

## KS3 STAGE 7, ALGEBRA, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:
<p>Prior key stage 2 content reviewed using pre-tests and whiteboard work at the start of each topic.</p> <p><b>Algebraic proficiency – using formulae</b></p> <ul style="list-style-type: none"> <li>• Key skills; simple 1 and 2 step formula written in words; simple formula expressed in symbols</li> <li>• Use a simple one-step formula written in words</li> <li>• Use a simple two-step formula written in words</li> <li>• Use simple formula expressed in symbols</li> <li>• Convert between miles and kilometres</li> </ul> <p><b>Pattern spotting</b></p> <ul style="list-style-type: none"> <li>• Key skills: recognise a linear sequence; find next terms; find missing numbers; create a linear sequence from description</li> <li>• Recognise and describe a linear sequence</li> <li>• Find the next terms in a linear sequence</li> </ul>	<p><b>Algebraic proficiency -Tinkering</b></p> <ul style="list-style-type: none"> <li>• Key skills: Manipulating expressions; use of letters, identifying like terms and simplify; multiply with brackets; explore functions and evaluate algebraic statements</li> <li>• <b><u>Manipulating expressions 1</u></b> <b><u>(collecting like terms)</u></b></li> <li>• You will learn to understand the vocabulary and notation of algebra and manipulate algebraic expressions</li> <li>• Know the meaning of expression, term, formula, equation, function</li> <li>• Know basic algebraic notation (the rules of algebra)</li> <li>• Use letters to represent variables</li> <li>• Identify like terms in an expression</li> <li>• Simplify an expression by collecting like terms</li> <li>• <b><u>Manipulating expressions 2</u></b> <b><u>(expanding brackets)</u></b></li> <li>• You will learn how to manipulate algebraic expressions involving products</li> </ul>	<p>Algebra, Expression, Term, Formula (formulae), Equation, Function, Variable, Mapping diagram, Input, Output, Represent , Substitute, Evaluate, Like terms, Simplify Pattern, Sequence, Linear, Term, Term-to-term rule, Ascending, Descending, Unknown, Operation, Solve, Solution, Symbol.</p> <p>Highlighted words <b>MUST</b> be explicitly taught, defined and recorded in student books as they are first met. Other listed words may be introduced verbally or written in a similar format.</p>

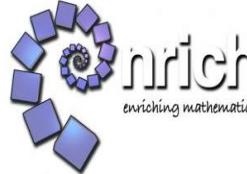
<ul style="list-style-type: none"> <li>Find a missing term in a linear sequence</li> <li>Generate a linear sequence from its description</li> </ul> <p><b>Solving equations and inequalities</b></p> <ul style="list-style-type: none"> <li>Key skills: Solve number problems; use algebra to solve a number problem with 2 unknowns; basic rules of algebraic notation</li> <li>Find all combinations of two variables that solve a missing number problem with two unknowns</li> <li>Find pairs of numbers that satisfy an equation with two unknowns e.g. <math>a + b = 15</math></li> <li>Know the basic rules of algebraic notation</li> <li>Express and solve missing number problems algebraically</li> </ul>	<ul style="list-style-type: none"> <li>Know how to multiply a (positive) single term over a bracket (the distributive law)</li> <li><b>Formulae</b></li> <li>You will explore functions and evaluate algebraic statements</li> <li>Substitute positive numbers into expressions and formulae</li> <li>Given a function, establish outputs from given inputs</li> <li>Given a function, establish inputs from given outputs</li> <li>Use a mapping diagram (function machine) to represent a function</li> <li>Use an expression to represent a function</li> <li>Use the order of operations correctly in algebraic situations</li> </ul> <p><b>Pattern spotting</b></p> <ul style="list-style-type: none"> <li>Key skills: Explore linear and non-linear sequences; find the term to term rule; describe a number sequence; solve problems using this rule</li> <li><b>Sequences</b></li> <li>You will explore number sequences</li> <li>Use a term-to-term rule to generate a linear sequence</li> <li>Use a term-to-term rule to generate a non-linear sequence</li> </ul>	
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- Find the term-to-term rule for a sequence
- Describe a number sequence
- Solve problems involving the term-to-term rule for a sequence
- Solve problems involving the term-to-term rule for a non-numerical sequence

