NCCA

An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

Primary Mathematics Curriculum

Draft overview of the Primary Mathematics Toolkit

March 2022

Contents

1. Introduction

The Primary Mathematics Toolkit supports the use of Learning Outcomes by providing practical support for teachers in building rich mathematical learning experiences for children.

The four components of the toolkit are described in the following section

1. Mathematical Concepts
2. Progression Continua
3. Examples of Children's Language Learning
4. Support Materials for teachers.

2. Mathematical Concepts

Mathematical Concepts are considered essential ideas that underpin each Learning Outcome. These essential ideas may provide useful entry and reference points in relation to planning, teaching and assessment, and may serve to remind teachers of key mathematical knowledge at each stage. The decision as to where the Mathematical Concepts will be situated will be addressed as development proceeds. Wherever the concepts are placed, they will be presented under each Learning Outcome according to each stage of the Learning Outcome Label to make sure that the relationships are clear. In order to achieve the Learning Outcome, children should develop their understanding of the underpinning mathematical concepts through engaging with a wide variety of mathematical processes. The Progression Continua provides a comprehensive outline of suggested learning experiences to support children in their learning and development through a wide variety of mathematical processes.

Table 1: Overview of Mathematical Concepts

Overview of Mathematical Concepts in the Primary Mathematics Curriculum		
Strand	**Learning Outcome Label**	**Pages**
Algebra	1. Patterns, rules and relationships	19
	2. Expressions and equations	19
Data and Chance	3. Data	20
	4. Chance	20
Measures	5. Measuring	21
	6. Time	21
	7. Money	21
Number	8. Uses of number	22
	9. Numeration and Counting	22
	10. Place Value and Base Ten	22
	11. Sets and Operations	23
	12. Fractions	23
Shape and Space	13. Spatial awareness and location	24
	14. Shape	24
	15. Transformation	24

Patterns, Rules and Relationships

	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to explore, extend and create patterns and sequences.	*Through appropriately engaging learning experiences children should be able* to identify and express relationships in patterns, including numerical and shape patterns.	*Through appropriately engaging learning experiences children should be able* to identify the rules that govern patterns to generalise and make predictions. Through appropriately engaging learning experiences children should be able to represent the relationships between quantities.	*Through appropriately engaging learning experiences children should be able to* identify, explain and apply generalisations, including properties of operations, mathematical models and patterns. *Through appropriately engaging learning experiences children should be able* to represent mathematical structures in multiple ways, including verbal expressions, diagrams, and symbolic representations.
Mathematical concepts	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.	A purpose of representations is to show relationships between quantities.	A mathematical expression expresses the structure of a pattern.
	A sequence is a list of objects or actions that follow an order.	When we identify the structure or rules governing a pattern, we can use this to identify, express, predict and generalise change or variation.	Representing 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.	From exploring the structure of patterns, one can 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.	Number patterns tell the story of relationships between quantities. The relationship between elements of a pattern can be expressed using word or number sentences.	The associative property is a rule that says the way in which numbers are grouped in an addition or multiplication sentence does not change the sum or product.	Whole numbers can be expressed in standard form, factor form and be written as a product of its 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.	Patterns can be used to determine number facts we don't know from number facts we do know.	The distributive property can be used to simplify complex multiplication and division equations 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. A square root can be multiplied by itself to get the original number.
		The commutative property of addition means we can swap the order of the numbers being added and still get the same total.		

Expressions and Equations

	Stage 1 (Junior & Senior Infants)	Stage 2 (1st & 2nd Class)	Stage 3 (3rd & 4th Class)	Stage 4 (5th & 6th Class)
Learning Outcomes		*Through appropriately engaging learning experiences children should be able* to interpret the representative nature of symbols or pictures in number sentences or expressions.	*Through appropriately engaging learning experiences children should be able* to represent and express problems with unknown values in different ways to include the use of appropriate letter-symbols or words.	*Through appropriately engaging learning experiences children should be able* to articulate, represent and solve mathematical situations through the use of expressions and equations that include letter-symbols.
Mathematical concepts		Real-life situations can be expressed using manipulatives, diagrams, and word and number sentences.	When expressing real-life situations, symbols can be used to represent an unknown, a quantity that varies (*variable*), or every number (*the general case*).	'Solving' an equation consists of determining which value(s) for a given symbol make(s) the equation true.
		An equals sign (=) conveys equality, whereas ≠, < and > convey inequality.	Real-life situations and functions can be represented in a variety of forms, including numbers, words, symbols and tables.	When generating an expression to represent a real-life situation, it can be possible and useful to 'simplify' a long or complex expression.
		In number sentences (*equations*), symbols can stand for something we need to find out, or they can express a relationship.	A function is a special relationship where each input has an output. There are always three main parts; the input, the functional relationship and the output.	An expression may contain more than one unknown or variable. Each unknown or variable must be represented by a dedicated symbol.
		In a number sentence, number facts can be applied to help find an unknown value.	Representing the structure of a function using words, symbols, graphs, tables or diagrams is useful to identify outputs for given inputs and vice versa.	A real-life situation can be represented by an expression or a series of expressions.

Data				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to explore, interpret and explain data in a variety of ways for a range of purposes.	*Through appropriately engaging learning experiences children should be able* to pose questions of interest, record and use data as evidence to answer those questions, and communicate the findings.	*Through appropriately engaging learning experiences children should be able* to pose questions of interest and collect, display and critically analyse data in a range of ways for a range of purposes, and communicate the findings.	*Through appropriately engaging learning experiences children should be able* to pose questions, collect, use and record data selectively to answer those questions. *Through appropriately engaging learning experiences children should be able* to critically analyse and evaluate findings and; communicate inferences, conclusions and implications from the findings.
Mathematical concepts	Objects and sets can be sorted according to one or more attribute.	Investigations are cyclical and are motivated by posing a question.	Data displays can hold a vast volume of information which can be reasoned and from which dedications and inferences can be made.	The mean, median and/ or mode are measures of centres which communicate different centres of the data and provide a range of insights.
	A data set is a collection which holds specific attributes or information.	Data investigations involve a process of planning, collection, gathering, representation and analysis of data, and communicating conclusions that answer the question.	Data displays are selected and justified based on their ability to communicate aspects of the data and answer the questions posed. Moving between data displays allows for further comparison and analysis.	Samples can be drawn from a population of data as representative evidence, to make generalisations and determine the degree of confidence or certainty about the generalisation.

Data (Continued)				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Mathematical concepts	Data is all around us and helps us interpret the world.	Data can be qualitative (it describes something) or quantitative (it holds numerical value).	Measures of centre (e.g. the mode, median or mean) are one number summaries of entire distributions.	Reported data can be evaluated in terms of its representativeness, intentionality and reliability.
	Data displays are a useful way of conveying information.	Different types of data require different graphs and different statistical measures.	The range is a measure used to capture variability or spread of the data.	
	Data can be collected and represented in many ways.	Graphs are tools which communicate distribution, centre and variability of data.	Secondary data can be analysed to make observations or inferences and to draw logical conclusions.	
			Informal inference is about moving beyond the data collected (sample) to a wider context (population).	
			Data can be distributed in different ways. Such distributions of data can be compared according to their shape.	

Chance				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes			*Through appropriately engaging learning experiences children should be able* to describe and test predictability and (un)certainty in events.	*Through appropriately engaging learning experiences children should be able* to use probability to make informed decisions and predictions. *Through appropriately engaging learning experiences children should be able* to represent and express probability in different forms.
Mathematical concepts			Events in everyday life involve chance. Some events are more likely to happen than others.	Probability can be represented on a scale between 0 – 1.
			If an event is unlikely to happen, it has a low probability. If something is likely to happen, it has a high probability.	The experimental probability of an event occurring may not always match the theoretical probability.
			Expected or predicted outcomes of an event can differ from actual outcomes.	The probability that a specific outcome will occur can be represented as a fraction, decimal or percentage.
			Investigating chance allows decision-making and predictions about everyday events and occurrences.	A sample space contains all possible outcomes of an experiment.
				Probability can be described in proportional terms and is calculated by dividing the number of ways the identified outcome can happen over the total number of possible outcomes.
				The greater the number of trials brings the actual outcomes closer to the expected outcomes.

Measuring				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to demonstrate an awareness of measuring length, weight (mass), capacity and area and its purpose in comparing the attributes of objects.	*Through appropriately engaging learning experiences children should be able* to compare, approximate and measure length, weight, capacity and area using appropriate instruments and record using appropriate units of measurement.	*Through appropriately engaging learning experiences children should be able* to compare, estimate and measure length, weight, capacity, area and volume using appropriate instruments and record and communicate appropriately. *Through appropriately engaging learning experiences children should be able* to identify the relationship between equivalent units of measurement, and rename measures using equivalent units.	*Through appropriately engaging learning experiences children should be able* to determine and calculate units of measurement in fractional and/or decimal form to solve practical problems. *Through appropriately engaging learning experiences children should be able* to find, interpret and deduce measures experimentally with increasing precision.
Mathematical concepts	Objects have attributes that can be measured such as length, weight, capacity and area.	Common base units of measurement are useful to make and test comparisons.	Metric units help us to interpret, communicate and calculate measurements with increasing accuracy and precision.	Purpose and practicality are important to consider when measuring attributes and selecting units and instruments for measuring.
	The purpose of measuring is to compare.	The size (metric) of the unit affects the number of units needed to measure an object.	Measurements can be made more precise by selecting metric units (multiples or subdivisions of base units e.g., km or cm).	Purposeful descriptions and comparisons often involve the measurement of more than one attribute.
	We can compare and order things by how much of a particular attribute (physical quantity) they have relative to each other.	We can compare, measure and order physical quantities by selecting the appropriate unit and determining how many units the thing has/holds.	The relationships between metric pre-fixes can be understood and applied in a similar way across different units of measurement.	The relationship between equivalent units in the metric system help us to judge attributes, move flexibly between units and do calculations.
	Attributes are compared and ordered using units of measurement.	Measurement instruments (e.g., rulers) are tools for measuring physical quantities or attributes such as length, weight and capacity.	The metric system is based on multiples of ten. Any measurement given in one metric unit (e.g., kilogram) can be converted to and renamed as another metric unit (e.g., gram).	Measurement sense develops as we anchor the meaning of measurement units to measurement benchmarks in the everyday world.

Time				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop a sense of time and its purpose.	*Through appropriately engaging learning experiences children should be able* to understand how time is measured, expressed and represented. *Through appropriately engaging learning experiences children should be able* to explore equivalent expressions of time.	*Through appropriately engaging learning experiences children should be able* to compare, approximate and measure time using appropriate units of measurement. Through appropriately engaging learning experiences children should be able to identify the relationship between different units and representations of time.	*Through appropriately engaging learning experiences children should be able* to solve and pose practical tasks and problems involving the interpretation and calculation of time.
Mathematical concepts	Time is temporal and passes consistently.	Time is measured using universal units; seconds, minutes, hours, days, weeks, months, years and centuries etc. There are distinct relations between these units.	60 is the base of the number system for measurement for hours, minutes and seconds and can be expressed in fractional terms (of 60).	Greenwich Mean Time is used as the standard time against which all the other time zones in the world are referenced.
	Events in daily routines can be described and sequenced. A timetable is a useful display to show when things will happen.	Units of time measure how long something lasts.	Time is expressed in relation to the hour using minutes or fractional intervals.	Speed is measured as distance travelled per unit of time.
	Time can be expressed and recorded in a variety of ways.	The hour and minute hands of the analogue clock move clockwise as time passes.	Time can be represented using 12-hour or 24-hour formats. The 24-hour format shows the number of hours and minutes elapsed since midnight.	
	Each hour has an area or space on the analogue clock.	Time can be represented in both analogue and digital formats.	Timetables and schedules are tools for managing and organising time.	
	Calendars displays day and month and can be used to highlight times of significance.			

