KS3 Maths Level-Up Recovery guidance

The following document maps the content of the KS3 Maths *Level-Up!* series. For more information on recovery catch-up visit: **pearsonschools.co.uk/recovery**.

Understand the value of digits in decimals, measure and integers

Unit 2 Know your numbers

***Level Up!* Levels 3-5 Unit 2.1: Place value**

- The value of a digit depends in its position – its place value. **(Level 3)**
- The decimal point separated the whole number parts from the fractional parts. **(Levels 3 and 4)**
- To multiply and divide whole numbers and decimals by 10, 100 and 1000 (Levels 4 and 5)

***Level Up! Levels 3-5* Unit 2.3: Positive and negative numbers**

- A thermometer shows how high or low a temperature is. **(Level 3)**
- Numbers above zero are positive and numbers below zero are negative. **(Level 3)**
- Positive and negative numbers can be represented on a number line. **(Level 4)**
- An integer is a positive or negative whole number, or zero. **(Level 4)**
- If you add / subtract a positive number the result is bigger/smaller. **(Level 4)**
- If you add / subtract a negative number the result is smaller / bigger. **(Level 5)**

***Level Up! Levels 3-5* Unit 2.4: Decimals**

- To compare and order whole numbers, tenths and hundredths. **(Level 4)**
- To compare decimal measures of the same unit. **(Level 4)**

What's in a number has some interesting and fun challenges: number pattern, digit dilemma, Chinese jigsaw.

Properties of number: factors, multiples, squares and cubes

Unit 1 All in order

Level Up! Levels 3-5 Unit 1.1: Multiples, squares and triangle numbers

- 3, 6, 9 and 12 are multiples of 3. 10, 20, 30 and 40 are multiplies of 10. **(Level 3)**
- A number multiplied by itself is a square number. **(Level 4)**
- Square numbers make a square pattern of dots. **(Level 4)**
- Triangle numbers make a triangular pattern of dots. **(Level 5)**

Unit 2 Know your numbers

***Level Up! Levels 3-5* Unit 2.5: Square numbers and multiplication**

- If you know a multiplication fact you can work out a division fact. **(Levels 3 and 4)**
- To square a number, you multiply it by itself. **(Levels 4 and 5)**
- Decimals can be written as fractions. **(Level 4)**

Unit 10 Algebra up close

***Level Up! Levels 3-5* Unit 10.1: Multiples and factors**

- A multiple is the product when two or more numbers are multiplied together. **(Level 3)**
- A factor is a number which can divide exactly into a given number. **(Level 3)**
- Rules of divisibility for 2, 5 and 10. **(Level 3)**
- Rules of divisibility for multiples of 3, 4, 6 and 9. **(Level 4)**
- A common factor is a factor that is common to two given numbers. **(Level 4)**
- The highest common factor (HCF) is the highest factor common to two given numbers. **(Level 5)**

Square and triangle numbers in Unit 10 has some great investigations

Arithmetic procedures with integers and decimals

Unit 2 Know your numbers

***Level Up! Levels 3-5* Unit 2.2: Addition and subtraction**

- Use partitioning to add and subtract mentally. **(Level 3)**
- Use compensations, by adding or subtracting too much and then compensating. **(Level 3)**
- Find the difference by counting on from the smaller number to the larger. **(Level 3)**
- Integer compliments are useful when adding and subtracting mentally. **(Level 4)**
- Use standard column procedures to add and subtract whole numbers and decimals. **(Level 4)**

Unit 6 Formula 1

***Level Up! Levels 3-5* Unit 6.2: Order of operations**

- 2 x (5 + 6) = 2 x 5 + 2 x 6, this is called the distributive law. **(Level 3)**
- The order of operations is, Brackets, Indices, Division and Multiplication, Addition and Subtraction, this is called BIDMAS to help us remember. **(Level 4)**
- A horizontal line acts as a bracket, (3 + 4) ÷ 2 can also be written as 3 + 4 / 2. **(Level 5)**

***Level Up! Levels 3-5* Unit 2.6: Using a calculator** is a good unit for practising this skill.

Algebra: Sequences, expressions and equations

Unit 1 All in order

***Level Up! Levels 3-5* Unit 1.2: Number patterns**

- A sequence of numbers can be made by counting on or back by the same amount each time. **(Levels 3 and 4)**
- Each number in a sequence us called a term. **(Level 4)**
- Find the missing terms of a sequence by working out the difference between terms. **(Level 3)**
- A sequence can be described using the first term and the term-to- term rule. **(Level 4)**

