

Development and progression in mathematics: algebraic thinking

EARLY	FIRST	SECOND	THIRD	FOURTH
LEARNERS CONTINUALLY DEVELOP, REINFORCE AND EXTEND THEIR UNDERSTANDING OF ALGEBRAIC THINKING THROUGH:				
<p>recognising, discussing, duplicating, extending and creating simple numeric and non-numeric patterns</p> <p>recognising and talking about simple rules in context e.g. getting bigger by 1</p> <p>understanding that symbols can be used to represent quantities</p> <p>beginning to work with the concept of 'equality' in quantities, and to recognise and use the equals sign (=)</p>	<p>extending, creating and explaining the rules for repeating patterns and simple number sequences</p> <p>beginning to understand the concept that the 'value of a symbol' can vary depending on the context</p> <p>understanding commutative and associative properties and using them to simplify calculations, for example: $3 + 5 = 5 + 3$ (commutative) $5 + 3 + 7 = (5 + 3) + 7 = 5 + (3 + 7)$ (associative)</p> <p>understanding and using the facts that add and subtract, and multiply and divide are inverse processes</p> <p>working with number sentences, where a number is replaced by a symbol, for example: $3 + ? = 7$ $9 - \square = 3$</p> <p>beginning to understand the concept that the 'equals' sign signifies balance in a number sentence</p> <p>further developing their understanding of symbols through the use of 'not equal to', 'less than' and 'greater than'</p>	<p>understanding number patterns involving the four operations (add, subtract, multiply and divide)</p> <p>understanding and using 'function machines' and the associated relationship between input and output values</p> <p>investigating number patterns; explaining in words rules that generate number patterns and beginning to understand that these rules can be represented by letters, symbols and graphs</p> <p>understanding and applying the concept of 'variables', where letters and symbols represent numbers, in appropriate contexts e.g. in science and technologies</p> <p>understanding and using distributive properties, for example: $2 \times 27 = (2 \times 20) + (2 \times 7)$ $72 \div 3 = (60 \div 3) + (12 \div 3)$</p> <p>extending their understanding of 'balance' by adding, subtracting, multiplying or dividing similarly on both sides in a number sentence or equation</p> <p>substituting values into formulae</p> <p>forming and solving simple expressions, equations and inequalities</p>	<p>understanding and explaining number patterns involving the four operations (add, subtract, multiply and divide)</p> <p>understanding and using the concept of 'collecting like terms' to simplify expressions</p> <p>using substitution to evaluate algebraic expressions and formulae, and understanding and applying them across a range of curriculum areas</p> <p>solving equations, and substituting back to test solutions (answers)</p> <p>understanding that the order of combining functions is important e.g. double then add 1 is different from add 1 then double</p> <p>beginning to understand that the order of combining functions is similarly important when identifying inverse function e.g. the inverse of 'double then add 1' is 'subtract 1 then half'</p> <p>forming formulae and equations from oral, written or graphical information</p> <p>generating values from given rules and expressing this in algebraic notation</p> <p>understanding and working with the concept that graphs are pictorial representations of number relationships</p>	<p>using relationships expressed in algebraic notation to form pairs of numbers and representing them graphically</p> <p>understanding the link between the gradient of a straight line (including horizontal and vertical lines) and the formula that generates the points on that line</p> <p>understanding and using the distributive law in practical contexts</p> <p>understanding and applying the concept of 'taking out a common factor' when solving equations</p> <p>forming and solving a range of equations and inequalities</p> <p>translating series of related diagrams or scenarios into number sequences and determining algebraic formulae that can represent the sequences of numbers</p>