Money				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop awareness of money and its purpose.	*Through appropriately engaging learning experiences children should be able* to recognise the value of money and use euro and cent in a range of meaningful contexts.	*Through appropriately engaging learning experiences children should be able* to transfer knowledge of the base ten system in number to monetary contexts, and use for purposes of calculation.	*Through appropriately engaging learning experiences children should be able* to solve and pose practical tasks to investigate and make informed judgements about transactions and financial plans.
Mathematical concepts	Money comes in many forms.	The price of an item or service is determined by its relative value.	Understanding the unit price helps us make judgements about value for money.	Budgets are useful tools for organising, managing and recording money and transactions.
	Money is used in the buying and selling of goods and services.	Set amounts of money can be represented by different combinations of coins and/ or notes.	Calculations of money can be approximated and determined by performing operations.	Currency is the medium of exchange of money (notes and coins) in common use in a nation. The currency exchange rate is determined by the value of the currency and is used to convert the value or quantity of one currency into the relative value or quantity of another.
	Goods or services can be exchanged for a set amount of money.	Monetary transactions can be recorded as number sentences.	Transactions and calculations of money can be recorded in different ways.	Tax is a contribution to state revenue. It can be deducted from income or business profits or added to the cost of goods, services and transactions.
	The units of money used in Ireland are euro (€) and cent (c).	The symbols of € (euro) and c (cent) are used to express and record money.	Money is recorded in decimal form.	Interest describes how much is paid for the use of money.
	Monetary transactions happen in a number of ways.	Various strategies can be used to calculate change in a transaction.	Estimation and rounding can help judge the reasonableness of transactions.	

Uses of Number				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop an awareness that numbers have a variety of uses.			
Mathematical concepts	Numbers can be used in different ways.			
	Numbers are used for labelling and identification purposes (nominality).			
	Numbers denote quantity or the amount within a set (cardinality).			
	Numbers describe the position of something in a list such as 1st, 2nd, 3rd (ordinality).			

Numeration and Counting				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop an awareness that the purpose of counting is to quantify. *Through appropriately playful learning experiences children should be able* to use a range of counting strategies for a range of purposes.	*Through appropriately engaging learning experiences children should be able* to demonstrate proficiency in using and applying different counting strategies.		
Mathematical concepts	Quantities can be subitised and compared without needing to be counted or assigned a numerical value.	Estimation and counting strategies can be applied to determine quantities / calculations.		
	There are five principles of counting; one-one, stable order, cardinal, order irrelevance and abstraction.	The reasonableness of estimations can be tested by counting.		
	The last number in the count indicates the quantity in a set.	There are a range of strategies for counting forwards and backwards.		

Place Value and Base Ten

	Stage 1 (Junior & Senior Infants)	Stage 2 (1st & 2nd Class)	Stage 3 (3rd & 4th Class)	Stage 4 (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop a sense of ten as the foundation for place value and counting.	*Through appropriately engaging learning experiences children should be able* to understand that digits have different values depending on their place or position in a number. *Through appropriately engaging learning experiences children should be able* to use estimation to quickly determine the value and calculation of numbers.	*Through appropriately engaging learning experiences children should be able* to explore equivalent numerical expressions of numbers using the base ten system.	*Through appropriately engaging learning experiences children should be able* to investigate how fractions, decimals and percentages can be compared, ordered and expressed in related terms.
Mathematical concepts	Numbers can be distinguished according to their quantitative value.	The value of a digit in a number depends on its place. The position of a digit denotes a value ten times that of the digit to its right.	The value of a multi-digit number is represented by the value of each of its constituent digits.	Fractions, decimals and percentages are three ways of expressing part-whole relationships.
	The base of our number system is ten.	A new place value unit is formed when ten of the previous place value units are grouped.	The principle of base ten holds for all numbers, including whole numbers and decimals.	Rationale numbers can be expressed as fractions with a denominator that is a power of 10.
	The base-ten number system consists of 10 digits and is based on groups of ten.	The relationship between one quantity and another quantity can be an equality or inequality relation.	A decimal point is a convention that separates whole numbers (left) from parts of a whole number (right).	Multiples of 10 are a useful tool for converting between fractions, decimals and percentages.
	In a 2-digit number, the digit to the left denotes the greater value.	0 can be used as a placeholder, allowing us to record a number accurately.	The base ten place value system extends indefinitely in two directions from “one”.	A percentage is a way of expressing a fraction of one hundred or another way of writing hundredth. Per ‘cent’ meant out of a hundred and uses the % notation.
		Numbers can be rounded or approximated to provide estimations of value.		

Sets and Operations

	Stage 1 (Junior & Senior Infants)	Stage 2 (1st & 2nd Class)	Stage 3 (3rd & 4th Class)	Stage 4 (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to recognise and understand what happens when quantities (sets) are partitioned and combined.	*Through appropriately engaging learning experiences children should be able* to select, make use of and represent a range of addition and subtraction strategies.	*Through appropriately engaging learning experiences children should be able* to understand and apply flexibly the four operations; and the relationships between operations.	*Through appropriately engaging learning experiences children should be able* to build upon, select and make use of a range of operation strategies.
Mathematical concepts	Quantities (or sets) can be partitioned and combined.	Commutative, associative, additive identity and distributive are significant properties of addition.	Commutative, associative, additive identity and distributive properties also apply to the operation of multiplication.	Estimation and rounding are useful to test the reasonableness of answers to more complex operations.
	Adding to a number makes the number (quantity) bigger. Subtracting from a number makes the number (quantity) smaller. This can be represented as a move on the number line or 100 square.	Numbers and symbols are used to construct and express number sentences. These can help to solve problems or are used to express contexts mathematically.	Multiplication is defined as having a certain number of groups of the same size. An early representation of multiplication is repeated addition.	For fractional and decimal computation, the ideas developed for whole-number computation sometimes do not apply.
	A number does not change when adding or subtracting zero from that number.	When combining or partitioning numbers, we sometimes need to exchange tens to units, or hundreds to tens where necessary.	The conventions for performing operations on whole numbers are the same for decimal numbers.	A prime number has exactly two factors – itself and one, a composite number has three or more factors. The number one is neither prime nor composite.
	Addition and subtraction have an inverse relationship.	A number fact is a mental picture of the relationship between a number and the parts that combine to make it.	Division can be described as the splitting of a number into equal parts or groups, or the repeated subtraction of a number.	Factors are numbers that multiply together to give a product.
		Representations of subtraction can include reduction, complement and difference.	Multiplication and division have an inverse relationship.	Multiples are the result of multiplying a number by a whole number.
			Use of a calculator can reduce computative focus allowing for increased focus on strategies.	

Fractions				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop an awareness of part-whole relationships using a variety of models (area, length and set).	*Through appropriately engaging learning experiences children should be able* to recognise and name fractions according to their part-whole relationships. *Through appropriately engaging learning experiences children should be able* to explore the concept of equivalence in terms of simple fractions.	*Through appropriately engaging learning experiences children should be able* to compare, express in equivalent terms, and order fractions. *Through appropriately engaging learning experiences children should be able* to calculate the fraction of quantities and express in multiple ways.	*Through appropriately engaging learning experiences children should be able* to explore (model, compare and convert) the relationships between fractions, decimals and percentages. *Through appropriately engaging learning experiences children should be able* to investigate proportionality and ratios of quantities (sets).
Mathematical concepts	Sets, objects and spaces can be partitioned in different ways.	Each equal share of a set has the same value.	A numerator denotes the number of parts, the denominator denotes the total number of parts in a whole.	Fractions can be more easily added / subtracted when they have a common denominator.
	Fractions are a representation of part-whole relationships.	Numbers may be expressed as numerous equivalent fractions.	A fraction may be considered as a representation of division.	Fractions can be represented in decimal and percentage form.
	Fractions are named according to their number of equal parts or shares.	The greater the number of portions of a whole, the smaller the size of each portion.	Fraction families are helpful to show how fractions are related and / equivalence, and when adding and subtracting fractions.	Ratios can be used to compare two or more whole numbers and have corresponding representations as fractions.
			Fractions can express value greater than one. Improper fractions have numerators that are higher than the denominators.	Multiplying or dividing a fraction by a fractional equivalent of one does not alter its value. This can be useful for exploring equivalence and / or computation involving fractions.

Spatial Awareness and Location				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to develop a sense of spatial awareness in relation to their bodies and immediate environment. *Through appropriately playful learning experiences children should be able* to describe the spatial features of objects and people, and their relative position in space.	*Through appropriately engaging learning experiences children should be able* to use spatial knowledge for the purposes of orientation, way-finding and navigation. *Through appropriately engaging learning experiences children should be able* to visualise and model location using symbolic co-ordinates.	*Through appropriately engaging learning experiences children should be able* to describe and interpret directional instructions. *Through appropriately engaging learning experiences children should be able* to compare and classify angles, recognising them as a property of a shape and as a description of a turn.	*Through appropriately engaging learning experiences children should be able* to describe location on the full co-ordinate plane. *Through appropriately engaging learning experiences children should be able* to investigate and construct angles in different contexts, and solve angle-related problems.
Mathematical concepts	Spatial awareness involves the awareness of oneself in the spatial environment.	Knowledge of one's location in the environment is necessary for successful orientation, way-finding and navigation.	Lines can be classified depending on their orientation and their interaction with one another.	Location can be described using co-ordinates.
	Simple maps and/ or routes can be used to track the movement of objects.	When two straight lines intersect, an angle is formed at the point of intersection.	Angles can be classified according to their size.	The sum of interior angles of a shape is determined by the number of its sides.
	Position can be viewed from various vantage points.	Turns can be described in terms of direction and extent of turn.		Co-ordinates can be plotted on a cartesian co-ordinate plane.
	Language can be used to describe how objects and people fit and move in relation to one another.	The location of objects can be portrayed on a grid system.		

Shape				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to explore and recognise properties of 3-D and 2-D shapes.	*Through appropriately engaging learning experiences children should be able* to examine, categorise and model 3-D and 2-D shapes.	*Through appropriately engaging learning experiences children should be able* to investigate and analyse the properties and calculate dimensions of shapes.	*Through appropriately engaging learning experiences children should be able* to construct models or structures given defined measurements and/ or specific conditions.
Mathematical concepts	3-D and 2-D shapes have different names depending on the properties and distinct features they possess.	3-D and 2-D shapes can be identified, categorised and distinguished by their properties and rules.	Shapes and shape families can be sorted and classified according to multiple properties and rules.	3-D and 2-D shapes can be measured and tested for the constituent properties and rules.
	3-D and 2-D shapes can be sorted and discriminated according to their shape attributes.	Shape families contain shapes that have common properties or features.	A net is a representation of a 3-D shape which can be folded or assembled to re-create the 3-D shape.	Given some information about lines and angles, measurements can be deduced and used for construction.
	2-D shapes are faces or flat representations of 3-D objects.	Shape families have a range of shapes within them.	Properties, rules and measurements of a shape can be investigated by construction, deconstruction and dissection.	To construct models or structures using geometric shapes certain rules must be followed.
	Models and structures are made up of different shapes.	A polygon is any 2-D shape with straight sides. The name tells you how many sides the shape has. To be a regular polygon all the sides and angles must be the same.	Prisms and pyramids gain their names from their polygon bases.	

Transformation				
	Stage 1 (Junior & Senior Infants)	**Stage 2** (1st & 2nd Class)	**Stage 3** (3rd & 4th Class)	**Stage 4** (5th & 6th Class)
Learning Outcomes	*Through appropriately playful learning experiences children should be able* to explore the effects of shape movements.	*Through appropriately engaging learning experiences children should be able* to understand that shapes and lines can be reflected, rotated, dilated and translated.	*Through appropriately engaging learning experiences children should be able* to model and explain the effects of transformations on shapes and lines.	*Through appropriately engaging learning experiences children should be able* to perform and devise a range of steps involving transformations.
Mathematical concepts	A shapes position, orientation or size can be changed without changing the kind of shape it is.	A shape or line is reflected when it is the same perpendicular distance from the mirror line.	Certain shapes and combinations of shapes can tesselate.	Transformations involve a number of steps that can be recorded, tested and performed.
	Shapes can be combined to make structures.	A shape or line is rotated when it is turned around a point called the centre of rotation.	Co-ordinates are numbers that determine the position of a point or a shape in a particular space (on a map or graph).	When shapes are transformed their co-ordinates can be predicted and deduced.
		A shape or line is dilated when its size changes (gets larger or smaller), but its position remains the same.	Cartesian co-ordinates are pairs of numbers, the first of which indicates the point on the x-axis and the second on the y-axis.	
		A shape or line is translated when it is moved a certain distance from its original position (without turning).	When shapes are transformed on a plane their co-ordinates change (and can form patterns).	

3. Progression Continua

Classrooms are complex and children come to class with different experiences and learn in diverse ways. They also learn and develop at different rates. Meeting the learning needs of all children within a classroom means the provision of differentiated learning experiences. The Progression Continua provides guidance for the provision of such differentiation by suggesting a wide range of learning experiences that children may engage with.

While the Progression Continua suggest a typical learning journey in mathematics throughout primary school, teachers should exercise professional judgement when making decisions as to the learning experiences which are most appropriate for the children in their classroom. This recognises that not all children learn in a linear or typical way. Children may move forwards and backwards across the continua for different Strands or Elements of mathematical learning; while others may work within one or across a small number of progression steps for the duration of their primary school years.

