The Sutton Academy

# Knowledge Rich Curriculum Plan

Year 7 Core – Algebraic Expressions, Equations and Inequalities

| Lesson objective | Intended Knowledge: | Tiered Vocabulary | Prior Knowledge: | Steps to Success | Feedback |
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| To learn how to simplify algebraic expressions by collecting like terms. | • Students will know how to collect like terms with single terms such as $y + y + y = 3y$.<br>• Students will know how to collect like terms with terms multiplied by an integer bigger than one. E.g. $2b + 3b = 5b$<br>• Students will know how to collect like terms involving multiple terms. E.g.$2x + 7y + 4x + 6y = 6x + 13y$<br>**Opportunity for challenge:**<br>• Students will know that when adding or subtracting terms with same power, the power must stay the same. E.g.$x^2 + x^2 = 2x^2$<br>• Students will know how to collect like terms involving powers. E.g. $4x + 5x^2 - x + 6x^2 = 3x + 11x^2$ | **Algebraic Expression –** A collection of variables and/or integers without an equal's sign. It cannot be solved. | • Students need to know how to add and subtract integers. | **Steps to Success – Collecting Like Terms**<br>**Step 1:** Identify the "like terms" within the expression. You need to allocate a shape/colour to each variable with the same exponent. Ensure that you include the sign in front of the term in your shape.<br>**Step 2:** Simplify each of the "like terms".<br>If there is no coefficient in front of the variable, the coefficient is 1.<br>**Step 3:** Rewrite the simplified expression. (Remember to write them in order) | |
| To learn how to multiply and divide algebraic expressions. | • Students will know how to multiply with single terms such as $y \times y \times y = y^3$.<br>• Students will know how to multiply algebraic expressions involving multiple letters and integers. E.g. $4 \times b \times c = 4bc$ or $4b \times 3c = 12bc$<br>• Students will know how to multiply algebraic expressions involving the same letter. E.g. $5 \times g \times g = 5g^2$<br>• Students will know how to divide simple algebraic expressions. E.g. $\frac{4t}{2} = 2t$ *or* $\frac{6t}{2t} = 3$<br>**Opportunity for challenge:**<br>• Students will know how to simplify algebraic expressions involving multiplication and division by correctly applying the index laws. | | • Students need to know how to multiply and divide integers.<br>• Students need to know how to square and cube integers. | **Simplifying expressions involving multiplication**<br>**Step 1:** Multiply the coefficients of the variables<br>**Step 2:** Multiply the variables – remember to add the powers for any variables represented by the same letter<br>**Simplifying expressions involving division**<br>**Step 1:** Divide the coefficients of the variables<br>**Step 2:** Divide the variables – remember to subtract the powers for any variables represented by the same letter | |
| To learn how to expand single brackets. | • Students will know how to expand single brackets by multiplying a single integer term over a bracket. E.g. $2(x + 3)$<br>• Students will know how to expand single brackets by multiplying an algebraic term over a bracket. E.g. $x(x - 4)$<br>**Opportunity for challenge:**<br>• Students will know how to expand single brackets by multiplying multiple terms over a bracket. e.g. $2a(4a + 5)$ or $2ab(3a + b)$ | **Expand –** in maths, expand means multiply out | • Students need to know how to multiply algebraic expressions. | **Steps to Success - How do we expand single brackets?**<br>**Step 1** – Multiply the expression within the brackets by the expression outside the bracket.<br>In order to expand the full, bracket, make sure to multiply the entire expression rather than just one term within the expression.<br>Remember if there are indices involved that when we multiply we add them.<br>**Step 2** – Check whether your answer can be simplified<br>Collect any like terms to simplify the answers. | |
| To learn how to expand two brackets and collect like terms. | • Students will know how to expand integers over two single brackets and simplify the answer by collecting like terms with a mixture of positive and negative values. E.g. $2(x + 3) + 3(x + 4)$<br>**Opportunity for challenge:**<br>• Students will know how to expand single letters over two single brackets and simplify the answer by | | • Students need to know how to expand single brackets. | **Steps to Success – How do we expand two single brackets?**<br>**Step 1** – Expand one bracket at a time. Start with bracket 1 - multiply the expression within the brackets by the expression outside the bracket.<br>**Step 2** – Expand bracket 2 - multiply the expression within the brackets by the expression outside the bracket.<br>**Step 3** – Simplify the expression by collecting like terms. | |