***Level Up! Levels 3-5* Unit 1.3: Terms of a sequence**

- Generates a sequence using the first term and the term-to-term rule. **(Level 4)**
- You can find a term in a sequence if you know its position, the first term and the position-to-term rule. **(Level 5)**

***Level Up! Levels 3*-5 Unit 1.4: Functions and mappings**

- Multiplication is the inverse of division. **(Level 3)**
- You can find the output of a function machine if you know the input. **(Level 3)**
- You can find the input of a function machine by using the inverse. **(Level 4)**
- You can find the rules of a function machine if you know the inputs and outputs. **(Level 4)**
- You can represent function machines using mappings and equations. **(Level 5)**

Functions and sequences in Unit 1 has some interesting puzzles.

***Level Up! Levels 3-5* Unit 1.6: Patterns and sequences**

- To find terms of a sequence of shapes you need to draw some more shapes. **(Level 4)**
- You can find the term-to-term rule by finding the difference between terms. **(Level 4)**
- To check your rule works, use your rule to find the next term in the sequence. **(Level 5)**

Unit 6 Formula 1

***Level Up! Levels 3-5* Unit 6.1: Writing expressions**

- Use algebra to write an expression that describes how one amount compares with another. **(Level 5)**
- You can use letters to stand for numbers. **(Level 4)**
- *m* is called a variable because its value can change or vary. **(Level 5)**
- You can write 3 times a mystery number as 3 x *m* or 3*m* **(Level 5)**

***Level Up! Levels 3-5* Unit 6.3: Simplifying expressions**

- An algebraic expression is made up of terms. **(Level 4)**
- Simplify an expression by adding terms that are alike. Like terms have the same letter. **(Levels 4 and 5)**
- You can multiply or expand expressions with brackets. **(Level 5)**

Unit 10 Algebra up close

***Level Up! Levels 3-5* Unit 10.2: Generating sequences**

- A sequence is a set of numbers that follow a pattern. **(Level 3)**
- Each number in a sequence is called a term. **(Level 3)**
- Sequences can be in ascending and descending order. **(Level 3)**
- Sequences can include negative and decimal numbers. **(Level 3 and 4)**
- You can generate a sequence from the first term and the term-to-term rule. **(Level 4)**
- You can use the position-to-term rule to find a term in a sequence. **(Level 5)**

***Level Up! Levels 3-5* Unit 10.3: Generating sequences using rules**

- To draw the next term in a sequence of patterns, work out how the pattern grows. **(Level 4)**
- You can generate a sequence from the rule and the first term. **(Level 5)**
- You can use the term-to-term rule of a sequence to find any term in the sequence. **(Level 5)**
- You can write the position-to- term rule of a sequence using algebra. **(Level 5)**

Unit 13 Express yourself

***Level Up! Levels 3-5* Unit 13.2: More simplifying expressions**

- An algebraic expression is made up of terms. **(Level 4)**
- You can simplify an expression by adding like terms. **(Level 5)**
- You can also multiply or expand expressions with brackets. **(Level 5)**

Unit 17 Algebra rules

***Level Up! Levels 3-5* Unit 17.1: Finding terms in a sequence**

- Find the next term of a sequence by drawing the next shape or by finding how much it goes up by each time. **(Level 3 and 4)**
- Find a term of a sequence if you know the position of the term in the sequence and the position-to-term rule. **(Level 5)**

***Level Up! Levels 3-5* Unit 17.2: More functions and mappings**

- You can put numbers into a function machine to get an output value. **(Level 4)**
- Function machines can help you find x- and y-values when you have been given a rule. **(Level 5)**

Algebra: letters, unknowns and formulae

Unit 6 Formula 1

***Level Up! Levels 3-5* Unit 6.4: Substituting into formulae**

- Formulae can be written in words or symbols (using algebra). **(Level 4 and 5)**
- Substituting values into a formula or an expression allows you to work out its value. **(Level 4 and 5)**