While the Progression Continua provide a useful reference for teachers, decisions on the kinds of learning experiences that are most appropriate for one's class should be primarily evidence based. Evidence may indicate the need to reinforce, revisit or extend a particular concept or element, and should support planning as well as holistic assessment of children's learning. In gathering evidence to determine a starting point for children's learning experiences at the beginning of the school year, it may be useful to select one of the learning experiences suggested in the Progression Continua, observe and ask probing questions relating to the learning outcome.

There are fifteen Progression Continua tables, one for each of the Learning Outcome Labels. Each continuum describes a learning journey across eleven Progression Milestones (a-k). Progression Milestones describe learning in terms of mathematical content and processes. In Progression Continua, mathematical processes are categorised as four key Elements – Understanding and Connecting; Communicating; Reasoning; Applying and Problem-Solving.

Table 2: Overview of Progression Continua

Overview of Progression Continua in the Primary Mathematics Curriculum		
Strand	**Learning Outcome Label**	**Pages**
Algebra	1. Patterns, rules and relationships	23-26
	2. Expressions and equations	27-29
Data and Chance	3. Data	30-33
	4. Chance	34-36
Measures	5. Measuring	37-39
	6. Time	40-43
	7. Money	44-45
Number	8. Uses of number	46
	9. Numeration and Counting	47-48
	10. Place Value and Base Ten	49-51
	11. Sets and Operations	52-55
	12. Fractions	56-58
Shape and Space	13. Spatial awareness and location	59-61
	14. Shape	62-63
	15. Transformation	64-65

Algebra 1 – 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	Attends to and responds to repeated sounds, actions and movements denoting patterns. Engages with a variety of number rhymes, games and role play situations involving number patterns and sequences.	Participates in situations involving sequenced sounds, actions and movements. Discovers patterns in the environment. Recites number word sequences forwards and backwards to 10. Investigates quantitative equivalence and non-equivalence: the same amount, the same as, as many as, more than, less than. Copies and extends repeated musical and verbal patterns.	Identifies a unit of repeat within a repeating pattern. Recognises simple shape, numerical, musical and verbal patterns. Recognises and sequences numbers to at least 10. Explores patterns in number sequences, noticing one more object being added each time. Begins to explore the zero property (when you add zero to or subtract zero from a number it does not change the number). Copies and extends repeated shape, numerical musical and verbal patterns.	Counts forwards and backwards within 20, and beyond. Notices patterns between number bonds to 10. Copies and extends repeated shape and numerical patterns of increasing complexity. Quantifies the jumps between units in growing and shrinking numerical patterns.	Explores patterns and numerical relationships in addition and subtraction facts up to at least 10. Recognises odd and even number patterns in a hundred square. Identifies the significance of the position in a pattern. Begins to explore the commutative property (we can swap the order of the numbers being added and still get the same total) of addition.	Explores and records a broad range of patterns in a hundred square. Explores patterns and numerical relationships in addition and subtraction facts up to at least 20.	Explores and recognises multiplication as repeated addition. Links the zero property and commutative property to multiplication. 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.	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). Explores and investigates the distributive property (multiply a sum, by multiplying each component separately and adding the products) of multiplication. Adopts a systematic approach in the identification of factors of numbers.	Identifies triangular (triangular numbers are representable by dots arranged in rows that form an equilateral / right-angled triangle), square (square numbers are representable by dots arranged in rows and columns that form a square) and rectangular numbers (rectangular numbers are representable by dots arranged in rows and columns that form a rectangle). Explores rules about brackets and priority of operations (BOMDAS stands for: brackets, of, multiplication, division, addition and subtraction). Identifies positive and negative numbers in context.	Identifies, explores and reaches mathematical conclusions about square roots. Makes connections between different representations of algebraic relationships. Adds and subtracts positive and negative numbers on a number line. Writes whole numbers in exponential form. Applies knowledge of factors to solve problems involving multiplication and division.	Explores how one and two-dimensional graphs describe the relationships depicted in an equation. Multiplies positive and negative numbers and looks for patterns.

	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**										
Communicating	Responds to a range of stimuli to indicate awareness of repeated patterns.	Participates in number rhymes, games and role-play situations involving number patterns and sequences. Listens to and retells stories involving number patterns and sequences. Identifies and conveys understanding of number patterns and sequences in pictures and stories.	Uses appropriate language to talk about patterns in school, home and the wider environment involving objects, colours, shapes and numbers. Describes observable changes in quantitative terms. Describes similarities and differences between sets in terms of quantity.	Describes simple growing and shrinking patterns. Describes repeating patterns as repetitions of a unit. Explains and argues the zero property (when you add zero to a number it does not change the number) of addition facts. Draws illustrations and uses concrete manipulatives to explore the structure of patterns. Describes and predicts future events.	Describes the structure and explains the rules that govern growing and shrinking patterns. Explains and argues the commutative property(we can swap the order of the numbers being added and still get the same total) of addition facts. Establishes the quantitative information provided in a story or problem and represents this in pictorial or graphical form.	Describes quantitative change in growing and shrinking patterns. Describes a rule for a pattern that refers to a relationship between each term and its position. Recognises and describes patterns that emerge in the addition and subtraction of odd/even numbers. Represents patterns using manipulatives, illustrations and diagrams.	Explores the different representations of patterns (For example – number and / or shape).	Illustrates different properties of number – commutative, associative, distributive. Represents and records structures and rules of patterns, in a variety of ways, including verbal, symbolic, and diagrammatic.	Uses tables and symbols to represent triangular, square and rectangular numbers. Represents and records structures and rules of patterns, in a variety of ways, including verbal, symbolic, and diagrammatic and graphical. Uses representations of patterns to find solutions to problems and to determines values for unknown or future events. Expresses a number as a product of factors.	Describes and represents, using a variety of tools, situations with constant or varying rates of change.	Uses notations for indices. Represents relationships between quantities in symbolic, graphical and diagrammatic ways. Selects the most appropriate representation. Translates between representations.

	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**										
Reasoning	Seeks and explores a range of activities involving patterns, sequences and early identification of number relationships. Observes what comes next in familiar pattern and sequence activities.	Explores relationship between adding or taking one more to / from a set and the next number in the counting sequence. Explores the numbers that come before or after in a sequence. Makes predictions about what comes before/ next in a sequence of objects, sounds or movements? Describes repeating patterns of at least two objects.	Recognises patterns and predict subsequent consecutive terms in a sequence. Explores the numbers that come between numbers in a sequence.	Justifies with proof(s) the zero property (when you add zero to or subtract zero from a number it does not change the number) and generalises for all numbers.	Compares alternative perspectives on patterns. Justifies the commutative property of addition with proof(s). Present an argument to support the rules identified in patterns or sequences. Generalises number rules to numbers up to at least 100.	Establishes the relationship between numbers and their position in a hundred square. Applies the rules that govern growing and shrinking patterns to extend to next terms, and to predict future values.	Generates expressions (Expressions can be verbal or symbolic) for key patterns, structures and rules from diverse contexts and uses to make predictions and generalisations. Justifies the associative property with proof(s). Represents a variety of patterns, in a variety of modes, such as verbal, pictorial, diagrammatic, and symbolic.	Justifies with proof(s) the distributive property. Justifies the structure and rules that govern patterns, comparing perspectives with others. Generates expressions for the structure of patterns, in number, shape, and real-world situations.	Justifies with proof(s) the order of calculations according to the BOMDAS rule BOMDAS stands for: brackets, of, multiplication, division, addition and subtraction). Extends and generalises patterns within the sequences of triangular and square numbers.	Recognises and extends regular patterns that include negative numbers. Interprets and analyses algebraic relationships on graphs. Interprets multiple representations of relationships between quantities (The relationships between quantities could be verbal, symbolic, graphical or diagrammatical) to predict future values and to solve for specific events.	Investigates the exponential potential of numbers, within real-world contexts.

	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**										
Applying and Problem-Solving	Explores the possibilities of pattern and sequence through play. Responds to and/or anticipates a range of familiar patterns, structures and rules in everyday routines and daily sequences.	Correctly sequences pictures that depict familiar / regular routines. Creates a repeating pattern beginning with at least two objects or images. Demonstrates the sequence of steps in everyday routines.	Copies and extends increasingly complex patterns using a range of manipulatives and /or pictures / symbols. Applies understanding of a routine to predict what will happen next, in stories, poems and everyday activities.	Creates repeating and growing patterns through construction, drawing. Represents daily/fictional routines in illustrations or with manipulatives.	Represents situations that involve the addition and subtraction of whole numbers, using objects, pictures and symbols.	Draws from patterns and properties to derive unknown number facts from core facts, (For example – doubles, multiples of 10). Applies the general rule for the addition and subtraction of odd and even numbers to check the validity of answers achieved for sums and differences. Investigates functions (For example – add 1, 2), identifies patterns emerging and applies to a sequence of numbers.	Applies the structure or identified rule of a pattern to determine further values. Applies the properties of operations to perform computations efficiently.	Solves problems involving proportional relationships. Represents situations using diagrams, graphs, tables and expressions to draw conclusions.	Uses knowledge of square numbers facts to solve problems efficiently. Draws on the commutative, associative, and distributive properties of multiplication to factorise numbers and identify products of factors.	Models and solves rich problems using various representations such as graphs, tables and equations. Identifies a missing exponent or base.	Discovers, justifies and applies rules for indices.

Algebra 2 – Expressions and equations

* 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	**Variables, expressions and equations**										
Understanding and Connecting					Uses symbols for equals to, not equals to, less than and greater than, as relational symbols. Uses number facts and/ or simple computation to find the missing value in a number sentence.	Explores alternative ways of expressing number sentences (For example: c=a+b / a+b=c). Investigates and tests the 'trueness' of number sentences. Breaks pattern into component parts and compares how each term changes as the pattern progresses.	Explores the concept of a variable in the context of simple shape-based or story-based patterns and tables. Explores and describes the relationship between sets of numbers in a growing or shrinking pattern (It might be useful to use examples based upon a real-life situation, numerical or shape-pattern).	Investigates how changes in input affect outputs (This is a good introduction to the role of functions). Substitutes values for variables and explores how change in one variable can impact change in results or outputs in a given context.	Constructs expressions and equations by using letters as unknowns that are variable or constant. Evaluates or finds the value of an unknown in a given equation.	Explores how expressions can be equivalent even when their symbolic forms differ. Identifies common factors and applies them to simplify expressions, (For example: 4x+4=4(x+1)). Evaluates algebraic expressions by substituting natural numbers for unknowns (Unknowns can be either variable or constant).	Identifies multiple versions of expressions, by combining like terms, identifying factors, and applying the commutative, distributive and associative properties where appropriate.

	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	**Variables, expressions and equations**										
Communicating					Translates verbal one-step problems into written addition or subtraction number sentences or expressions [and vice versa].	Uses a symbol or picture to represent an unknown value in a number sentence. Translates verbal problems involving addition and subtraction of increasing complexity into written number sentences or expressions [and vice versa].	Translates verbal problems involving unknown elements into written number sentences or expressions [and vice versa]. Compiles a table of values for elements of a pattern. Uses a table to extend, and describe the pattern, and to predict future values.	Translates word and verbal problems into written multiplication or division number sentences or expressions [and vice versa]. Expresses a function as a pattern and tabulates or graphs to illustrate.	Uses letters to stand for unknown numbers in equations. Draws models that represent problems that involve more than one variable. Uses symbols to express generalisations (For example – for the zero or commutative properties of multiplication).	Generates expressions for contexts. If relevant simplifies expressions by grouping like terms and identifying common factors. Translates word and verbal problems into written equations [and vice versa]. Writes equations with more than one unknown (Unknowns can be either variable or constant), to arrive at a solution to a problem.	Writes equations and model problems to represent mathematical situations or structures of increasing complexity.

