Knowledge Rich Curriculum Plan

Year 10 Higher – Number 1

Lesson	Intended Knowledge:	Tiered Vocabulary	Prior Knowledge:	Steps to Success	Feedback
To learn how to multiply and divide decimals.	• Students will know how to multiply decimals using the column method. • Students will know how to solve worded problems involving multiplication of decimals. • Students will know how to solve money problems involving multiplication of decimals. • Students will know how to divide a decimal by an integer using short and long division. • Students will know how to divide a decimal by a decimal using short and long division. • Students will know how to solve multi-step problems involving division of decimals. • Students will know how to solve worded problems involving the division of decimals.	**Integer** – a whole number **Decimal** – a number whose whole number part and the fractional part is separated by a decimal point **Place Value** – the value of a digit depending on its position within a number **Divide** – the act or process of separating or sharing Split the vocabulary into different parts of the lesson.	• Students need to know how to multiply integers using column multiplication. • Students need to know how to divide integers using short division.	**Steps to Success – Multiplying decimals.** **Step 1:** Multiply each number by powers of ten to transform it from a decimal to an integer. **Step 2:** Multiply the two integers using column multiplication. **Step 3:** Adjust your answer by dividing by the powers of 10 that you multiplied by at the start (for example if you multiplied one number by 10 and the other by 100 you would need to divide by 1000 (10 x 100). **Steps to Success - Dividing Decimals** **Step 1:** Write the question as a fraction. **Step 2:** Multiply both the numerator and denominator by an appropriate power of ten to eliminate the decimal in the denominator but keep the fraction equivalent to the original question. **Step 3:** Divide the numerator by the denominator using the bus stop method where necessary.	
To learn how to estimate.	• Students will know how to estimate answers to simple calculations. • Students will know how to estimate answers to more complex, multi-step calculations including where there is a decimal in the denominator. • Students will know how to estimate calculations involving roots. **Opportunity for challenge:** • Students will know how to estimate to solve worded problems.	**Estimate** – an approximate calculation of the value of something	• Students need to know how to round to 1 significant figure. • Students need to know how to divide by a decimal.	**Steps to Success - Estimation** **Step 1:** Round the values in the question to **1 significant figure.** **Step 2:** Use BIDMAS to calculate the answer making sure to show each step.	
To learn how to apply numerical index laws.	• Students will know how to use the basic index laws for multiplication, division and brackets with integer bases where the powers are both positive and/or negative. • Students will know how to simplify more complex multi-step numerical expressions using the index laws. • Students will know how to find the value of a calculation involving the index laws. • Students will know how to interpret the power of 0.	**Index** – An index, or a power, is the small floating number that goes next to a number or letter	• Students need to know how to find powers and roots.	**Steps to success – Index Laws** There are four index laws that we use to simplify expressions or write a number as a single power: • When the bases are the same and you're multiplying, add the indices. • When the bases are the same and you're dividing, subtract the indices. • When there are brackets, multiply the indices. • An additional rule is the power of 0; anything to the power of 0 equals 1.	
To learn how to interpret fractional and negative indices.	• Students will know how to evaluate negative powers. • Students will know how to evaluate fractional powers where the power is a unit fraction (e.g. 1/2, 1/3) • Students will know how to evaluate more difficult fractional powers where the power is a non-unit fraction (e.g. 2/3) • Students will know how to evaluate a mixture of negative and fractional powers. **Opportunity for challenge:** • Students will know how to evaluate a mixture of negative and fractional powers to a fractional base. E.g. $\left(\frac{3}{2}\right)^{-2}$ or $\left(\frac{16}{25}\right)^{\frac{3}{2}}$	**Reciprocal** – The reciprocal of a number is 1 divided by the number	• Students need to how to use a mixture of the index laws.	**Steps to success – Negative indices** • To evaluate a negative power, first take the reciprocal, the index changes sign, then calculate it. **Steps to Success - Fractional indices** • A power of $\frac{1}{2}$ means that you find the square root of the base. • A power of $\frac{1}{3}$ is cube root, and a power of $\frac{1}{4}$ is 4th root, and so on! • When the power is a fraction with a **numerator** that isn't 1, we have to find the root indicated by the **denominator** and then raise the answer to the power of the numerator. Algebraically this can be written as: $$a^{\frac{b}{c}} = (\sqrt[c]{a})^b$$	