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| | collecting like terms with a mixture of positive and negative values. E.g. $x(x+3)+x(x+4)$ | | | | |
| **To learn how to factorise expressions into single brackets.** | • Students will know how to factorise algebraic expressions into a single bracket by taking out common numerical factors.<br>**Opportunity for challenge:**<br>• Students will know how to factorise algebraic expressions into a single bracket by taking out common algebraic factors. | **Factorise –** put back into brackets by bringing common factors outside | • Students need to know how to multiply and divide algebraic terms.<br>• Students need to know how to find the HCF of two numbers. | **Steps to Success – Factorising expression into a single bracket**<br>**Step 1:** Identify the highest common factor of the terms and write it in front of brackets.<br>**Step 2:** Figure out what you multiply the HCF with to get the first term of the expression given in the question. This will be the first term that you place inside the bracket.<br>**Step 3:** Figure out what you multiply the HCF with to get the second term of the expression given in the question. This will be the second term that you place inside the bracket. | |
| **To learn how to substitute numbers into expressions and formulae.** | • Students will know how to substitute positive and negative integers into formulae.<br>• Students will know how to substitute positive and negative numbers into worded formulae.<br>• | **Substitution** - replacing letters with numbers in algebraic expressions or equations | • Students need to know how to use the order of operations. | **Steps to Success - Substitution**<br>**Step 1:** Write the **expression** out with the calculation symbols in all of the correct places.<br>**Step 2: Substitute** the values for each letter into the correct place in the calculation.<br>**Step 3:** Calculate the answer remembering to follow **BIDMAS.** | |
| **To learn how to use function machines.** | • Students will know how to use function machines to complete one step operations.<br>• Students will know how to use inverse operations to find an input using the output.<br>• Students will know how to find missing operations of a function machines given the input and output.<br>• Students will know how to use function machines to complete two step operations. | **Input** - what is put in, taken in, or operated on by any process or system.<br>**Output** - the amount of something produced by a person, machine, or industry.<br>**Inverse –** something that is the opposite or reverse of something else. | • Students need to know how to add, subtract, multiply and divide integers. | **Steps to Success – Function machines**<br>**Step 1:** Place the input value at the front of the function machine.<br>**Step 2:** Carry out the first calculation with your inputted value and the operation given in the first box of the function machine. Write this after the first operation box.<br>**Step 3:** Carry out the next calculation with your current value and the operation given in the second box of the function machine. Write this after the second operation box.<br>**Step 4:** Write the output as your answer.<br>**Steps to Success – Inverse operations with function machines**<br>**Step 1:** Place the output value at the end of the function machine.<br>**Step 2:** Carry out the first calculation with your output value and the **inverse** operation given in the last box of the function machine. Write this before the second operation box.<br>**Step 3:** Carry out the next calculation with your current value and the **inverse** operation given in the first box of the function machine. Write this before the first operation box.<br>**Step 4:** Write the input as your answer. | |
| **To learn how to solve one step linear equations.** | • Students will know how to use algebraic methods to solve one step linear equations involving addition and subtraction to find an integer solution. E.g. $x+7=10$ and $y-4=8$<br>• Students will know how to use algebraic methods to solve one step linear equations involving multiplication to find an integer solution. E.g. $3x=18$ | **Solve –** find an answer<br>**Equation –** a mathematical statement where two algebraic expressions are equal<br>**Linear Equation –** an equation where the highest power of x is 1 | • Students need to know how to use function machines to apply operations.<br>• Students need to know how to use a function machine to apply inverse operations. | **Steps to Success – Solving one step linear equations**<br>**Step 1:** Determine what operation needs to happen first. Do this by going in reverse BIDMAS order.<br>**Step 2:** Carry out the inverse operation across both sides of the equation to keep it balanced. | |