	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					**Variables, expressions and equations**						
Reasoning					Selects appropriate operational or relational symbols to make an expression true. Recognises the function of operational symbols [+, -] and relational symbols [=, >, <, ≠] and how this function remains the same in all contexts.	Recognises that symbols can also be used to stand for or represent a variable which can be known or unknown, and which changes depending on the context in which it is used.	Describes rules for the general case underlying functions. Recognises functions in growing or shrinking patterns to make predictions about further outputs/ inputs.	Deduces patterns and rules that emerge from substituting values for variables or from applying functions. Determines the meaning of a variable depending on its context or purpose.	Uses and interprets formulas to answer questions about quantities and their relationships. Uses words, diagrams and tables as appropriate to show the logic of expressions.	Explore and describe how different operations produce different graphs.	Completes a table to explain the structure underpinning a two-variable relationship.
Applying and Problem-Solving					Tells the story of simple number sentences or expressions, verbally or using appropriate models.	Solves a problem to determine an unknown value. Applies addition and subtraction facts to find an unknown value.	Models and solves problems using various representations such as tables, words, diagrams and expressions.	Solves problems by using inverse operational relationships and factorisation. Applies multiplication and division properties to find an unknown value.	Solves for the unknown numbers using properties of the four operations. Solves problems involving the functional relationship between two quantities.	Models and represents problem situations of increasing complexity using graphs, tables and equations. Uses appropriate methods to solve a range of simple equations, within a context.	Solves word problems involving two variable equations. Generates and applies expressions to solve problems. Applies knowledge of notional representations of numbers and operations (For example – fraction notation, exponents) to interpret and solve problems with unknowns.

Data and Chance 3 – Data

* 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	**Data**										
Understanding and Connecting	Develops an awareness of properties of simple data sets.	Explores data displays found in the immediate environment and in other areas of the curriculum. Collects data of personal relevance.	Reads and explains the information conveyed in various categorical and numerical displays.	Explores and formulates possible research topics and questions for data collection relevant to themselves or their surroundings (For example – hair colour, pets).	Explores and recognises different ways of representing and collecting data. Uses simple tallying for recording of data. Recognises that data symbols hold and/ or represent information or numerical value.	Explores and recognises the relationship between different ways of representing same data (Data can be represented in tables, charts and graphs). Recognises and identifies where data symbols represent multiple values.	Uses data as evidence to support ideas, arguments, decisions and conclusions drawn. Identifies the most common outcome as the mode.	Explores and establishes how to best handle data for a given purpose. Identifies and disregards surplus information. Explores the median of a data set. Investigates the range (The range is a measure used to capture variability or spread of the data.) of a data set.	Explores the different ways data can be classified and distinguished including numerical / categorical; primary / secondary. Investigates and calculates the mean (The mean is a measure of centre that takes into account all data values collected) of given quantitative data.	Distinguishes between a census and a sample from a population. Examines and analyses the shape (Shape can be used to describe the different types of graphs. For example – symmetric, skewed or bell shaped) of a data set.	Explores the relationship between a census, a representative sample, sample size, and a population. Explores and interprets data sets where the range includes negative numbers.

	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	**Data**										
Communicating	Explores the different ways properties of data sets are conveyed.	Describes and/or labels the attributes of different objects and sets. Responds to questions and /or problems that relate to the attributes of data sets.	Notice and discuss data in the direct environment Discusses opportunities for collecting data. Uses different organisers when sorting and identifying negations / complements.	Represents and displays data gathered using objects, pictures or simple graphs. Explores and devises questions and statements based on data displays.	Reads, interprets and discusses data displays such as concrete and visual charts (For example – pictograms) and graphs (For example – block graphs).	Represents and displays data using simple tables, graphs and charts, and interprets results and draws conclusions. Designs symbols to represent multiple information or values on a data display.	Designs, uses and interprets different displays to represent data. Uses symbols as part of data displays to convey information or numerical value(s).	Establishes how to best record and represent data for a given purposes, including the use of appropriate scales and legends.	Represents data using various displays (For example – multiple bar charts, line graphs and histograms) to support interpretation and drawing of conclusions. Compares similarities and differences between two related sets of data, using a variety of strategies.	Represents data using an increasing variety of tools (For example – using graph paper, spread-sheets, statistical software). Uses a program to input data and compare the effectivity of different types of graphics that can be generated. Discusses and describes of a data set by referring distribution, mean, mode and median.	Takes account of the shape of data, measures of centre and other relevant calculations to present an analysis of data. Describes their understanding of the whole investigative cycle.

	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						**Data**					
Reasoning	Engages with a range of sorting and/ or classifying activities. Attends to attributes of a data set.	Sorts and classifies objects according to at least one attribute. Justifies classifications.	Sorts and classifies objects and sets according to multiple attributes. Re-sorts data sets according to different attributes and justifies.	Explores the potential for data displays to convey large volumes of information. Explains and makes simple inferences based on data gathered.	Differentiates information as useful or surplus to address questions of interest. Listens to others' interpretations of data investigations and compare with own interpretations.	Critically analyses the nature and objectivity of simple data sets. Checks and evaluates the accuracy and reasonableness of own methods of data collection and representations. Refines own methods.	Confirms or refutes whether the statements made by others about data displays are consistent with the display and/ or evidence. Uses data displays to generate new hypotheses and questions for investigation. Recognises proportionality and how the distribution of data is organised in a display.	Justifies why a set of data is collected and represented in the way chosen. Generates scales appropriate to the proportion, range and distribution of the data. Evaluates the methods used by peers in representing data.	Analyses data relative to the mean to describe the shape of the data set across its range of values. Justifies conclusions using observations and measurements. Deduces and infers a range of contextual information from patterns of data.	Investigates the relationship between mean and median values. Critically analyses the nature and objectivity of complex data representations. Makes inferences and convincing arguments that are based on the analysis of data displays.	Investigates bias in data collection methods and presentation. Establishes, through investigation, a) the representativeness of the sample, b) the rigour of the findings and c) the reliability of the data provided. Justifies which measure of centre is most appropriate.

Elements	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
						Data					
Applying and Problem-Solving	Sorts and/or classifies real-life data.	Interprets and matches related data sets or collections of data.	Collects data by asking simple questions of each other and gathering responses. Displays and contrasts data in personal ways.	Applies an investigation cycle of problem-posing, planning, data gathering, representation, analysis and conclusion. Works with information collected about themselves or peers as a data sample.	Selects and applies appropriate methods of collecting, recording and representing data in different problem-solving scenarios.	Applies an investigation cycle of problem-posing, planning, data gathering, representation, analysis and conclusion. Compares two data samples about themselves and that of another.	Collects data by conducting a survey or an experiment related to themselves, their environment, issues in their school or community, or content from another subject. Makes deductions and inferences from existing information provided in data displays.	Applies an investigation cycle of problem-posing, planning, data gathering, representation, analysis and conclusion. Compares multiple data samples involving themselves as at least one data sample.	Solves problems based on secondary data such as election results, temperature data and media headlines.	Applies an appropriate investigation cycle of problem-posing, planning, data gathering, representation, analysis and conclusion. Compares multiple data samples in meaningful contexts.	Synthesises and analyses complex data for a range of purposes and problems. Tests the appropriateness of measures of centre to solve a data related problem.

Data and Chance 4 – Chance

* 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							**Chance**				
Understanding and Connecting							Identifies practical activities and everyday events that involve chance. Explore the independence of each trial in an investigation. (For example – when tossing a coin, each toss has a 50 / 50 chance, regardless of what came before it).	Explores the concept of even chance. Uses various materials such as coins and dice to investigate probability.	Recognises that probabilities range from 0-1 (With 0 being impossible / never and 1 being always / certain). Predicts and represents all the possible outcomes in a simple probability experiment using systematic lists and models	Uses data to predict how likely an event is to happen in the future. Explores how the greater the number of trials brings the experimental [actual] outcomes closer to the theoretical [expected] outcomes. Examines the range of variability in small samples (Useful to explain the law of small numbers).	Uses technology, to rapidly replicate random events (For example – toss coins, roll dice) for efficient investigations. Uses technology to rapidly identify the set of all possible outcomes in an investigation.

	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	**Chance**										
Communicating						Uses examples of everyday situations to talk about the likelihood of events happening and use the language of chance and probability.	Uses mathematical language [such as impossible, never, possible, certain, always], to describe the likelihood that events will occur.	Uses mathematical language [such as very likely, unlikely, less likely, probable, improbable], to describe the likelihood that events will occur. Records outcomes of trials and investigations using appropriate strategies (For example – tally marks or simple tables).	Selects appropriate methods of recording results of probability investigations. Express as a common fraction, the probability that an event will occur. Discusses and compares theoretical	Represents probability using values from the range of 0 to 1. (With 0 being impossible / never and 1 being always / certain). Represents all possible outcomes of an experiment using a sample space (A sample space is a set of all possible outcomes in an experiment).	Describes real-world applications of probabilities expressed in various forms (For example - fractions, decimals and percentages)..
Reasoning							Predicts outcomes and tests through simple probability experiment or game.	Compares experimental values with theoretical values of an investigation (For example – compare observed results from tossing a coin 50 times with expected values i.e. 25 heads, 25 tails).	Deduces through investigation, how the number of repetitions of a probability experiment can affect the conclusions drawn.	Predicts and calculates the probability of an outcome considering frequency, reliability and rigour of investigation. Establishes the reliability of outcomes based on the number of investigations conducted.	Makes predictions about an unknown situation when given a probability.

	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	**Chance**										
Applying and Problem-Solving							Investigates the probability that an everyday event will occur. Plays games with an element of chance.	Conducts chance experiments, identifying and describing possible outcomes and recognising variation in results. Ranks possible events in order of their likelihood.	Poses simple probability problems and solves them by conducting probability experiments. Uses probability to determine mathematically fair and unfair games and explains possible outcomes.	Uses games to carry out blind experiments and predict whether they are fair or unfair. Uses previous data to evaluate whether you can use patterns to make informed decisions about future events.	Refines all possible outcomes to meet a given criteria. Conducts chance experiments with both small and large numbers of trials using appropriate digital technologies.

Measures 5 - Measuring

* 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	**Measuring– length, weight, capacity, area**										
Understanding and Connecting	Handles and explores everyday objects and items. Attends to activities in which direct comparisons are made between objects.	Makes direct comparisons of objects, containers or surfaces to compare measurable attributes and develop an understanding of same. Explores how measures help us to make sense of our world. Recognises that to be accurate, measurements must be fair.	Explores and identifies the different attributes (For example – Length: long/ short; Weight: heavy/ light; Capacity: full/ empty) of a single object that can be measured. Compares and orders objects according to length; Containers and volumes according to capacity; Surfaces and shapes according to area.	Recognises that quantifying a measurement helps us describe and compare more precisely. Explores the conservations of length, weight, capacity and area through practical activities.	Identifies commonalities and differences between measurable attributes and the needs for standard units of measurements. Identifies the appropriate measurement instruments and units for a given situation.	Identifies base units for length [metre], weight [gram], capacity [litre] and area [square metres]. Compares the measurements of objects using the same base unit (For example – comparing the lengths of objects relative to a metre stick)	Explores the relationship between the metric units associated with an attribute (For example- how centimetres relate to metres). Converts between equivalent units of measurement. Explores how to read a simple scale and use conventional measuring instruments.	Uses knowledge of base ten [multiples of ten] to move flexibly between units of measurement. Renames measurements using equivalent units. Adds and subtracts units of measurement to determine differences in quantity. Explores, estimates and then measures the perimeter and area of regular 2-D shapes.	Connects decimal representations to the metric system. Converts between and renames measurements using equivalent units involving fractions and decimals. Explores, estimates and measures the perimeter and area of regular and irregular 2-D shapes. Applies the relationship between metric pre-fixes in similar ways across different units of measurement. Uses 3-D shape nets to explore the surface area.	Compares and orders metric units of measurement in fractional and decimal form. Determines the relevant features and calculates the surface area of appropriate 3-D shapes. Determines the relevant features and calculates the volumes of appropriate 3-D shapes. Connects volume and capacity and their units of measurement. Uses knowledge of existing attributes to find the measure of unknown attributes.	Determines the relevant features and finds the perimeters and areas of circles and composite shapes and the volumes of prisms, including cylinders. Calculates volumes, including prisms, pyramids, cones, and spheres, using formulae.