### Solving equations and inequalities

- Key skills: solve two and three step equations with brackets and when the solution is a whole number and a fraction
- **Equations**
- You will explore way of solving two and three step equations
- Choose the required inverse operation when solving an equation
- Identify the correct order of undoing the operations in an equation
- Solve one-step equations when the solution is a whole number (fraction)
- Solve two-step equations (including the use of brackets) when the solution is a whole number
- Solve two-step equations (including the use of brackets) when the solution is a fraction

	<ul style="list-style-type: none"> <li>Solve three-step equations (including the use of brackets) when the solution is a whole number</li> <li>Solve three-step equations (including the use of brackets) when the solution is a fraction</li> <li>Check the solution to an equation by substitution</li> </ul>	
<b>Challenge and Support:</b>	<b>World wide learning/ links to 21<sup>st</sup> century:</b>	<b>Cultural capital/ Industry/ Enrichment:</b>
<ul style="list-style-type: none"> <li>Show me an example of an expression / formula / equation</li> <li>Always / Sometimes / Never: <math>4(g+2) = 4g+8</math>, <math>3(d+1) = 3d+1</math>, <math>a^2 = 2a</math>, <math>ab = ba</math></li> <li>Jenny writes <math>2a + 3b + 5a - b = 7a + 3</math>. Kenny writes <math>2a + 3b + 5a - b = 9ab</math>. What would you write? Why?</li> <li>Show me a (non-)linear sequence. And another. And another.</li> <li>What's the same, what's different: 2, 5, 8, 11, 14, ... and 4, 7, 10, 13, 16, ...?</li> <li>Create a (non-linear/linear) sequence with a 3<sup>rd</sup> term of '7'</li> <li>Always/ Sometimes /Never: The 10<sup>th</sup> term of is double the 5<sup>th</sup> term of the (linear) sequence</li> <li>Kenny thinks that the 20<sup>th</sup> term of the sequence 5, 9, 13, 17, 21, ... will be 105. Do you agree with Kenny? Explain your answer.</li> </ul>	<ul style="list-style-type: none"> <li>Algebra lets you describe and represent patterns using precise mathematical language. This is useful for many careers including accounting, navigation, building, plumbing, medicine, science and computing.</li> <li>Finding a pattern and working out how the parts of a pattern fit together is important in scientific discovery. Scientists use sequences to model and solve real life problems, such as estimating how quickly a disease will spread.</li> <li>Accounting involves a great deal of maths. Accountants set up computer spreadsheets to calculate and analyse data. Programs such as excel work by applying different equations to values in columns of cells, you need to know</li> </ul>	 <p>Search Algebra ages 11-14</p> <p>NRICH website – access current articles and enrichment activities.</p> <ul style="list-style-type: none"> <li>NRICH provides thousands of free online mathematics resources for ages 3 to 18 - completely free and available to all via their website (<a href="http://nrich.maths.org/">nrich.maths.org/</a>). These resources aim to: <ul style="list-style-type: none"> <li>○ Enrich and enhance the experience of the mathematics curriculum for all learners</li> <li>○ Develop mathematical thinking and problem-solving skills</li> <li>○ Offer challenging, inspiring and engaging activities</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>Show me an (one-step, two-step) equation with a solution of 14 (positive, fractional solution). And another. And another ...</li> <li>Kenny thinks if <math>6x = 3</math> then <math>x = 2</math>. Do you agree with Kenny? Explain</li> <li>Jenny and Lenny are solving: <math>3(x - 2) = 15</math>. Who is correct? Explain</li> </ul> <p><b>Jenny's solution</b></p> $  \begin{array}{rcl}  3(x - 15) & = & 15 \\  - & & \\  2) & & \\  \div 3 & \quad \div 3 & \text{Multiplying out brackets} \\  x - 5 & = & 15 \\  2 & & \\  \div 2 & \quad \div 2 & +2 \\  x = 7 & = & 7  \end{array}  $ <p><b>Lenny's solution</b></p> $  \begin{array}{rcl}  3(x - 2) & = & 15 \\  \div 3 & & \\  x - 6 & = & 15 \\  \div 3 & & \\  x = 7 & = & 7  \end{array}  $	<p>what equation or formulae to use to get the results you need.</p>	<ul style="list-style-type: none"> <li>Transition Day – Cluedo activity using Coordinates.</li> <li>Code breaking</li> <li>Functional Skills Projects</li> </ul>
<p><b>Historical, Social, Moral, Spiritual, Cultural context:</b></p> <ul style="list-style-type: none"> <li>Algebra allows students to use spreadsheets, solve real world problems, use and understand modern technology and to work efficiently in the workplace. It is also fundamental to understanding patterns in the natural world.</li> </ul>	<p><b>Cross curricular links/ literacy/numeracy:</b></p> <p>The lower case and upper case of a letter should not be used interchangeably when worked with algebra  Juxtaposition is used in place of '<math>\times</math>'. <math>2a</math> is used rather than <math>a2</math>.</p> <ul style="list-style-type: none"> <li>Division is written as a fraction</li> </ul>	<p><b>Common misconceptions:</b></p> <ul style="list-style-type: none"> <li>Some pupils may think that it is always true that <math>a=1</math>, <math>b=2</math>, <math>c=3</math>, etc.</li> <li>A common misconception is to believe that <math>a^2 = a \times 2 = a2</math> or <math>2a</math> (which it can do on rare occasions but is not the case in general)</li> </ul>