Unit 1 All in order

***Level Up! Levels 3-5* Unit 1.5: Letters and unknowns**

- You can use inverse operations to find missing numbers. **(Level 3)**
- You need to know what calculation to do before answering a question. **(Level 3)**
- You can write an expression to describe a situation. **(Level 5)**
- You can write a position-to-term rule as an expression. **(Level 5)**

Unit 6 Formula 1

***Level Up! Levels 3-5* Unit 6.5: Deriving formulae**

- A variable is a quantity in a formula that can take different values. **(Level 5)**
- Use a formula to describe how to work out an amount that depends on a variable. **(Level 5)**

Unit 13 Express yourself

***Level Up! Levels 3-5* Unit 13.3: Writing and solving one-step equations**

- You can use algebra to describe an amount by forming an expression. **(Level 5)**
- You can make an equation by putting an expression equal to a number. **(Level 5)**
- An equation can be solved to find the value of the letter. **(Level 5)**

***Level Up! Levels 3-5* Unit 13.4: Writing and solving two-step equations**

- You can solve two-step equations by making sure that both sides remain balanced. **(Level 5)**
- You can check your answer by substituting it into the original equation. **(Level 5)**

Unit 17 Algebra rules

***Level Up! Levels 3-5* Unit 17.6: Using formulae**

- A variable is a quantity that can change. **(Level 4 and 5)**
- A formula is a rule for working out an amount that depends on a variable. **(Level 4 and 5)**
- To substitute values into a formula, replace the letters with their values. **(Level 5)**

***Level Up! Levels 3-5* Unit 17.7: More deriving formulae**

- Use a formula to describe how to work out an amount that depends on a variable. **(Level 5)**

Fior v Tartaglia in Unit 6 is a good activity for practising to simplify expressions within a real-life historical context.

Algebra: Sequences

Unit 1 Pattern perfect

***Level Up! Levels 4-6* Unit 1.1: Sequences**

- Sequences are patterns. Each pattern or number in a sequence is called a term. The number at the start of a sequence is called the first term. The term-to-term rule shows you how to get the next term. **(Level 4)**
- Sequences where the numbers increase are called ascending sequences. **(Level 4)**
- A sequence which carries on forever is infinite. A sequence which has a fixed number of terms is finite. **(Level 4)**
- A sequence can be made with decimal or negative numbers. **(Level 5)**

***Level Up! Levels 4-6* Unit 1.2: Generating sequences**

- Patterns can be described using numbers. **(Level 4)**
- You can find terms is you know the first term and the term-to-term rule. **(Levels 4 and 5)**

***Level Up! Levels 4-6* Unit 1.3: More sequences**

- Square numbers form a square pattern of dots and triangle numbers form a triangle pattern of dots. **(Level 4)**
- You can use the position-to-term rule to find any term in the sequence without having to write the whole sequence. **(Level 5)**
- An arithmetic sequence goes up or down in equal sized steps. **(Level 5)**

***Level Up! Levels 4-6* Unit 1.4: Function machines**

- You can find the output of a function machine if you know the input. **(Level 4)**
- You can find the input of a function machine by using inverse operations. **(Level 5)**
- You can find the function if you have inputs and outputs. **(Level 5)**

Scrap number machine in Unit 1 is a function machine investigation.

***Level Up! Levels 4-6* Units 1.5 and 6.1: Expressions and mappings**

- In an algebraic expression, letters stand for mystery numbers. **(Level 4)**
- You can simplify expressions by collecting like terms. **(Level 5)**
- Mappings are another way of writing function machines. **(Level 6)**
- A mapping can be shown on a mapping diagram. **(Level 6)**

***Level Up! Levels 4-6* Units 1.5 and 10.3: Functions and mappings**

- You can find the input of a function machine when you know the output, by using the inverse operation. **(Level 5)**
- You can use mapping diagrams to show the inputs and outputs function machine. **(Level 6)**
- You can represent a function using a function machine, a mapping and an equation. **(Level 6)**

Algebra: the nth term

Unit 10 All about algebra

***Level Up! Levels 4-6* Unit 10.1: Position-to-term rule**

- Find a term in a sequence using the position-to-term rule if you know its position. **(Level 5)**
- The nth term gives the position-to-term rule for a sequence. **(Level 5)**