	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	**Measuring– length, weight, capacity, area**										
Communicating	Demonstrates awareness of measurable attributes of everyday objects and items.	Uses appropriate vocabulary to describe and then compare measurable attributes. Listens to and responds to a range of stories and rhymes involving concepts of measurement.	Describes and discriminates between items using appropriate comparative language. Informally records comparisons and measurement activities.	Records estimates and measures concretely, pictorially and orally.	Recognises that units of measurement can simplify communication about measurement. Collects and records measurement data in systematic ways (For example – by using lists, tables etc.) and compares results.	Discusses and records estimations and measurements using appropriate base units and symbols. Make comparative statements or judgements.	Uses language of metric measurement to describe similarities and differences in attributes of objects. Expresses measurements in appropriate metric units.	Represents equivalent units of measurements in multiple ways.	Communicates and represents measurements using suitable and effective modes of presentation. Records using appropriate unit of measurement according to the level of accuracy required.	Uses technology to input and represent measurements for a range of purposes. Builds models and structures based on given measurements.	Inputs appropriate measurements into computer programmes for the purposes of generating simulations and models.
Reasoning	Explores and/ or investigates measurable attributes.	Predicts how measurable attributes of objects will compare to each other.	Recognises that if different attributes are used to compare and order objects, the order may be different. Investigates and explains such cases.	Recognises the need for units to measure length, weight, capacity and area. Makes numerical estimates of measure based on units that can be seen or handled.	Explains and justifies the necessity of selecting the same unit when comparing two things. Assesses reasonableness of estimations and measurements with reference to previous measurements and personal benchmarks.	Estimates using base units with increasing accuracy. Evaluates the reasonableness of measurements with reference to estimations and personal benchmarks.	Explains and justifies the selection of unit of measure used to measure and/or compare things. Makes reasonable estimations using appropriate units of measurement. Explains and justifies the selection of appropriate instrument for a given situation, depending on the level of accuracy required.	Justifies the specific unit of measurement used to describe an attribute. Orders and compares non-equivalent units of measurements. Deduces formulae for measuring from experience with practical measurement tasks.	Uses smaller units of measurement where a more accurate measurements is necessary. Realises when a more accurate measurement is unhelpful to solving a problem. Tests and evaluates the reasonableness of measurements and numerical calculations of measurements.	Justifies the size of the unit selected when calculating measures and solving problems involving measures.	Deduces and uses formulae to find the perimeters and areas of polygons and the volumes of prisms. Justifies formula used for such cases.

	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	**Measuring– length, weight, capacity, area**										
Applying and Problem-Solving	Engages in a range of appropriate real-life learning activities involving measurable attributes.	Explores various materials used to compare the attributes of length, weight, capacity and area. Chooses an object from a group of objects for a purpose based on a particular attribute.	Explores the procedures of measuring by making direct comparisons of measurements in meaningful contexts. Compares and orders objects, containers and surfaces according to appropriate measurable attributes. Selects and uses suitable materials for comparing.	Selects and uses appropriate materials to propose and estimate fair comparisons. Estimates and measures the attributes of a range of items using appropriate repeated units of measurements in purposeful or problem-solving contexts. Uses repetitions of the same size unit to make approximate measurements.	Identifies the appropriate attribute to measure for a given problem situation. Selects and uses appropriate procedures, measures and equipment to measure attributes of length, weight, capacity and area.	Uses base units and appropriate instruments to solve rich practical tasks and problems involving measurement. Devises strategies to measure the attributes of a wide range of objects.	Selects and uses appropriately sized units of measurement to solve practical tasks. Measures for increasing accuracy by using smaller [fractional] metrics of base units. Reads and interprets instruments with increasing accuracy.	Devises strategies to calculate measures where necessary (For example – adding or subtracting measurements). Measures and records with increasing accuracy and precision.	Uses measurement of an object to determine if it is suitable for a given purpose (For example – will it fit?). Calculates measurements with increasing accuracy in purposeful contexts.	Solves problems and practical tasks involving measurements of more than one attribute. Applies formulae in a meaningful way to solve problems efficiently.	Solves problems of increasing complexity involving the interpretation, calculation and presentation of measurements. Refines decision making for the purposes of more efficient problem-solving.

Measures 6 – Time

* 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	**Time**										
Understanding and Connecting	Shows an awareness of time passing. Begins to recognise the order of daily routines at home and at school.	Recognises personally meaningful times of the day and week. Identifies the present time, things that happened in the (recent and distant) past, and events that will happen in the (near and distant) future.	Demonstrates understanding of days of the week. Explores different, non-standard devices available to demonstrate time passing. Connects amount of time passing with experience.	Becomes familiar with the clock as a tool for measuring time. Demonstrates understanding that the hands of the analogue clock cover an area of space in time (For example – one full rotation of the minute hand represents an hour passing).	Recognises time in hours and half hours on analogue clocks. Recognises and identifies the time of significant daily events represented on analogue clocks. Explores the functionality of the calendar and identify dates.	Recognises the relationship between analogue and digital forms. Recognises and expresses time in half and quarter hours on analogue and digital clocks. Demonstrates understanding of am and pm.	Recognises five-minute intervals on analogue and digital clocks. Interprets simple timetables. Renames minutes as hours and hours as minutes. Explores the relationships between units of time – seconds/minutes; minutes/hours; hours/days; days/months/years; months/years.	Explores the relationship between analogue and digital clocks – 12-hour / 24-hour; am / pm. (For example – Useful to point out the use of the colon in expressing time digitally and distinguishes this from the decimal point symbol). Recognises 60 as the base for performing calculations involving the addition and subtraction of time. Renames related units of time.	Converts flexibly between times in 12-hour and 24-hour format for a number of purposes. Performs calculations [multiplication and division] involving hours, minutes and seconds, by holding the integral value of base 60.	Interprets timetables and schedules presented in 24-hour format.	Recognises and explores the use of other smaller and larger units of time. Identifies and explores different international time zones and calculates time differences between Ireland and other countries. Explores how time is a consideration in calculating other measures.

	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	**Time**										
Communicating	Attends to key transitions throughout the day.	Uses or responds to simple language associated with time. Describes and sequences events in their daily routine Actively measures passing of time using non-standard measures (Non-Standard measures could include claps, bounces, ticks).	Recalls the sequence of the days of the week. Describes and represents sequences of events. Begins to recognise that there are standard universal ways of expressing time.	Uses the vocabulary of time to sequence events (For examples – first, last, next, before, after, early, late etc.). Begins to recognise and relate to the language of days, months and seasons. Expresses a week as seven days and vice versa. Recalls current day, month and season.	Communicates the sequence of events, days of the week, months of the year and seasons (For example – 24 hours in a day, 7 days in a week, number of days in the month). Reads and records time in one-hour and half hour intervals on analogue clocks. Makes approximations of the present time or the time shown on analogue clocks using appropriate language.	Reads and records time in one-hour, half-hour and quarter-hour intervals on analogue and digital clocks. Reads day, date and month using calendar and identifies the season. Explores different ways of presenting time using a variety of strategies (For example – using open number lines and empty clock faces etc.).	Represents five-minute intervals on analogue and digital clocks.	Tells the time from reading an analogue and digital clock. Expresses and represents time in 12-hour and 24-hour formats.	Uses charts or graphs to represent and draw conclusions about time. Interprets and describes information provided in timetables and schedules.	Presents timetables, converting between analogue and digital time. Creates timetables and schedules for a range of purposes. Represents time on graphs and tables for meaningful purposes.	Explains how and why time zones change with references to lines of latitude.

	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						**Time**					
Reasoning	Attends to a variety of routines, activities and transitions on a daily basis. Acknowledges and celebrates events of personal significance.	Recognises predictable patterns of time (For example – in daily routines). Predicts events in the immediate future based on familiar patterns of events.	Logically sequences daily and weekly events or stages in stories or real-life situations. Identifies errors in chronological sequences of events.	Identifies things that happened in the recent past and shows an understanding that things and events will happen in the future. Identifies meaningful intervals of time in daily routines.	Becomes familiar with the movements of analogue clock hands in a clockwise direction. Establishes and makes reasonable estimations of time. Investigates the fractional representation of time on an analogue clock.	Investigates and discusses calendar patterns and characteristics of months and seasons. Estimates and compares lengths of elapsed time. Matches and orders equivalent expressions of time For example – (represented on analogue and/ or digital clocks), converting times where useful.	Makes and discusses approximations before engaging in numerical calculations involving time.	Translates between digital and analogue representations of time. Approximates durations of events and compares against calculations. Analyses and evaluates the ideas of other children in determining time or making predictions of time.	Interprets and analyses timetables and schedules. Evaluates the reasonableness of predictions and numerical calculations involving time.	Explores the relationship between time, distance and speed. Performs mental calculations involving time with increasing fluency for a range of purposes.	Uses given information to calculate times in different parts of the world.

	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	**Time**										
Applying and Problem-Solving	Begins to anticipate and navigate key daily routines using supports as required.	Recognises instruments which tell the time and acknowledges time passing throughout the day. Uses visual supports to convey and understand time sequences.	Asks questions that are useful to acquire a clearer understanding of time. Analyses and sorts events according to when they occur (For example – night time vs day time activities).	Recognises special times (lunch or home time) on the clock face. Attends to sequences of events, days of the week, months of the year and seasons. Correctly sequences stages of development of an event or story.	Records time passing using a variety of devices and methods. Predicts and models how the face of an analogue clock will change over a specified time. Uses language of approximation to relate events which occur naturally throughout the day to various units of time.	Sequences time given on time devices. Analyses and creates timetables and calendars.	Solves and completes rich practical tasks and problems involving time and dates. Approximates and measures, where possible, time taken for familiar activities or events.	Solves problems involving the addition and subtraction of units of time. Solves and completes practical tasks and problems involving time durations and timetables.	Solves and completes practical tasks and problems involving the calculation of times and dates (For example – using multiplication to predict or plan a timeline).	Solves problems involving fractional, decimal and percentage representations of time.	Uses understanding of time in the creation and planning of simulations and models.

Measures 7 – Money

* 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						**Money**					
Understanding and Connecting	Experiences and/ or engages in role-play activities involving exchange.	Recognises that money has a purpose. Begins to develop an appreciation and value of money relative to different objects.	Recognises that coins hold different values. Recognises and demonstrates that lower value coins can be combined to equal the value of a higher value coin.	Recognises the relative value of coins, up to the value of at least 50c, using the cent [c] symbol.	Recognises the relative value of coins, up to the value of at least €1. Determines what can be bought for certain sums of money.	Recognises, exchanges and uses coins up to the value of €2.	Represents and describes the relationships between coins and notes. Calculates the difference between amounts of money.	Explores the concept of saving, value for money and better value.	Recognises the basic functions and operations of financial institutions. (For example – loans and savings may be useful to explore the application of interest rates). Calculates simple interest rates.	Explores how the tax system works and impacts their lives. Explores currencies used in different countries. Performs calculations involving a deficit balance [overdraft / credit].	Explores account identifiers (For example – IBAN and BIC). Explores the differences between simple and compound interest, and how they are calculated.
Communicating	Attends to situations where objects are exchanged for money.	Partakes in scenarios involving exchange of money. Discusses the different goods and services we can pay for with money.	Uses comparative language to discuss coin values. Communicates and records the number symbols on coins. Partakes in situations where items are bought and sold using cash and cashless methods.	Sets relative monetary values to items in role-play scenarios. Uses a range of strategies to mentally calculate sums of money.	Explores a variety of ways to record calculations. Uses the euro [€] and cent [c] symbol to represent money.	Records calculations of money as number sentences. Represents and records amounts of money in decimal forms of euro.	Shares ideas on different ways to save and spend money.	Ensures money is recorded correctly (For example – put emphasis on using correct columns) for the purposes of calculating.	Discusses other forms of financial transactions (For example using credit/ debit cards) and explores how the payments are made and received using them.	Converts other currencies to euro and vice versa.	Develops and makes a financial plan for an entrepreneurial scenario.

	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						**Money**					
Reasoning	Engages in a range of transactional activities in which objects are exchanged for notional value.	Recognises that some items will cost more than other items; and that some coins are worth more than others. Recognises that money is necessary to pay or exchange for goods and services.	Identifies and justifies which coin or collection of coins has the greatest value. Explains why having the most coins does not necessarily mean having the most money. Recognises, sorts and matches coins.	Judges whether there is enough money to buy an item of a particular value and/ or whether change should be expected.	Analyses different ways of combining coins/ amounts to make particular sums. Estimates values of undetermined amounts of money.	Makes and justifies conjectures about combinations of coins/ amounts. Selects appropriate mental strategies for calculation and estimation depending on context. Renames amounts of euro and cent.	Estimates and investigates simple ways of combining set amounts of money. Uses estimates to assess reasonableness of calculations.	Makes and justifies conjectures about combinations of coins and notes, and calculations. Uses estimation strategies to put the decimal point in the correct place. Compares the value of items using a variety of strategies (For example – compare according to their unit price).	Justifies and argues the prudency of financial decisions. Critically reviews simple statements of transactions.	Plans a basic household budget and/ or for a personal or school event.	Compares interest rates offered on savings, presenting most optimum options for different account types and money amounts.
Applying and Problem-Solving	Participates in activities where money is used functionally.	Explores money transactions in role-play and/ or everyday situations.	Exchanges fairly based on relative value in real life or role play contexts.	Selects and uses suitable strategies to tender appropriate coins and calculates change. Investigates different ways to find a given value using a group of coins.	Exchanges money for goods / items in real-life or role play contexts.	Selects and uses a range of mental strategies to calculate amounts; identify coins required; determine change from a transaction. Calculates simple bills and the number of items that can be bought with a given sum.	Solves and completes practical problems and tasks involving addition and subtraction; set amounts; provision of change.	Solves and completes practical problems and tasks involving the addition, subtraction, multiplication and division of money.	Applies the unitary method in problems involving price comparisons. Solves a range of problems involving budgeting, planning and evaluating money situations.	Calculates pay based on hourly and daily rates. Solves problems relating to profit and loss, discounts, VAT, interest, increases and decreases.	Solves problems that involve finding profit and loss, percentage profit and loss on the cost price.

