</b> – in maths, a product is the result of multiplication</p> <p><b>Product of Primes</b> – a product in which every factor is a prime number</p>	<ul style="list-style-type: none"> <li>• Students need to know how to multiply and divide integers.</li> <li>• Students need to know how to express numbers in index form.</li> </ul>	Mini-Assessment 2

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	<ul style="list-style-type: none"> <li>Students will know that it doesn't matter which way you break the number down into prime factors the result should be the same.</li> </ul>			
<p><b>To learn how to find the HCF and LCM of two numbers using Venn diagrams.</b></p>	<ul style="list-style-type: none"> <li>Students will know how to find the highest common factor of two numbers by using the product of prime factors and a Venn diagram.</li> <li>Students will know that to find the highest common factor from a Venn diagram they must find the product of the numbers contained within the overlap.</li> <li>Students will know that if there is a single integer contained within the overlap of a Venn diagram then that number is the highest common factor of the two numbers.</li> <li>Students will know that if there are no numbers contained within the overlap then the highest common factor of the two numbers is 1.</li> <li>Students will know how to find the lowest common multiple of two numbers by using the product of prime factors and a Venn diagram.</li> <li>Students will know that to find the lowest common multiple from a Venn diagram they must find the product of all the numbers contained within the whole Venn diagram.</li> </ul> <p><b>Opportunity for challenge:</b></p> <ul style="list-style-type: none"> <li>Students will know how to find the HCF and LCM of three numbers using a Venn diagram.</li> </ul>	<p><b>Common</b> – shared by, coming from, or done by two or more people, groups, or things.</p> <p><b>Highest Common Factor</b> – the largest number that both or all of the numbers can be divided by</p> <p><b>Lowest Common Multiple</b> – the smallest number that is in both numbers' times tables</p> <p><b>Product</b> – in maths, a product is the result of multiplication</p> <p><b>Product of Primes</b> – a product in which every factor is a prime number</p>	<ul style="list-style-type: none"> <li>Students need to know to find the HCF and LCM using lists.</li> <li>Students need to know how to find the product of prime factors.</li> <li>Students need to know how to use a Venn diagram.</li> </ul>	<p>Mini-Assessment 2</p>