***Level Up! Levels 4-6* Unit 10.2: Describing the nth term**

- The nth term of a sequence is the position-to-term rule written using algebra. **(Level 5)**
- You can use the nth term to find other terms in the sequence. **(Level 6)**
- You can justify the nth term by looking at the structure of the sequence. **(Level 6)**

Mathematics and disease in unit 10 is a good cross-curricular investigation

Unit 17 The return of algebra

***Level Up! Levels 4-6* Unit 17.1: Sequences and finding the nth term**

- Sequences have a first term and a term-to-term rule that connects one term to the next. **(Level 5)**
- You can use an algebraic expression to describe a linear sequence. **(Level 5 and 6)**
- The nth term can be used to calculate any term in the sequence as long as you know its position. **(Level 6)**

Algebra: brackets

Unit 6 Forming formulae

***Level Up! Levels 4-6* Unit 6.3: Using brackets**

- The order of operations applies to number and algebra. **(Level 4 and 5)**
- You can multiply or expand expressions with brackets. **(Level 5)**
- Multiply or expand expressions with unknow both inside and outside the brackets. **(Level 6)**

Algebra: formulae

Unit 6 Forming formulae

***Level Up! Levels 4-6* Unit 6.4: Substituting into expressions and formulae**

- A formula is a rule which connects two or more variables. **(Level 4)**
- Use a formula to calculate an unknown value by substituting values for the letters or words. **(Level 4)**
- You can substitute values into a formula with indices to work out the unknown value. **(Level 6)**

***Level Up! Levels 4-6* Units 1.5 and 6.1: Expressions and mappings**

- To help you remember the order of operations, use BIDMAS. **(Level 5)**
- In an algebraic expression, letters stand for mystery numbers. **(Level 5)**
- You can simplify expressions by collecting like terms. **(Level 5)**
- You can use arithmetic operations with algebra. **(Level 5)**
- Mappings are another way of writing function machines. **(Level 6)**
- A mapping can be shown on a mapping diagram. **(Level 6)**

***Level Up! Levels 4-6* Unit 6.5: Deriving formulae**

- You can derive a formula to work out an amount that depends on a variable. **(Level 5)**
- A variable is a quantity that can change. **(Level 5)**

Rocket science in Unit 6 has some nice investigations to work on together.

Unit 17 The return of algebra

***Level Up! Levels 4-6* Unit 17.3: Using formulae**

- A formula stated the relationship between variable. **(Level 5)**
- You can use a formula to calculate unknown values when you know other values, by substituting in numbers. **(Level 5)**
- The subject of a formula is the unknown value which appears alone on one side of the formula. **(Level 5)**

Algebra: Equations

Unit 13 Balancing act

***Level Up! Levels 4-6* Units 13.1: Solving simple equations**

- An equation contains an unknown number and an = sign. **(Level 5)**
- You can use the balancing method to solve an equation. **(Level 5)**
- Check your answer by substituting it back into the equation. **(Level 5)**

***Level Up! Levels 4-6* Units 13.2: Solving more complex equations**

- Equations with the unknown on one side can be solves using inverse operations or the balancing method. **(Level 5)**
- You can construct an equation to help you solve a problem. **(Level 6)**
- Equations with brackets can be solved using the order or operations. **(Level 6)**

***Level Up! Levels 4-6* Units 13.3: Constructing and solving equations**

- You can construct an equation to find an unknown value. **(Level 6)**
- Equations can have unknowns on both sides. **(Level 6)**
- When solving an equation, it is important to do the same operation o both sides of the equation to keep it balanced. **(Level 6)**

Equation quest in Unit 13 has some mazes and other problems for the students to solve. Work on these together.

Unit 17 The return of algebra

***Level Up! Levels 4-6* Units 17.2: More equations**

- You can use algebra to describe an amount by writing an expression. **(Level 5)**
- An equation contains an unknown number and an = sign. **(Level 5)**
- You can use the balancing method to solve any equation. **(Level 5)**
- To construct an equation, find two different expressions that have the same value ad link them together using the = sign. **(Level 6)**

Properties of number

Unit 2 Number knowledge

***Level Up! Levels 4-6* Unit 2.1: Decimal know-how**

- Digits after the decimal point are fractions. **(Level 4)**
- To compare decimal measurements, all the measurements must be in the same units. **(Level 4)**
- When you multiply/divide a number by 10, the digits move one place to the left/right. **(Level 4)**
- To order decimals, first compare the whole numbers, next compare the tenths, then hundredths and so on. **(Level 4 and 5)**