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To learn how to find the HCF and LCM using a Venn diagram.	• Students will know how to find the product of prime factors and write the solution in index form. • Students will know how to find the highest common factor (HCF) of two numbers using a Venn diagram. • Students will know how to find the lowest common multiple (LCM) of two numbers using a Venn diagram.	**Multiple** – A multiple is a number in the given number's multiplication tables **Factor** – A factor is a number that divides into a given number without leaving a remainder **Common** – shared **Highest Common Factor** – the largest number that both or all of the numbers can be divided by **Lowest Common Multiple** – the smallest number that is in both numbers' times tables **Prime Number** – a number that has exactly 2 factors - 1 and the number itself. **Product** – the result of multiplication **Product of Primes** – a product in which every factor is a prime number **Intersection** – the overlap of a Venn diagram Split the vocabulary up between sections of the lesson.	• Students need to know how to identify factors, multiples and prime numbers from a list.	**Steps for Success – Product of prime factors** **Step 1:** To construct a factor tree, think of 2 numbers which multiply together to make the integer in the question. **Step 2:** Draw two branches coming down from the integer, and at the end of the branches write the two factors that you chose. **Step 3:** If a factor is prime, then circle it. If a factor is not prime, then repeat the process until each number at the end of each branch is prime. **Step 4:** Write the prime factors as a product in index form. **Steps for Success – Finding the HCF and LCM from Venn diagrams.** **Step 1:** Find the product of prime factors for both numbers. **Step 2:** Now draw a Venn diagram where each circle represents each number. **Step 3:** Cross off a common factor from both lists and place the number in the overlap/intersection of the Venn diagram. Repeat this until there are no common factor left. **Step 4:** Place any remaining numbers from the lists into the circle that represents that number. **Step 5:** To find the **HCF**, we multiply the numbers in the intersection (these are the factors that are common between both numbers). To find the **LCM** we multiply all of the numbers in the Venn diagram together.	
To learn how to solve real life problems involving the HCF and LCM.	• Students will know how to solve more complex problems using HCF, LCM and prime numbers including problems involving real life contexts. • Students will know how to solve worded problems involving the LCM. • Students will know how to find the LCM and HCF from index notation. E.g. $A = 2 \times 3^2 \times 5$ and $B = 2^3 \times 3 \times 7$.		• Students need to know how to find the HCF and LCM of two numbers from lists.	**Steps to Success- Lowest common factor problems** **Step 1:** List the first 5-10 multiples of both numbers. **Step 2:** Identify the first multiple that is in both multiplication tables, this is the Lowest Common Multiple. **Step 3:** • If the question is asking what the next time the events occur at the same time, then add the LCM to the time given in the question. Take care when going over an hour. • If the question is asking how many packs or packets items are in, then count down your lists to see how many packs of each item you need to get that LCM.	

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To learn how to convert between standard form and ordinary numbers.	• Students will know that a number written in standard form is written as a $a \times 10^n$ where $1 \le a < 10$ • Students will know how to write large and small numbers in standard form in the form $a \times 10^n$ where $1 \le a < 10$ • Students will know how to convert numbers from standard form back into ordinary numbers. • Students will know when a number is/isn't written in standard form because either $a > 10$ or $a < 0$ • Students will know how to adjust a number written in the form $a \times 10^n$ where $a > 10$ or $a \le 0$ so that it is written in standard form (in the form $a \times 10^n$ where $1 \le a < 10$) • Students will know how to compare numbers written in standard form and how the $x10^n$ affects the size of one number compared with another.	**Standard form -** 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 $a \times 10^n$ where $1 \le a < 10$	• Students will need to be able to multiply and divide by powers of 10.	**Steps to Success - Writing numbers in standard form** **Step 1:** To write a number in standard form put the decimal point after the first significant figure. This will give you 'a' between 1 and 10. **Step 2:** Work out how many times you would have to multiply or divide that number by 10 to get the original number. **Step 3:** Write this after your number as $x10^n$ where n is positive if the number needs multiplying by 10 and negative if we need to divide the number by 10. The value of n tells us how many times we need to multiply or divide by 10. **Steps to Success - Converting numbers out of standard form** To convert a number that is written in the form $a \times 10^n$ out of standard form, when n is positive multiply the 'a' by 10, _n_ times. When _n_ is negative divide the 'a' by 10, _n_ times.	
To learn how to calculate with numbers written in standard form	• Students will know that to add and subtract numbers written in standard form. • Students will know how to multiply numbers in standard form. • Students will know how to divide numbers in standard form. • Students will know how to solve non-calculator multi-step problems involving calculating in standard form.		• Students need to know how to convert from standard form to ordinary numbers and vice versa. • Students need to know the index laws for multiplication and division.	**Steps to Success - Adding and subtracting numbers in standard form** **Step 1:** Write the numbers as ordinary numbers by multiplying or dividing by powers of 10. **Step 2:** Add or subtract the numbers using the column method. **Step 3:** Convert your answer into standard form, if necessary. **Steps to Success – Multiplying numbers in standard form** **Step 1:** Multiply the 'a' for each number written in standard form. **Step 2:** Multiply the two 10^n parts. Remember that we will need to add the powers. **Step 3:** Put the two parts back together. **Step 4:** If necessary, check your answer is written in standard form, if not you will need to adjust your answer. **Steps to Success – Dividing numbers in standard form** **Step 1:** Divide the 'a' for each number written in standard form. **Step 2:** Divide the two 10^n parts. Remember that we will need to subtract the powers. **Step 3:** Put the two parts back together. **Step 4:** If necessary, check your answer is written in standard form, if not you will need to adjust your answer.	
To learn how to solve problems involving numbers written in standard form.	• Students will know how to carry out basic calculations with numbers written in standard form using a calculator and interpret a calculator display where answers are given in standard form or as ordinary numbers that need converting to standard form. • Students will know how to solve more complex problems with numbers written in standard form both with a calculator (as appropriate).		• Students will need to know how to convert from standard form to ordinary numbers and vice versa.		