Number 8 – Uses of Number

* 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
Elements	**Uses of Number**			
Understanding and Connecting	Explores numerals in 2-D and 3-D sensory form (For example – tracing numbers on paper and in sand).	Recognises numerals in the immediate environment. Develops an awareness of number and number word sequencing through song, stories, rhymes and games. Attends to numerals of significance or importance to the child (For example – age, address)	Recognises that objects and symbols can represent number. Orders numerals up to at least 10. Notices and recognises the use of numerals as labels in the context of home, the classroom and school environment. Recognises the use of ordinal numbers first, second, third, last in everyday life contexts.	Reads, writes and orders numerals up to at least 20. Recalls the number sequence forwards and backwards, from zero to at least 20, from any given number. Discusses and explores the use of number for a variety of purposes; to quantify [cardinality], to order/rank [ordinality] and to name or label [nominality].
Communicating	Participates with number songs, rhymes and stories.	Participates in activities that involve number.	Represents numbers using informal symbols (For example – fingers, tallies of marks and pictures), and begins to record such numbers. Explains ordinality using the language of after, before and in-between. Displays 0, 1 2, 3, 4, 5, to convey the different uses and application of numerals to represent 'how many', order/rank, label.	Represents 6, 7, 8, 9, 10 to convey the different uses and application of numerals to represent 'how many', order/rank, label.
Reasoning	Begins to observe a numeral rich, learning environment. Begins to develop an awareness of numerals of significance to the child.	Distinguishes numerals from letters and other symbols.	Distinguishes the use of numbers in contexts of personal significance (For example – birthdays, addresses and phone numbers). Represents quantities, order and labels by numerals.	Distinguishes between quantity [cardinal], order/rank in a list [ordinal] and name/label not denoting value [nominal] using everyday examples.
Applying and Problem-Solving	Engages in everyday routines and activities that involve numerals.	Explores the use of number and plays games to raise awareness of number in their environment. Sorts sets of symbols into numerals and letters.	Matches numerals to sets and to other numerals in a variety of contexts.	Uses a simple calendar to apply ordinality of numbers to dates of upcoming events.

Number 9 – Numeration and Counting

* 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
Elements	**Numeration and Counting**						
Understanding and Connecting	Participates in counting activities. Explores, through the immediate environment, opportunities to quantify and subitise.	Explores how numbers are used for quantifying and that the last number in the count indicates the quantity of objects in a set. Recognises numbers, initially within 10. Recites forward to at least 10. Engages in counting of concrete objects in their environment.	Connects numbers to counted objects. Explores how the appearance of a set has no effect on the overall total [conservation of number]. Identifies the empty set and the numeral zero. Demonstrates a growing understanding of the five principles of counting (The five principles of counting are: one-one, stable order, cardinal, order relevance and abstraction).	Develops an understanding of the conservation of number (11-20). Discusses and links relationship between the numbers 11-20 and prior knowledge of 1-10. Counts forwards and backwards from 20 starting at any given number using verbal, concrete and pictorial supports.	Counts to at least 100, counting fluently across decades. Skip counts multiples of twos, fives and tens from a given multiple using verbal, concrete and pictorial supports. Counts forwards and backwards in tens from any given number using verbal, concrete and pictorial supports. Explores a range of approaches to support calculation strategies (For example – doubles, near doubles).	Counts combinations of wholes and parts (For example – 3 wholes and 4 halves make 5). Demonstrates ability to count forward and backwards in 100s.	Explores and counts numbers to 1000 and beyond. Represents understanding of numbers up to at least 1000 using different models. Uses splitting, jumping and other strategies to undertake calculations involving large numbers.
Communicating	Recognises number rhymes, songs, jingles and stories.	Counts objects or people by touching, gesture or verbalisation from 1. Begins to use ideas about number and quantity. Begins to recognise and use numerals in personally meaningful contexts.	Discusses, draws and writes representations of numbers 1-10, using manipulatives. Keeps track of counting acts by using numerical patterns such as tapping or fingers. Makes numerals creatively.	Discusses, draws and writes representations of numbers up to at least 20. Counts mentally 1, 2, and 3 more than/less than a given number. Explains different strategies used to count arrays.	Explains and justifies choices of counting and calculation strategies used and compares with the choices of others.	Represents understanding of numbers up to at least 100 using different models, illustrations and number expressions. Describes mental strategies used to count or compute.	Explains and justifies strategies used to calculate with large numbers. Records answers and suggests strategic approaches to calculations.

	a The learner	b The learner	c The learner	d The learner	e The learner	f The learner	g The learner
Elements	**Numeration and Counting**						
Reasoning	Engages with the concept of zero, none, empty, all gone.	Establishes that zero, as a numeral, represents nothing/none in terms of quantity. Identifies the empty set. Subitises, and counts the number of objects in sets up to at least 5. Orders and distinguishes between sets without counting (subitising).	Orders sets without counting and check by counting. Subitises, and counts the number of objects in a set 1-10. Recognises that each subsequent number in a sequence is one more than the one that precedes it and one smaller than the one that comes after it. Estimates and counts the number of objects in a set, up to 10	Estimates the number of objects in a set 1-20 and checks by counting. Subitises 'how many' in various regular and irregular arrangements (dot patterns, arrays, frames and dice) without having to count. Establishes the number immediately before or after another number without having to start at one.	Uses knowledge of simpler fact groups (doubles, bonds of 5 and 10, adding 10) to develop further calculation strategies (near doubling, bridging through 5 and 10, add 1, compensation). Checks the reasonableness of calculations by comparing the final solution with the estimate.	Uses mental strategies to estimate and count quantities within at least 100.	Investigates the part / whole relationship in counting (For example – 1, 1½, 2, 2½). Estimates quantities, sums and differences between sets.
Applying and Problem-Solving	Engages with a range of manipulatives and explores how quantifying is applicable in their personal lives.	Investigates the role of quantifying in real-life situations. Explores how counting can be used to solve problems related to everyday life. Undertakes tasks involving counting in other areas of learning.	Begins to use simple number paths and/ or lines for counting all, counting on and counting back, as appropriate. Selects and uses appropriate materials to make a variety of sets for a given number.	Selects and uses appropriate materials to make a variety of sets for a given number up to 20 and beyond. Uses a range of counting strategies to determine quantities and justifies their efficiency.	Selects and uses a range of mental strategies to solve problems. Uses skip counting to extend number patterns.	Explores a variety of ways of counting and estimation strategies to support computation. Uses number lines, benchmarks numbers [5, 10, 100], and patterns to count forward and backwards. Uses known facts and knowledge of mental strategies to solve problems.	Selects an appropriate method for solving a problem for example mental estimation and mental or written strategies. Analyses and evaluates answers to problems involving estimation and/ or calculation.

Number 10 – Place Value and Base Ten

* 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	**Place Value and Base Ten**										
Understanding and Connecting	Begins to develop an awareness of more and less.	Shows an understanding of differences in value (For example – 'one', 'a lot', 'some' and 'more').	Explores the relationship between numbers 1-9 and also their relationship to 10. Uses manipulatives to demonstrate equivalence between the numeral and quantity of 10. Demonstrates an ability to subitise various arrangements or models of numbers to 10.	Represents amounts of tens and ones as 2-digit numbers. Composes and decomposes the structure of numbers 11-20 in terms of tens and ones. In a numeral, appreciates that digits to the left have the greater value and digits to the right have the lesser value. Demonstrates an ability to subitise various arrangements or models of numbers to 20.	Composes and decomposes the structure and identifies place value in 2-digit whole numbers up to at least 99. Compares two 2-digit numbers and represents the relationship between these numbers using <, >, and = Demonstrates an ability to subitise various arrangements or models of numbers to 99.	Composes and decomposes the structure and identifies place value in 3-digit whole numbers up to at least 199. Compares two 3-digit numbers up to at least 199, and represents the relationship between these numbers using <, >, and = Demonstrates an ability to subitise various arrangements or models of numbers to 199.	Composes and decomposes the structure and identifies place value in 3-digit numbers up to at least 999. Compares numbers up to at least 999, and represents relationship between numbers using <, >, and = Explores place value in decimal numbers to one place of decimals [tenths] including for computation Recognises that numbers that can be negative as well as positive.	Composes and decomposes the structure and identifies place value in whole numbers up to at least 9999. Compares numbers up to at least 9999, and represents relationship between numbers using <, >, and = Explores place value in decimal numbers to two places of decimals [hundredths] including for computation.	Composes and decomposes the structure and identifies place value in whole numbers beyond 10000. Explores place value in decimal numbers to at least three places of decimals [thousandths] including for computation. Recognises the per cent symbol [%] and relates this to 'number of parts per hundred'. Develops an understanding of benchmark percentages (For example – 50%, 25%, 10%, 1%) in the context of fractions and decimals.	Identifies the percentage of a quantity. Multiplies and divides decimal numbers by tens, hundreds and thousands. Identifies decimal and fraction equivalents for percentages.	Explores the idea that the powers of base ten continue infinitely. Uses known facts to make deductions about the relationship between fractions, decimals and percentages.

	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	**Place Value and Base Ten**										
Communicating	Acknowledges the language (including more, less and enough) of quantity.	Shows awareness of the concept of grouping and swapping/ exchanging.	Discusses the grouping and swapping of ten ones to 'make a group of ten.' Discusses cardinal numbers of personal significance such as age and compares with other familiar people.	Explores mathematical representation (manipulatives and/ or pictorially) of tens and ones. Discusses the groupings of tens [and ones leftover]. Names multiples of ten.	Models and represents 2-digit numbers in terms of tens and ones. Describes 2-digit numbers in terms of tens and ones.	Models and represents 3-digit numbers up to at least 199 in terms of hundreds, tens and ones. Describes 3-digit numbers up to at least 199 in terms of hundreds, tens and ones.	Models and represents and describes 3-digit numbers up to at least 999 in terms of hundreds, tens and ones. Describes 3-digit numbers up to at least 999 in terms of hundreds, tens and ones. Communicates the value of a number relative to their position to the decimal point.	Models and represents 4-digit numbers up to at least 9999 in terms of thousands, hundreds, tens and ones. Describes 4-digit numbers up to at least 9999 in terms of thousands, hundreds, tens and ones. Communicates the value of a number relative to their position to the decimal point.	Uses appropriate supports to compose and decompose numbers beyond 10000. Models, represents and expresses percentages as fractions and decimals and vice versa. Communicates the value of a digit relative to its position to the decimal point. Expresses directed numbers in real life situations (temperature / money).	Converts between fractions, decimals and percentages.	Converts complex fractions to decimals and percentages and vice versa.
Reasoning	Practices exchange of materials.	Sorts, groups and arranges materials according to quantitative criteria.	Explores various arrangements (For example – on number frames) of manipulatives to prompt different mental images of numbers up to 10, while developing a sense of each number. Orders and compares numbers 1-10 with each other.	Explores various arrangements (such as on number frames) of manipulatives to prompt different mental images of numbers up to 20, while developing a sense of each number. Orders and compares numbers 1-20 with each other. Explores how the names of numerals reflect their relationships in relation to 10.	Explores efficiency of different estimation strategies, including rounding numbers to the nearest ten. Orders 2-digit numbers (For example – from least to most, most to least). Estimates the number of objects in a set from 0-20.	Explores efficiency of different estimation strategies, including rounding numbers to the nearest ten or hundred. Orders 3-digit numbers up to at least 199. Explores place value in the context of numbers less than 1.	Explores efficiency of different estimation strategies, including rounding numbers to the nearest ten or hundred. Orders 3-digit numbers up to 999. Compares and orders decimals to one place, locating them on a number line.	Rounds numbers to the nearest ten, hundred or thousand, and uses this skill alongside other strategies to estimate and check the reasonableness of a solution. Orders 4-digit numbers up to 9999 in terms of their value. Rounds numbers with one decimal place to the nearest whole number. Express known fractions in decimal form.	Orders fractions, decimals and percentages by their comparative value. Identifies percentages as a fraction [with denominator 100] and as a decimal. Rounds numbers with two decimal places to one decimal place, and to whole numbers.	Uses their skills of rounding and estimating as a means of predicting and checking their answers to decimal calculations. Identifies and generalises how the place value works.	Selects the most efficient approach between fractions, decimals and percentages to solve a problem and justifies selection.