***Level Up! Levels 4-6* Unit 2.2: Negative numbers**

- You can show positive and negative numbers on a number line. **(Level 4)**
- Adding a negative number is the same as subtracting a positive number. **(Level 5)**
- Subtracting a negative number is the same as adding a positive number. **(Level 5)**
- When you multiply of divide a negative number by a positive number the answer is positive. **(Level 5)**
- When multiplying or dividing two numbers you need to check the signs. **(Level 6)**

***Level Up! Levels 4-6* Unit 2.5: Squares and square roots**

- To find the square of a number, you multiply it by itself. **(Level 4)**
- Finding the square root is the inverse of squaring. **(Level 5)**
- All positive numbers have a positive and a negative square root. **(Level 6)**

Unit 6 Forming formulae

***Level Up! Levels 4-6* Unit 6.2: Powers**

- Square numbers are shown with a power of 2^2. **(Level 4)**
- Cube numbers are shown with a power of 3^3. **(Level 5)**
- Finding the cube root of a number is the inverse of finding the cube of a number. **(Level 6)**
- If a number or term is multiplied by itself you can use a power to write the expression in a shorter way. **(Level 6)**

Unit 16 Safety in numbers

***Level Up! Levels 4-6* Unit 16.1: Powers and roots**

- 3^2 means 3 x 3 or 3 squared. The number 2 is called the power or index. **(Level 5)**
- The inverse of squaring is finding the square root. **(Level 5)**
- 2^3 means 2 x 2 x 2 or 2 cubed. The number 3 is called the power or index. **(Level 5)**
- The inverse of cubing is finding the cube root. **(Level 6)**
- You can write powers of 10 in index form, for example 10 000 = 10 x 10 x 10 x 10 =10^4. **(Level 6)**

***Level Up! Levels 4-6* Unit 16.2: Powers and roots on a calculator**

- You use the square root key on a calculator to find the square root of a number. **(Level 5)**
- For complex calculations you can use the brackets or memory keys. **(Level 6)**
- You use the cube root key to find the cube root. **(Level 6)**
- You can sometimes find a square root by factorising. **(Level 6)**

***Level Up! Levels 4-6* Unit 16.3: Multiples, factors and primes**

- A number is exactly divisible by:
  - 3, if the sum of the digits is divisible by 3
  - 4, if the last two digits are divisible by 4
  - 6, if it is even and it is divisible by 3
  - 25, if the last two digits are 00, 25, 50 or 75. **(Level 4)**
- A common multiple is a number which is a multiple of at least two numbers. **(Level 4)**
- Numbers that are factors of two separate numbers are called common factors. **(Level 4)**
- A prime number has two factors, itself and 1. **(Level 4)**
- The lowest common multiple (LCM) of two numbers is the smallest number that is a multiple of them both. **(Level 5)**
- The highest common factor (HC) of two numbers is the biggest number that is a factor of them both. **(Level 5)**

***Level Up! Levels 4-6* Unit 16.4: LCM, HCF and prime factors**

- A factor divides into a number exactly, if the factor is prime, it is called a prime factor. **(Level 6)**
- You can write any number as a product of its prime factors. **(Level 6)**
- You can write the same prime factors using powers. **(Level 6)**

Fractions, percentages, ratio and proportion

Unit 4 Bit parts

***Level Up! Levels 4-6* Unit 4.1: Fractions**

- A fraction can be used to describe part of a whole. **(Level 3)**
- The top number of a fraction is the numerator, the bottom is the denominator. **(Level 3)**
- Equivalent fractions are fractions that have the same value. **(Level 3)**
- You can find equivalent fractions by multiplying or dividing the numerator and denominator by the same number. **(Level 4)**
- Fractions can be simplified by cancelling common factors. **(Level 5)**
- A decimal is another way to describe part of a whole. **(Level 4)**
- Convert a decimal to a fraction by writing if with a denominator of 10, 100 or 1000 and then cancelling. **(Level 5)**

