

Patterns, rules and relationships

Children should be given opportunities to demonstrate how the knowledge and skills gained in this strand can be used to link, reinforce and progress learning across the other four interconnected strands.

	a The learner	b The learner	c The learner	d The learner	e The learner	f The learner	g The learner	h The learner	i The learner	j The learner	k The learner	
Elements	Patterns, rules and relationships											
Understanding and Connecting	<p>Attends to and responds to repeated sounds, actions and movements denoting patterns.</p> <p>Engages with a variety of number rhymes, games and role play situations involving number patterns and sequences.</p>	<p>Participates in situations involving sequenced sounds, actions and movements.</p> <p>Discovers patterns in the environment.</p> <p>Recites number word sequences forwards and backwards to 10.</p> <p>Investigates quantitative equivalence and non-equivalence. (For example: the same amount, the same as, as many as, more than, less than).</p> <p>Copies and extends repeated musical (song or instruments) and verbal patterns.</p>	<p>Identifies a unit of repeat within a repeating pattern.</p> <p>Recognises simple shape, numerical, musical and verbal patterns.</p> <p>Recognises and sequences numbers to at least 10.</p> <p>Explores patterns in number sequences.</p> <p>Copies and extends repeated shape, numerical and verbal patterns.</p>	<p>Counts forwards and backwards within 20, and beyond.</p> <p>Notices patterns between number bonds to 10.</p> <p>Copies and extends repeated shape and numerical patterns of increasing complexity.</p> <p>Quantifies the jumps between units in simple growing and shrinking numerical patterns.</p> <p>Begins to explore the zero property (adding zero to or subtracting zero from a number it does not change the number).</p>	<p>Explores patterns and numerical relationships in addition and subtraction facts up to at least 10.</p> <p>Recognises odd and even number patterns in a hundred square.</p> <p>Begins to explore the commutative property (swapping the order of the numbers being added and still getting the same total) of addition.</p>	<p>Explores and records a broad range of patterns in a hundred square.</p> <p>Explores patterns and numerical relationships in addition and subtraction facts up to at least 20.</p>	<p>Explores and recognises multiplication as repeated addition.</p> <p>Explores the zero property and commutative property of multiplication.</p> <p>Explores and investigates the associative property (the way in which numbers are grouped in an addition or multiplication sentence does not change the sum or product) and its application to addition and multiplication.</p> <p>Adopts a systematic approach in the identification of multiples of numbers.</p>	<p>Explores and recognises multiplication as repeated addition.</p> <p>Explores the zero property and commutative property of multiplication.</p> <p>Explores and investigates the associative property (the way in which numbers are grouped in an addition or multiplication sentence does not change the sum or product) and its application to addition and multiplication.</p> <p>Adopts a systematic approach in the identification of factors of numbers.</p> <p>Explores rules about inverses.</p>	<p>Building upon their understanding of multiplication as repeated addition, students recognise the need to multiply in situations involving arrays, area, and scaling up (For example: ten times bigger).</p> <p>Explores and investigates the distributive property of multiplication (multiply a sum, by multiplying each component separately and adding the products).</p> <p>Adopts a systematic approach in the identification of factors of numbers.</p> <p>Explores rules about inverses.</p>	<p>Identifies triangular, square and rectangular numbers: triangular numbers are representable by dots arranged in rows that form an equilateral /right-angled triangle; square numbers are representable by dots arranged in rows and columns that form a square; and rectangular numbers are representable by dots arranged in rows and columns that form a rectangle.</p> <p>Explores rules about brackets and priority of operations (For example: BMDAS stands for brackets, indices, multiplication, division, addition and subtraction).</p> <p>Identifies positive and negative numbers in context.</p>	<p>Identifies, explores and reaches mathematical conclusions about square roots.</p> <p>Makes connections between different representations of algebraic relationships. (For example: Between expressions, tables, graphs and shape patterns).</p> <p>Adds and subtracts positive and negative numbers on a number line.</p> <p>Writes whole numbers in exponential form.</p>	<p>Multiplies positive and negative numbers and looks for patterns.</p> <p>Explores how one and two-dimensional graphs describe the relationships depicted in an equation.</p>

