

## Patterns, rules and relationships

	Stage 1 (Junior & Senior Infants)	Stage 2 (1st & 2nd Class)	Stage 3 (3rd & 4th Class)	Stage 4 (5th & 6th Class)
<i>Through appropriately playful and engaging learning experiences, children should be able to</i>				
<b>Learning Outcomes</b>	explore, extend and create patterns and sequences.	identify and express relationships in patterns, including growing or shrinking shape patterns and number sequences.	identify rules that describe the structure of a pattern and use these rules to make predictions.  represent the relationships between quantities.	identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.  represent mathematical structures in multiple ways, including verbal expressions, diagrams and symbolic representations.
<b>Mathematical concepts</b>	A pattern is an arrangement of elements organised according to a defined structure or rule.	Quantitative change in growing and shrinking patterns is consistent and predictable.	Representations can be used to show and explore the relationships between quantities.	The structure of a pattern, or the property of operations, can be described succinctly by a mathematical expression, for example, the commutative property: $a+b=b+a$ .
	A sequence is a list of objects or actions that follow an order.	We can describe the structure of a growing or shrinking pattern, in word or number sentences, and use our description to predict future terms.	Representing scenarios, including patterns, in words, number sentences, diagrams and graphs can be useful to solve problems or to determine values for unknown or future events.	Describing a real-life situation using words or symbols can be useful to solve problems or to determine values for unknown or future events.
	There are patterns and sequences to everyday routines and events, from which predictions can be made.	When exploring the structure of growing or shrinking patterns, it is useful to determine what is changing and what is staying the same.	A geometric sequence of numbers is based upon multiplication or division. Each consecutive number is found by multiplying the preceding number by a common multiplier.	An integer is a whole number that can be positive, negative, or zero.
	Repeating patterns are made up of units of repeat and do not contain random elements.	The commutative property of addition means we can swap the order of the numbers being added and still get the same total.	The associative property states that when three or more numbers are added or multiplied, the sum or product remains the same regardless of how the numbers are grouped.	Whole numbers can be expressed in standard form, exponential form or be written as a product of factors.
	The zero property of addition and subtraction means that when you add zero to or subtract zero from a number it does not change the number.	Properties of operations (e.g., zero, commutative) and patterns in numbers can be used to determine number facts we don't know from number facts we do know. Examples include doubles & near-doubles, inverses, adding 10, odd and even numbers.	The distributive property means that complex multiplication and division equations can be simplified by breaking one (in the case of the dividend) or both numbers down into smaller parts.	A square number is what we get after multiplying an integer by itself. The square root of a number identifies what must be squared to get the number.
		Number patterns tell the story of relationships between quantities. The relationship between elements of a pattern can be expressed using word or number sentences.		