***Level Up! Levels 4-6* Unit 4.2: Adding and subtracting fractions**

- To add or subtract fractions with a common denominator just add or subtract the numerators. Write the result over the same denominator. **(Level 3)**
- To add of subtract fractions with different denominators, first find equivalent fractions with the same denominators. **(Level 4)**

***Level Up! Levels 4-6* Unit 4.3: Improper fractions and mixed numbers**

- An improper fraction has a numerator that is bigger than its denominator. **(Level 3)**
- A mixed number has a whole number part and a fraction part. **(Level 3)**
- To check a fraction addition or subtraction, use an inverse calculation. **(Level 4)**
- To add mixed numbers, subtract the whole number parts and then the fractions. **(Level 4)**
- When subtracting, it is sometimes necessary to convert the first mixed number to an equivalent mixed number with a larger fraction. **(Level 5)**

***Level Up! Levels 4-6* Unit 4.4: Multiplying and dividing with fractions**

- To find a fraction of a quantity, divide the quantity by the denominator and the multiply by the numerator. **(Level 3)**
- 3/7 of 28, 3/7 x 28 and 28 x 3/7 are all equivalent. **(Level 5)**
- You can multiply a fraction by a whole number by multiplying the numerator by the whole number and simplify. **(Level 4)**
- To divide a whole number by a fraction, you find out how many groups of the fraction can be made out of the whole number. **(Level 5)**

Unit 12 Put things in proportion

***Level Up! Levels 4-6* Unit 12.1: Percentages**

- Percent means out of 100. **(Level 4)**
- You can write any percentages as a fraction with denominator 100. **(Level 4)**
- To find 10% of an amount, you divide by 10. **(Level 4)**
- To express one number as a percentage of another: write the number as a fraction of the other; find the equivalent fraction with denominator 100; write down the percentage. **(Level 5)**
- You can express part of an amount as a fraction. **(Level 5)**

Unit 12 Put things in proportion

***Level Up! Levels 4-6* Unit 12.2: Ratio**

- A ratio compares part with part. **(Level 4)**
- Simplifying a ratio is similar to simplifying fractions. **(Level 5)**
- To simplify a ratio expressed in different units you need to convert to the same units first. **(Level 5)**
- You can divide a quantity into three parts using a three-part ratio. **(Level 6)**

***Level Up! Levels 4-6* Unit 12.3: Proportion**

- A proportion compares a part with the whole. **(Level 4)**
- Proportion can be given as a fraction, a decimal or a percentage. **(Level 5)**
- If two quantities are in direct proportion, it means that as one quantity increases, the other increases at the same rate. **(Level 5)**
- Finding the value of one item is called the unitary method. **(Level 5)**

***Level Up! Levels 4-6* Unit 12.4: More ratio and proportion**

- Equivalent fraction, decimals and percentages have the same value. **(Level 4)**
- To convert a percentage to a decimal, divide by 100. **(Level 4)**
- To convert a decimal to a percentage, first change the decimal to a fraction with a denominator of 100. **(Level 4)**
- To convert a fraction to a percentage, look for an equivalent fraction that is easy to work with. **(Level 4)**
- If you know the proportion, you can work out the ratio. **(Level 5)**
- To compare proportions, make sure you are using just fractions, just decimals or just percentages. **(Level 5)**

Getting the right gear in Unit 12 looks at ratio and proportion in practical situations. These would be good to explore together.

Fractions: solving problems

Unit 16 Safety in numbers

***Level Up! Levels 4-6* Unit 16.5: Solving fraction problems**

- The word 'of' means multiply. **(Level 4)**
- To find a fraction of a quantity, divide the number by the denominator and multiply by the numerator. **(Level 3)**
- You can multiply a fraction by a whole number by multiplying the numerator by the whole number and simplify. **(Level 4)**
- You can add and subtract fractions easily if they have the same denominator. You may need to convert them to equivalent fractions. **(Level 4)**
- To divide a whole number by a fraction, you find out how many groups of the fraction can be made out of the whole number. **(Level 5)**

***Level Up! Levels 4-6* Unit 16.7: Fractions on a calculator**

- A recurring decimal is a decimal fraction which goes on repeating itself without end. **(Level 6)**
- Some calculators round recurring decimals. **(Level 6)**
- You need to use the fraction keys on your calculator to enter fractions and mixed numbers. **(Level 6)**