	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	**Place Value and Base Ten**										
Applying and Problem-Solving	Uses sense of quantity to make requests or show preference.	Engages in classifying, matching, sorting and ordering activities.	Participates in grouping and swapping activities that involve making ten.	Participates in grouping and swapping activities involving making tens [and ones leftover.	Explores a range of games, puzzles and real-life contexts involving 2-digit numbers.	Makes predictions and conjectures about the value of numbers to solve problems or play games.	Applies knowledge of place value to determine answers in problem-solving activities where there are missing values.	Uses rounding to check answers to calculations and establishes, in the context of a problem, levels of accuracy Solves problems in real-life contexts involving money and measuring length.	Solves problems involving operations with whole numbers, fractions, decimals and benchmark percentages.	Solves problems involving fractions, decimals and percentages where a value is missing. Calculates percentages of quantities by using decimals [multiply] or unit fractions [divide].	Uses money as a context to solve problems involving fractions, decimals and percentages. Applies logic of fractions, decimals and percentages interchangeably to solve problems.

Number 11 – Sets and Operations

* 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	**Sets and Operations**										
Understanding and Connecting	Attends to activities where quantities are combined and partitioned. Attends to activities where quantities increased and decreased.	Sorts a variety of random materials into a set according to a single criterion [property]. Subitises the number of objects in a set. Matches objects and/or sets using one-to-one correspondence.	Sorts items into sets by quantity. Matches numbers to sets up to at least 10. Combines sets of objects to make at least 10. Partitions sets of 2 or more objects.	Combines sets of objects up to at least 10 including the empty set/ zero. Recognises the zero property of an empty set. Partitions sets of objects [2 to at least 10] into two or more subsets. Uses knowledge of addition to develop understanding of subtraction (For example - 2+4=6 so 6-4=2)	Uses 10 as a base when combining and partitioning sets of objects up to at least 20. Explores and uses the zero property when performing calculations. Adds within 100 including 2-digit + 1-digit; 2-digit + 2-digit; 2-digit + a multiple of 10. Subtracts numbers within 99 with and without renaming.	Explores addition and subtraction up to at least 199. Practices repeated addition and group or skip counting. Uses inverse operations to check addition and subtraction calculations. Subtracts numbers up to at least 199 with and without renaming. Compares equivalent and non-equivalent sets.	Adds and subtracts within 999, with and without renaming. Acknowledges multiplication as repeated addition and division as sharing / repeated subtraction and vice versa. Divides 2-digit numbers by a 1-digit number, without and with remainders. Explores the implications of multiplying by 10. Multiplies a 1-digit or 2-digit number by 0-10.	Adds and subtracts within 9999, with and without renaming. Divides 3-digit numbers by a 1-digit number, without and with remainders. Multiplies a 2-digit or 3-digit number by a 1 or 2-digit number. Adds and subtracts whole numbers and decimals up to two places. Multiplies and divides a decimal number up to two places by a single digit whole number. Performs simple calculations involving numbers crossing zero.	Adds and subtracts whole numbers and decimals [to 3 decimal places], without and with a calculator. Multiplies a decimal [up to 3 places] by a whole number, without and with a calculator. Divides a 3-digit number by a 2-digit number, with a calculator. Multiplies a decimal by a decimal, with a calculator. Multiplies and divides a whole number by 100. Identifies prime and composite numbers up to 100	Multiplies a decimal by a decimal, with and without a calculator. Divides a 4-digit number by a 2-digit number with or without a calculator. Identifies prime and composite numbers beyond 100. Explores the order of operations using brackets.	Divides a decimal number by a decimal, without a calculator. Extends previous conceptual and practical work to include larger numbers and further decimals. Uses concrete and dot representation to express prime and composite numbers.

	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	**Sets and Operations**										
Communicating	Engages with activities that encourage comparisons of quantities in sets.	Describes the process of sorting and justifies selection criteria used in forming sets. Represents a verbal context or problem using concrete objects. Uses appropriate gestures and words to convey and make comparisons.	Uses comparative language, [more, less, same] to compare sets to at least 10. Records a number sentence pictorially. Jumps forwards / backwards on a number line or path to begin to express addition.	Counts forwards and backwards in ones to demonstrate addition [how many more] and subtraction [how many less]. Jumps forwards / backwards on a number line or path to begin to express addition and subtraction.	Fluently recalls addition and subtraction facts [bonds] to at least 10. Uses symbols +, -, = to convey addition and subtraction facts. Records equivalent and non-equivalent sets 0-20 using <, > and =.	Fluently recalls addition and subtraction facts [bonds] to at least 20. Uses symbols +, -, =, < and > to convey addition and subtraction facts. Describes and records mental strategies for addition within 99. Records equivalent and non-equivalent sets up to 99 using <,> and =.	Fluently recalls addition and subtraction facts [bonds] beyond 20. Practices multiplication and division facts based on number families [10,5 / 2,4,8 / 3,6,9 / 7].	Recalls more complex multiplication facts based on known facts (For example – multiplication facts based on number families (10,5 / 2,4,8 / 3,6,9 / 7).	Fluently recalls multiplication and division facts. Illustrates prime and composite numbers on a hundred square. Explains the rules governing prime and composite numbers.	Generates multiples and factors using a variety of tools and strategies. Identifies prime and composite numbers with increasing fluency.	Establishes common factors and common multiples using the prime factorisation of numbers.

	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	**Sets and Operations**										
Reasoning	Differentiates between sets based on their quantity.	Classifies objects into sets. Combines and partitions sets of objects when requested. Identifies, recognises and estimates 'more' or 'less' in the real-life context and/or play.	Accurately counts and compares equivalent and non-equivalent sets from 1 up to at least 5 and establishes which set has more or less.	Partitions sets 2-10 into two or more subsets and recognises that this does not affect the total (For example – 1+2+6=9). Demonstrates understanding of all possible partitions of number bonds up to at least 10. Compares equivalent and non-equivalent sets by value [1 to at least 10] and establishes how much more / less.	Justifies and proves the commutative property in relation to addition facts (For example – 3+4=4+3). Estimates totals and differences within 99. Uses number sense to identify unreasonable and reasonable answers. Justifies with proofs the selection and use of operations [addition and subtraction] in a variety of contexts.	Uses a range of estimation strategies (For example – clustering, front-end estimation) routinely to check the reasonableness of a solution. Applies the associative and zero properties to support calculations and justifies with proof[s]. Develops strategies for efficient computation of addition and subtraction number facts.	Uses inverse operations to explain and check answers. Explores alternative solution strategies to addition and subtraction tasks. Justifies the efficiency of one estimation strategy over another for specific numbers or contexts.. Justifies with proofs the selection and use of operations [addition, subtraction, multiplication and division] in a variety of contexts.	Analyses the links between addition and multiplication, and division and subtraction. Recognises when and how to use a calculator, and checks reasonableness of answers. Uses inverse operations to check multiplication and division calculations (For example – 6x4=24, 24÷4=6) Develops strategies for efficient computation of multiplication and division number facts.	Estimates using a variety of strategies sums, differences, products and quotients of whole numbers Recognises, explains and uses the connections between multiplication and division to complete mental and written calculations. Identifies factors and multiples from basic multiplication facts. Deduces that all prime numbers, except 2, are odd numbers. Explores lowest common multiple [LCM] in terms of fractional equivalence.	Extends understanding of factors and multiples in N [Natural numbers] by exploring the highest common factor [HCF] and the lowest common multiple [LCM]. Estimates sums, differences, products and quotients of decimals Evaluates expressions that contain brackets, using order of operations. Identifies the common factors and multiples of whole numbers within 100.	Evaluates expressions that involve integers, including expressions that contain brackets and exponents.

	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	**Sets and Operations**										
Applying and Problem-Solving	Demonstrates an awareness of objects being introduced or taken away from a set.	Plays games and participates in singing games and rhymes where objects are added or taken away.	Uses appropriate strategies to find out how many. Orders sets of objects according to their quantity, up to at least 5.	Uses a range of strategies to add and subtract mentally to at least 10. Orders sets of objects up to at least 10.	Selects and shares mental strategies for addition and subtraction facts within 20. Constructs number sentences and number stories to solves problems involving addition and subtraction within 99.	Constructs number sentences and number stories to solve problems involving addition and subtraction within 199. Solves multi-step problems involving addition and subtraction [using real-life contexts where appropriate].	Solves problems involving multiplication and division [using real-life contexts where appropriate]. Applies a range of strategies, including visual strategies, to solve problems involving more than one operation.	Explores and applies the zero, commutative, distributive and associative properties of multiplication. Solves and completes practical tasks and problems involving multiplication of whole numbers. Solves problems involving decimals [using real-life contexts where appropriate].	Uses a variety of strategies to solve addition, subtraction, multiplication and division problems involving decimal and whole numbers.	Solves multi-step problems contexts and involving whole numbers and decimals using a variety of tools and strategies [using real-life contexts where appropriate]. Uses estimation when solving problems involving operations with whole numbers, decimals and percentages, to help judge reasonableness of a solution.	Solves problems involving percentages expressed to one decimal place and whole-number percentages greater than 100 [using real-life contexts where appropriate]. Uses estimation when solving problems involving operations with whole numbers, decimals, percentages, integers, and fractions to help judge the reasonableness of a solution.

Number 12 – Fractions

* 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	**Fractions**										
Understanding and Connecting	Engages with activities involving partitioning and sharing.	Recognises, identifies and matches pairs. Explores how a whole object or set can be shared often in different ways.	Partitions objects and shapes into two equal shares and describes the whole and parts by the number of shares / parts.	Establishes and identifies half of sets up to at least 10.	Makes explicit connections between the parts that make up one whole. Establishes and identifies half of sets up to at least 20.	Establishes and identifies quarters of sets. Explores the concept of equivalence between halves and quarters.	Establishes and identifies eighths, fifths and tenths. Establishes the relationship between numerators and denominators, exploring the concept of proper and improper fractions. Expresses tenths in decimal form. Relates division to fractions.	Explores equivalent forms of fractions with denominators 2-12. Adds and subtracts related fractions with and without manipulatives. Establishes multiple fractions of a whole with and without manipulatives. Translates between improper fractions and mixed numbers. Expresses hundredths in decimal form.	Adds and subtracts related fractions and mixed numbers. Identifies common denominators by listing multiples. Expresses thousandths in decimal form. Uses ratios to compare two quantities. Multiplies a whole number by a unit fraction.	Adds and subtracts unrelated fractions and mixed numbers. Recognises and uses thousandths and relate them to tenths, hundredths and decimal equivalents. Relates ratios to fractions of a quantity. Multiplies a whole number by a multiple fraction and vice versa. Divides a whole number by a unit fraction and vice versa.	Multiplies a fraction by another fraction. Divides a whole number by a multiple fraction and vice versa. Uses ratios to compare three quantities. Finds equivalent ratios and simplify ratios.

