

## KS3 STAGE 6, ALGEBRA, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:
<p><b><u>Algebraic proficiency: using formulae</u></b></p> <p><b><u>Key Skills:</u></b></p> <ul style="list-style-type: none"> <li>• Know the order of operations</li> <li>• <b><u>Know the fact that area of rectangle = length x width</u></b></li> </ul> <p><b><u>Pattern spotting</u></b></p> <p><b><u>Key Skills:</u></b></p> <ul style="list-style-type: none"> <li>• Count forwards and backwards in tens (hundreds, thousands) from any positive number up to 10 000 (100 000, 1 000 000)</li> <li>• <b><u>Count forwards and backwards through zero</u></b></li> </ul> <p><b><u>Solving equations and inequalities</u></b></p> <p><b><u>Key Skills:</u></b></p> <ul style="list-style-type: none"> <li>• <b><u>Use symbols to represent variables in a formula</u></b></li> </ul>	<p><b><u>Algebraic proficiency: using formulae</u></b></p> <p><b><u>Formulae</u></b></p> <p>You will use and create simple formulae written in words and work with formulae written algebraically</p> <ul style="list-style-type: none"> <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>• <b><u>Convert between miles and kilometres</u></b></li> </ul> <p><b><u>Pattern spotting</u></b></p> <p><b><u>Sequences</u></b></p> <p>You will explore number sequences</p> <ul style="list-style-type: none"> <li>• Recognise and describe a linear sequence</li> <li>• Find the next terms in a linear sequence</li> <li>• Find a missing term in a linear sequence</li> <li>• <b><u>Generate a linear sequence from its description</u></b></li> </ul>	<p>• Formula, Formulae, Expression, Variable, Substitute, Symbol,, Pattern, Sequence, Linear, Term, Ascending, Descending, Algebra, Algebraic, Algebraically, Symbol, Expression, Constant, Substitute, Equation, Unknown, Enumerate.</p> <p><i>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.</i></p>

	<p><b>Solving equations and inequalities</b></p> <p><b>Missing number problems</b></p> <p>You will learn to solve missing number problems and understand and use algebra</p> <ul style="list-style-type: none"> <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>	
<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>• Look at this formula. Write down a fact that it tells you. And another. And another ...</li> <li>• Jenny and Kenny are using the formula 'Cost in pounds = 40 + 20 × number of hours' to work out the cost for three hours. Jenny writes down £180. Kenny writes down £100. Who do you agree with? Why?</li> <li>• Always / Sometimes / Never: The formula <math>T = 4n + 6</math> results in an odd number.</li> <li>• Show me a (ascending/descending) linear sequence. And another. And another.</li> </ul>	<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>	<ul style="list-style-type: none"> <li>• Students will be able to solve problems, design, develop technology, program computers, worksheets, work in Sciences (esp. Physics), develop efficient working practices, analyse, understand rates of change, etc.</li> </ul>

- Kenny thinks that 2, 4, 8, 16, ... is a linear example. Do you agree? Explain your answer.
- Create a linear sequence with a 3<sup>rd</sup> term of '8'.
- Show me a linear sequence where the rule to get from one term to the next is 'add 3'. And another. And another.
- Use symbols to represent variables in a formula
- $a + b = 15$ . Show me a pair of values for a and b. And another. And another.
- $p + q = 7$ . Show me a pair of values for p and q that no one else will think of. And another. And another.
- Kenny thinks that ' $b^2$ ' is the same as '2b' because when  $b = 2$ ,  $b^2 = 4$  and  $2b = 4$ . Do you agree with Kenny? Explain your answer.
- Jenny thinks that  $7 + 2a = 9a$ . Do you agree with Jenny? Explain your answer.

### Historical, Social, Moral, Spiritual, Cultural context:

- 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.

### Cross curricular links/ literacy/numeracy:

The lower case and upper case of a letter should not be used interchangeably when worked with algebra  
 Juxtaposition is used in place of '×'.  $2a$  is used rather than  $a2$ .

- Division is written as a fraction

### Common misconceptions:

- Some pupils may apply the order of operations incorrectly when working with two step formulae
- Units must be consistent when using formulae. For example, a mobile phone plan might charge £15 per month plus

<ul style="list-style-type: none"> <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>Equations allow us to explain situations where we do not have all the information.</li> <li>When a situation is described as an equation we can solve by finding the missing numbers.</li> <li></li> </ul>	<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>	<p>5p for every text. The formula 'Monthly cost = <math>15 + 5 \times</math> number of texts' is wrong because amounts in both pounds and pence are involved. Monthly cost (in pence) = <math>1500 + 5 \times</math> number of texts is one correct way of writing the formula.</p> <ul style="list-style-type: none"> <li>It is not advisable to abbreviate the formula 'kilometres = miles <math>\times 1.6</math>' using letters. 'm' is the normal abbreviation for metres and 'k' can represent £1000. If 'km' is used it could even be interpreted as '<math>k \times m</math>'.</li> <li>Some pupils may think linear sequences are only ascending.</li> <li>Some pupils may think that any sequence that can be described by a rule to get from one term to the next is a linear sequence, e.g. 2, 4, 8, 16, ...</li> <li>Some pupils may not appreciate that both a starting number and a rule to find the next term are required in order to describe a sequence in full.</li> <li>Some pupils may think that variables have a set value, such as <math>a = 1</math>, <math>b = 2</math>, <math>c = 3</math>, <math>d = 4</math>, etc. (especially if they have done lots of poorly designed treasure hunts/codes) – this will lead to problems such as thinking '<math>b^2</math>' is the same as '<math>2b</math>' because when <math>b = 2</math>, <math>b^2 = 4</math> and <math>2b = 4</math>.</li> </ul>
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<b>Assessment timeline:</b>		
<ul style="list-style-type: none"> <li>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.</li> <li>Pre-checks are conducted at the start of the topic to test student prior knowledge. This informs lesson planning and delivery.</li> <li>Tracking assessments are conducted once a term with end of year formal exams, for reporting and checking cumulative knowledge.</li> <li>Testing data leads to discussions about setting, intervention groups and individual in-class intervention.</li> <li>All students have access to a wide range of resources to develop their understanding.</li> </ul>		
<b>Home learning</b>		
<ul style="list-style-type: none"> <li>Homework is set weekly for each group. This will often be via interactive websites with immediate feedback and support.</li> <li>Teachers have the autonomy to use whichever resource they wish within the criteria set for the topic.</li> <li>Students have access to lots of resources at home, including: Kerboodle, MyMaths, Mathswatch, PiXL Maths APP, PiXL Times Table App.</li> </ul>		
<b>Feedback</b>		
<ul style="list-style-type: none"> <li>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.</li> </ul>		

### Length of unit (duration indicated in lessons)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
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**Unit:**