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Communicating	<p>Responds to a range of stimuli to indicate awareness of repeated patterns.</p>	<p>Participates in number rhymes, games and role-play situations involving number patterns and sequences.</p> <p>Listens to and retells stories involving number patterns and sequences.</p> <p>Identifies and conveys understanding of number patterns and sequences in pictures and stories.</p> <p>Distinguishes between structured sequences (repeating or growing) and sequences or collections that include random elements, and are therefore not 'patterns'.</p>	<p>Uses appropriate language to talk about patterns in school, home and the wider environment involving objects, colours, shapes and numbers.</p> <p>Describes observable changes in quantitative terms.</p> <p>Describes similarities and differences between sets in terms of quantity.</p>	<p>Describes simple growing and shrinking patterns.</p> <p>Describes repeating patterns as repetitions of a unit.</p> <p>Explains and argues the zero property of addition, i.e. when you add zero to a number it does not change the number.</p> <p>Draws illustrations and uses concrete manipulatives to explore the structure of patterns.</p> <p>Describes and predicts future events (For example: Days of the week, months of the year).</p>	<p>Describes the structure of growing and shrinking pattern.</p> <p>Explains and argues the commutative property of addition facts (swapping the order of the numbers being added and still getting the same total).</p> <p>Records the quantitative information provided in a story or problem in pictorial or graphical form.</p>	<p>Describes quantitative change in growing and shrinking patterns.</p> <p>Describes a rule for a pattern that refers to a relationship between each term and its position. (For example: the second figure has 1 square and 2 triangles, so the fifth has 5 squares and 10 triangles).</p> <p>Recognises and describes patterns that emerge in the addition and subtraction of odd/even numbers.</p> <p>Represents patterns using manipulatives, illustrations and diagrams.</p>	<p>Explores the different representations of patterns (For example: within tables or fractions).</p>	<p>Illustrates the properties of operations – zero, commutative, associative, distributive.</p> <p>Represents and records structures and rules of patterns, in a variety of ways, including verbal, symbolic and diagrammatic.</p>	<p>Uses tables and symbols to represent triangular, square and rectangular numbers.</p> <p>Represents and records rules of patterns, in a variety of ways, including verbal, symbolic, diagrammatic and graphical.</p> <p>Expresses directed numbers in real life situations (For example: with temperature or money).</p> <p>Expresses a number as a product of factors.</p>	<p>Describes and represents, using a variety of tools, situations with constant or varying rates of change.</p> <p>Uses representations of patterns to find solutions to problems and to determine values for unknown or future events.</p>	<p>Uses notations for indices.</p> <p>Represents relationships between quantities in symbolic, graphical and diagrammatic ways. Selects the most appropriate representation and translates between representations.</p>

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Reasoning	<p>Seeks and explores a range of activities involving patterns, sequences and early identification of number relationships.</p> <p>Observes what comes next in familiar pattern and sequence activities.</p>	<p>Explores relationship between adding or taking one more to/from a set and the next number in the counting sequence.</p> <p>Explores the numbers that come before or after in a sequence.</p> <p>Makes predictions about what comes before/next in a sequence of objects, sounds or movements?</p> <p>Describes repeating patterns of at least two objects.</p>	<p>Recognises patterns and predict subsequent consecutive terms in a sequence.</p>	<p>Justifies with proof(s) the zero property (adding zero to or subtracting zero from a number it does not change the number) and generalises for all numbers.</p>	<p>Compares alternative perspectives on patterns.</p> <p>Demonstrates the commutative property of addition with proof(s) (For example: drawing a diagram or using concrete materials).</p> <p>Describes or shows why a rule describes a pattern.</p>	<p>Establishes the relationship between numbers and their position in a hundred square.</p> <p>Applies the rules that govern growing and shrinking patterns to extend to next terms, and to predict future values.</p> <p>Building on examples of numbers below 100, generalises number rules (For example: even numbers end in 0, 2, 4, 6, or 8 no matter how big the number is).</p>	<p>Generates expressions (expressions can be verbal or symbolic) for a variety of patterns, structures and rules and uses to make predictions about future terms.</p> <p>Demonstrates the associative property with proof(s). (For example: with a diagram or verbal justification).</p> <p>Represents a variety of patterns, in a variety of modes, such as verbal, pictorial, diagrammatic, and symbolic.</p>	<p>Generates word and symbolic expressions for the structure of patterns, in number, shape, and real-world situations.</p> <p>Justifies the structure and rules that describe patterns, comparing perspectives with others.</p> <p>Explains the distributive property and demonstrates how it works.</p>	<p>Justifies with proof(s) the order of calculations according to the BIMDAS rule.</p> <p>Extends and generalises patterns within the sequences of triangular and square numbers.</p>	<p>Recognises and extends regular patterns that include negative numbers.</p> <p>Uses verbal, symbolic, graphical or diagrammatical representations of relationships between quantities to predict future values and to solve for specific events.</p>	<p>Interprets and analyses algebraic relationships on graphs.</p> <p>Investigates the exponential potential of numbers, within real-world contexts.</p>
Applying and Problem-Solving	<p>Explores the possibilities of pattern and sequence through play.</p> <p>Responds to and/or anticipates a range of familiar patterns, structures and rules in everyday routines and daily sequences.</p>	<p>Correctly sequences pictures of familiar events or steps in everyday routines.</p> <p>Creates a repeating pattern beginning with at least two objects or images.</p>	<p>Copies and extends increasingly complex patterns using a range of manipulatives and/or pictures/symbols.</p> <p>Applies understanding of a routine to predict what will happen next, in stories, poems and everyday activities.</p>	<p>Creates repeating and growing patterns through construction or drawing.</p>	<p>Represents situations that involve the addition and subtraction of whole numbers, using objects, pictures and symbols.</p>	<p>Draws from patterns and properties to determine unknown number facts from core facts (For example: doubles, multiples of 10).</p> <p>Investigates and applies a function to a sequence of numbers (For example: add 2).</p>	<p>Applies the structure or identified rule of a pattern to determine further values.</p> <p>Models and solves rich problems using various representations such as graphs, tables and equations.</p>	<p>Solves problems involving proportional relationships.</p> <p>Represents situations using diagrams, graphs, tables and expressions to draw conclusions.</p>	<p>Draws on the commutative, associative, and distributive properties of multiplication to factorise numbers and identify products of factors.</p>	<p>Identifies a missing exponent or base.</p> <p>Applies knowledge of factors to solve problems involving multiplication and division.</p>	<p>Uses knowledge of square numbers to solve problems efficiently.</p> <p>Discovers, justifies and applies rules for indices.</p>