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To learn how to simplify, multiply and divide surds.	• Students will know how to simplify surds by breaking it down into two factors, one of which is a square number • Students will know how to multiply surds in the form $\sqrt{a} \times \sqrt{b}$ • Students will know how to multiply surds in the form $a\sqrt{b} \times c\sqrt{d}$ • Students will know how to simplify their answers once they have multiplied surds. • Students will know how to divide surds in the form $\sqrt{a} \div \sqrt{b}$ • Students will know how to divide surds in the form $\frac{\sqrt{a}}{\sqrt{b}}$ • Students will know how to divide surds in the form $a\sqrt{b} \div c\sqrt{d}$ • Students will know that $(\sqrt{a})^2 = a$ **Opportunity for challenge:** • Students will know how to solve problems involving multiplying and dividing surds.	**Surd** – a square root which cannot be reduced to a whole number. Surds are irrational numbers. **Irrational Numbers** – Numbers which, when written in decimal form, would go on forever without any repeating pattern	• Students need to know how to calculate squares and square roots.	**Steps to Success – Simplifying Surds** **Step 1:** Find a factor pair for the number in the root. One of the numbers in the factor pair must be a square number. **Step 2:** Rewrite the surd as $\sqrt{factor\ a} \times \sqrt{factor\ b}$ **Step 3:** Square root the number that can be square rooted. **Step 4:** Rewrite the answer in the form $c\sqrt{b}$ where c is the square root of factor a. **Steps to Success – Multiplying Surds** **Step 1:** Multiply integers by integers. **Step 2:** Multiply roots by roots. **Step 3:** Combine the answer and simplify where possible. **Steps to Success – Dividing Surds** **Step 1:** Divide integers by integers. **Step 2:** Divide roots by roots. **Step 3:** Combine the answer and simplify where possible.	
To learn how to add and subtract surds.	• Students will know that to add and subtract surds we use similar rules to collecting like terms and that therefore $\sqrt{a} + \sqrt{a} = 2\sqrt{a}$ etc. • Students will know how to add and subtract surds.		• Students need to know how to simplify surds. • Students need to know their powers and roots.	**Steps to Success – Adding and Subtracting Surds** **Step 1:** Ensure the number under the root is the same, if not simplify each of the surds as much as possible. **Step 2:** Collect any roots with the same number together like you would with algebra (for instance $3\sqrt{a} + 5\sqrt{a} = 8\sqrt{a}$). ***Remember you can only collect the same roots together!***	
To learn how to expand brackets with surds.	• Students will know how to expand single brackets with surds, including where simplification of surds is required. • Students will know how to expand and simplify double brackets with surds including where resulting surds need simplifying. They will know how to do this where the numerator is an integer, single surd or an expression involving surds and/or integers.	**Expand** – multiply out	• Students need to know how to expand single brackets with algebraic terms. • Students need to know how to expand double brackets with algebraic terms.	**Steps to Success – Expanding single brackets involving Surds** **Step 1:** Using the rules for multiplying with surds, multiply everything on the outside of the bracket by everything on the inside of the bracket, remember to apply the rules of negatives. **Step 2:** Check whether any of your products can be simplified. If they can you must simplify them. **Steps to Success – Expanding double brackets involving Surds** **Step 1:** Using the rules for multiplying with surds, multiply the first term in the first bracket by each of the terms in the second bracket. **Step 2:** Using the rules for multiplying with surds, multiply the second term in the first bracket by each of the terms in the second bracket. **Step 3:** Check whether any of the square roots or surds that have been produced can be simplified and simplify where possible **Step 4:** Collect like terms together using the rules for adding and subtracting surds.	
Exam Preparation 1					