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|  | <ul style="list-style-type: none"><li>• Algebra allows students to be able to communicate efficiently and to solve problems in Science (especially Physics)</li><li>• Correct use of specialised mathematical terms and phrases is crucial.</li></ul> | <ul style="list-style-type: none"><li>• When working with an expression such as <math>5a</math>, some pupils may think that if <math>a=2</math>, then <math>5a = 52</math>.</li><li>• Some pupils may think that <math>3(g+4) = 3g+4</math></li><li>• The convention of not writing a coefficient of 1 (i.e. '<math>1x</math>' is written as '<math>x</math>') may cause some confusion. In particular some pupils may think</li><li>• When describing a number sequence some students may not appreciate the fact that the starting number is required as well as a term-to-term rule</li><li>• Some pupils may think that all sequences are ascending</li><li>• Some pupils may think the <math>(2n)^{\text{th}}</math> term of a sequence is double the <math>n^{\text{th}}</math> term of a (linear) sequence</li><li>• Some pupils may think that equations always need to be presented in the form <math>ax + b = c</math> rather than <math>c = ax + b</math>.</li><li>• Some pupils may think that the solution to an equation is always positive and/or a whole number.</li><li>• Some pupils may get the use the inverse operations in the wrong order, for example, to solve <math>2x + 18 = 38</math> the pupils divide by 2 first and then subtract 18.</li></ul> |
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## **Assessment timeline:**

- Topic test assessments (BAM tests) are conducted at the end of each topic. These are roughly after 2 weeks per topic, but this may vary.
  - Pre-checks are conducted at the start of the topic to test student prior knowledge. This informs lesson planning and delivery.
  - Tracking assessments are conducted once a term with end of year formal exams, for reporting and checking cumulative knowledge.
  - Testing data leads to discussions about setting, intervention groups and individual in-class intervention.
  - All students have access to a wide range of resources to develop their understanding.

## Home learning

- Homework is set weekly for each group. This will often be via interactive websites with immediate feedback and support.
  - Teachers have the autonomy to use whichever resource they wish within the criteria set for the topic.
  - Students have access to lots of resources at home, including: Kerboodle, MyMaths, Mathswatch, PiXL Maths APP, PiXL Times Table App.

## Feedback

- Feedback is given after each topic test, tracking assessment and end of year exams. After tracking and end of year exams, this will include “Formative Marking” sheets which give feedback question by question to help support the students with priorities for further work.

## Length of unit (duration indicated in lessons)

**Unit:**