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| | • Students will know how to use algebraic methods to solve one step linear equations involving fractions to find an integer solution. E.g. $\frac{x}{3} = 2$<br>• Students will know that they can get positive and negative solutions. | | | | |
| **To learn how to solve two step linear equations.** | • Students will know how to solve simple two step linear equations with one unknown to find an integer solution. e.g. $2x + 3 = 15$<br>• Students will know how to solve two step linear equations involving fractions. E.g. $\frac{x}{2} + 3 = 4$<br>**Opportunity for challenge:**<br>• Students will know how to solve equations involving a bracket. E.g. $2(4x + 6) = 10$ | | • Students need to know how to solve one step equations involving addition, subtract, multiplication and division. | **Steps to Success – Solving two step linear equations**<br>**Step 1:** Determine what operation needs to happen first. Do this by going in reverse BIDMAS order.<br>**Step 2:** Carry out the inverse operation across both sides of the equation to keep it balanced. This is usually an addition or subtraction.<br>**Step 3:** Repeat steps one and two until the value of the letter is found. | |
| **To learn how to list integers that satisfy an inequality.** | • Students will know how to use inequality signs to show inclusive and exclusive inequalities.<br>• Students will know that inclusive means inequalities that concerns the symbols ≤, ≥.<br>• Students will know that exclusive means inequalities that concerns the symbols >,<.<br>• Students will know how to list some integers that satisfy an inequality. E.g. $x > 4$ or $x \leq 9$.<br>• Students will know how to list integers that satisfy an inequality. e.g. $-2 \leq x < 3$. | **Inequality –** a symbol which makes a non-equal comparison between two numbers or other mathematical expressions e.g. >, <, ≥ and ≤<br><br>**Satisfies –** meet the expectations, needs, or desires of | • Students need to know how to order numbers. | **Key Information**<br>• > means greater than.<br>• < means less than.<br>• ≥ means greater than or equal to.<br>• ≤ means less than or equal to. | |
| **To learn how to represent and interpret inequalities on number lines.** | • Students will know how to represent inequalities such as $x \geq 3$.<br>• Students will know how to represent inequalities such as $-1 < x \leq 3$.<br>• Students will know that a line must connect both circles.<br>• Students will know how to write linear inequalities to represent a set shown on a number line such as $x < 5$ and $2 \leq x < 7$. | | • Students need to know how to list integers that satisfy an inequality. | **Steps to Success – Drawing inequalities on a number line with one limit**<br>**Step 1:** Identify the limit of the inequality and draw a circle above this number.<br>**Step 2:** If the limit is **less than or equal to** or a **greater than or equal to**, colour in the circle.<br>**Step 3:** Identify if the inequality is a greater than or less than. If it is a greater than, draw the arrow pointing to the right. If it is a less than, draw the arrow pointing to the left.<br>**Steps to Success – Drawing inequalities on a number line with two limits**<br>**Step 1:** Identify the limits of the inequality and draw a circle above both numbers.<br>**Step 2:** If the first sign is **less than or equal**, colour in the first circle.<br>**Step 3:** IF the second sign is **greater than or equal to**, colour in the second circle.<br>**Step 4:** Connect the circles with a single straight line.<br>**Steps to Success – Writing inequalities from a number line with one limit**<br>**Step 1:** Write down the letter. | |

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| | | | | **Step 2:** If the circle is not coloured in then the limit is **less than** or **greater then**. If the circle is coloured in, then the limit is **less than or equal to** or a **greater than or equal to**. Write the sign to the right of your letter.<br>**Step 3:** Identify the limit of the inequality by looking at the number which the circle is above. Write this number down on the right of your inequality sign.<br>**Step 4:** Double check that your inequality makes sense for the diagram you have.<br>**Steps to Success – Writing inequalities from a number line with two limits**<br>**Step 1:** Write down the letter.<br>**Step 2:** If the first circle is not coloured in then the limit is **less than**. If the first circle is coloured in, then the limit is **less than or equal to**. Write the sign to the left of your letter – pointing it to the left.<br>**Step 3:** If the second circle is not coloured in then the limit is **less than**. If the second circle is coloured in, then the limit is **less than or equal to**. Write the sign to the right of your letter – pointing it to the left.<br>**Step 4:** Identify the limits of the inequality by looking at the numbers which each circle is above. Write these numbers down. The smallest number should be on the left and the biggest number should be on the right.<br>**Step 5:** Double check that your inequality makes sense for the diagram you have. | |
| Mini-Assessment 5 | | | | | |