	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	**Fractions**										
Communicating	Follows the conventions of partitioning and sharing.	Describes scenarios where sharing, combining or partitioning takes place.	Represents parts of models [sets or areas] using concrete materials. Compares and describes parts of sets in terms of quantity (For example – bigger, more, smaller, less than, the same as).	Recognises and names equal parts of a whole [halves]. Represents and records understanding of halves using manipulatives, pictorially or by using symbols.	Uses simple fraction names (halves and quarters) in real life situations. Represents and records understanding of quarters using manipulatives, pictorially or by using symbols Explains unit fractions as one part of a whole.	Discusses and explains relationship between 'related fractions' halves and quarters [fraction families]. Explores different models to demonstrate understanding of simple equivalent fractions. Explains multiple fractions as more than one part of a whole.	Establishes the fraction of a set using manipulatives, illustrations and calculations. Establishes and represents equivalence between fraction families using manipulatives and different models (For example – as number lines).	Discusses and explains relationship between 'related fractions' with denominators up to at least twelve [fraction families]. Combines fractions and expresses as improper fractions. Investigates the equivalence of fractions within fraction families with and without manipulatives.	Identifies and represents equivalent fractions of a given fraction, including tenths and hundredths. Simplifies fractions with and without manipulatives.	Uses common multiples to express fractions in the same denomination. Identifies equivalent ratios and simplifies ratios.	Uses a variety of visual representations to support their understanding of multiplication and division with fractions. Uses a variety of representations to express equivalence between fractions, ratio, decimals and percentages.
Reasoning	Co-operates with activities involving partitioning and sharing.	Shares in real-life and justifies the share. Sorts materials in an undirected manner [according to self-selected criteria].	Identifies patterns emerging from partitioning a set into two parts. Explores the partitioning of a whole and sets of items. Visualises and represents understanding of a half.	Partitions an array of objects or a shape into two equal shares. Establishes that equal shares of identical wholes need not have the same shape.	Partitions an array of objects or a shape into four equal shares. Demonstrates understanding that the greater the number of portions of a whole, the smaller the size of each equal share.	Orders and justifies the positioning of fractions along a number line, including whole numbers.	Explores patterns in respect of equivalent fractions. Establishes the total number, given a unit fraction, using manipulatives illustrations and calculations. Explains the role of the numerator and denominator. Compares and orders unit fractions with the different denominators.	Compares fractions [proper, improper and mixed numbers] and orders them on a number line. Calculates the total number, given a fraction [unit and multiple] of it. Expresses known measures [minutes/ hours, cent/ euro] as fractions.	Compares and orders fractions with different denominators and numerators on a number line. Explores the relationship between fractions, decimals and percentages. Calculates ratios using proportions.	Represent ratios found in real-life contexts, using manipulatives, illustrations and standard fractional notation. Relates ratios to proportions.	Estimates and makes approximations in real-life situations involving fractions. Demonstrates an understanding of rate as a comparison, or ratio, of two measurements with different units (For example – distance to time)

	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	**Fractions**										
Applying and Problem-Solving	Practices the rules of equal sharing in real-life scenarios.	Applies idea of equal sharing among peers by partitioning whole sets of objects or spaces [using real-life contexts where appropriate].	Divides whole sets of objects or space into subsets or parts [using real-life contexts where appropriate].	Splits a whole into smaller parts and explains that 'equal parts' are the same. Divides or shares out groups of objects equally into smaller groups. Investigates halves of different geometric shapes.	Explores and solves a range of everyday problems involving partitioning. Investigates quarters of different geometric shapes.	Investigates relationships between fractions using various models (For example – paper folding, clocks, games). Uses knowledge of halves and quarters to solve problems involving sharing and combining given quantities.	Manipulates models of 'related fractions' for purposes of addition and subtraction [using real-life contexts where appropriate].	Use fractions to solve more complex word problems and puzzles involving numbers and measures. Solve a range of problems involving fractions given missing values.	Completes problem-solving tasks involving fractions and measures, explaining methods and reasoning. Identifies equivalent and simplified ratios.	Solves fraction problems involving more than one operation. Solves problems which requires application of fraction, percentage and decimal equivalents. Solves problems involving proportions.	Flexibly converts between fractions, decimals, ratio and percentages [using real-life contexts where appropriate]. Solves problems involving changing ratios.

Shape and Space 13 – Spatial Awareness and Location

* 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	**Spatial Awareness and Location**										
Understanding and Connecting	Explores the movements of different parts of the body and/ or the ways in which the body can move, or be moved, in space. Develops an awareness of the position of their body in space.	Explores the position or location of objects. Explores and orientates the environment of the classroom, school and other familiar settings.	Explores and negotiates the relative location of objects (For example – over, under, above, below).	Explores and negotiates the proximity (near, far, right, left) of objects. Describes the relative locations and movement of objects on picture maps and simple plans.	Explores movement from one location to another using a grid or simple map. Recognises and uses directions 'right' and 'left' in real situations. Describes movement in terms of whole, half, quarter and three-quarter turns.	Identifies and describes the general location of an object using a grid system. Explores square and non-square corners in the environment, identifying square corners as right angles.	Identifies and classifies angles greater/less than a right angle. Explore the effects of quarter turns, both clockwise and anti-clockwise, referring to the cardinal points. Identifies, describes and classifies vertical, horizontal and perpendicular lines.	Identifies and classifies angles as acute, obtuse, straight or reflex. Appreciates the cardinal directions (With focus on North, South, East and West) in relation to the classroom and school environment. Identifies, describes and classifies oblique and parallel lines.	Draws given angles and measures them in degrees. Develops an understanding of the eight points of the compass and explore angles of 45°. Explores the positions and types of angles [internal and external] in shapes. Explores the sum of the angles in a triangle. Explores, measures angles and constructs different types of triangles.	Describes positions on the full coordinate grid (all four quadrants) Explores the sum of the angles in quadrilaterals. Explores, estimates and measures the angles formed when two lines intersect. Explores and measures internal and external angles of cross-sections of shapes.	Describes and compares regular and irregular shapes defined in terms of co-ordinates.

	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	**Spatial Awareness and Location**										
Communicating	Responds to the language and act of movement.	Gives and follows simple instructions related to movement and positioning. Describes the movement and positioning of objects, people and self.	Demonstrates the position (For example – behind, in front of, on, under, over, beside) of an object in a scene.	Communicates position with increased accuracy.	Gives and follows simple directions. Uses language 'clockwise, anticlockwise, right, left' to describe turns and direction.	Gives and follows directions involving half and quarter turns in the context of simple plans. Describes and records directions as a series of simple steps. Relate clockwise movements to the clockface. Analyses and evaluates representations for accuracy.	Discusses and compares grid systems commonly used on maps (For example – the use of numbers and letters to identify an area). Records and displays a set of instructions involving locating an object according to distance and cardinal points.	Discusses mathematical features (For example – scale, relative distance between locations) of conventional maps and digital maps or route-planning tools. Discusses and compares alternate routes on maps and plans.	Follows and gives turning instructions related to the eight points of the compass. Represent co-ordinates in the first quadrant; including identifying position from given co-ordinates and plotting position.	Draws a pair of axes [X and Y] to form a quadrant, considering equal scales and labelling.	Represents co-ordinates in all four quadrants.
Reasoning	Co-operates with the positioning or movement of objects, people or self. Acknowledges object permanence.	Deduces the location of an object from descriptions of position or location.	Explores the rationale and significance of location and/ or position of objects, people or self. Makes predictions about location based on spatial understanding.	Explores and creates simple picture maps or drawings to represent location. Explores spatial relations in number lines to predict location of numbers.	Visualises the result of following a sequence of directions on a map or plan. Deduces and identifies where, in a series of steps, the wrong direction may have been taken. Relates clockwise movements to the clockface.	Recognises the relationship between different modes of representing position and location (For example – birds-eye view versus street view). Evaluates directions for movement and refines for clarity and accuracy.	Uses maps to plan routes. Makes and justifies conjectures about position and location and evaluates the statements of others.	Compares angles to decide if a polygon is regular or irregular. Explores and explains the roles of angles in shape tessellation.	Explores how a co-ordinate system represents location. Constructs shapes given some properties and / or values.	Uses angle sum facts to make deductions about missing angles. Deduces the reasonableness of estimated measures of angles of intersecting lines. Explores angle relationships associated with parallel lines.	Draw and labels rectangles [including squares], parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes.

	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	**Spatial Awareness and Location**										
Applying and Problem-Solving	Moves and repositions self for a purpose.	Moves and repositions objects for a purpose. Responds to obstacles in familiar environments by adjusting paths and/ or types of movements.	Traces paths on simple maps or mazes. Identifies objects and specific locations using knowledge of spatial relations.	Creates simple picture maps or drawings of familiar settings and indicates the positionality of objects. Describes simple paths through familiar environments.	Solves problems and plays games involving simple maps or grids. Creates a set of simple instructions to direct movement for a given purpose. Identifies and models turns using arms, legs, whole body movements or straws.	Devises and analyses routes on maps, plans or grids that satisfy certain constraints (For example – the shortest route, no crossing roads, avoiding obstacles).	Creates simple grids or plans which enable collaborative problem-solving activity with peers. Solves rich problems involving location of objects using distance and the cardinal directions – north, south, east and west (For example – walk 5 steps north).	Uses a protractor to test estimations; to compare and order angles. Uses formal spatial and measurement conventions to create a set of easily–interpretable steps to direct movement.	Solves problems that involve missing angles. Solves problems involving placing and locating co-ordinate points in the first quadrant.	Uses manipulatives or programmable devices to explore position, movement and direction. Plots and connects co-ordinates to make an image.	Solves angle-relationships problems involving triangles (For example – finding interior angles or complimentary angles) and intersecting lines.

Shape and Space 14 – Shape

* 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						**Shape**					
Understanding and Connecting	Explores shapes in the environment.	Identifies and recognises shapes in the environment.	Recognises and names common 3-D and 2-D shapes in different orientation and sizes.	Identifies and describes simple properties (For example – faces, sides, corners) and capabilities (For example – roll, stack, slide) of some regular shapes. Identifies 2-D shapes as the faces of 3-D solids.	Compares properties (For example – faces, sides, corners, vertices) of shapes. Constructs and draws 2-D shapes.	Analyses the relationships between properties and capabilities in families of shapes. Creates collections or families of shapes based on common properties. Constructs 3-D shapes using modelling materials.	Explores and investigates properties of shapes including symmetry, lines and angles. Explores the combinations of shapes to create 2-D images or construct 3-D models [taking into consideration their unique properties].	Recognises an angle as the corner of a 2-D shape. Compares and classifies geometric shapes, including quadrilaterals and triangles, based on their properties.	Dissects 3-D shapes and explores how properties change or stay the same. Identifies and explores the properties of the circle.	Classifies and distinguishes different triangles and quadrilaterals according to their lines and angles.	Describes the properties of shapes and explains how unknown angles and lengths can be derived from known measurement.
Communicating	Attends to language describing the properties and appearance of shapes and objects.	Explores and uses language to describe shape properties and functions.	Represents shapes in various ways. Discusses similarities and differences between shapes.	Asks questions about the properties of shapes to determine their identity.	Analyses and discusses the results of shape sorting activities. Describes the key differences and similarities of 2-D shapes according to their properties.	Represents classification of shapes (according to attributes) using tables or diagrams. Describes the key differences and similarities of 3-D shapes according to their properties.	Selects and justifies criteria for the classification of a diverse range of shapes. Identifies the properties of 3-D shapes that make them suitable for particular real-life purposes.	Represents logical classification of an increasing number of shapes ([regular and irregular] (To do this it may be useful to use tables, illustrations, or diagrams – venn or carroll, et).	Make clear statements and inferences about the effects of dissecting 2-D and 3-D shapes.	Presents a wide range of purposes for the potential use of 2-D and 3-D shapes.	Uses simple programming to construct shapes.

	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						**Shape**					
Reasoning	Explores and investigates the properties of different shapes.	Discriminates between shapes, identifying when one shape is similar or different to another. Identifies when an object or set of objects is different or does not belong to a familiar category.	Selects appropriate criteria for shape sorting. Explains how shapes have been sorted. Sorts, compares and classifies 2-D and 3-D objects into logical categories according to their attributes, size and geometric properties.	Compares and sorts common 2-D and 3-D shapes and everyday objects. Explains and justifies why shapes belong or do not belong to certain sets.	Compares and contrasts shapes and shape families based on their properties. Sorts an increased range of shapes according to at least two properties.	Conjectures and justifies about whether an unfamiliar shape belongs to a certain category.	Explores and describes the relationships of 3-D shapes with constituent 2-D shapes. Visualises and describes how 3-D solids will look when deconstructed into nets. Makes generalisations about shapes based on understandings of their properties (For example – two right-angled triangles of equal dimensions can combine to make a square).	Explores and devises nets for simple 3-D shapes. Makes conjectures about the possible effects of dissecting shapes [2-D and 3-D].	Explores and compares circles of various unit diameters. Measures and identifies the relationship of diameter to radius.	Investigates and measures the surface area of 3-D shapes. Relates the diameter of a circle to its circumference by measurement. Discuses and justifies relationships between and within groups of shapes.	Investigates and measures the volume of 3-D shapes. Devises nets of complex 3-D shapes.
Applying and Problem-Solving	Acknowledges the presence of shapes in their immediate environment.	Selects appropriate shapes for a purpose.	Builds and creates structures using solid shapes or technology.	Selects materials to represent shapes. Solves tasks and problems involving regular shapes [2-D and 3-D shapes].	Deconstructs and reconstructs everyday items (For example – containers or packaging). Combines and partitions 2-D shapes.	Solves problems requiring the greatest or least number of 2-D shapes needed to compose a larger 2-D shape in a variety of ways. Solves tasks and problems involving technology / virtually-based tools.	Designs and makes accurate models of 2-D and 3-D shapes using a variety of materials (collections of models could be developed in consideration of common properties).	Constructs and de-constructs 3-D shapes from net designs. Visualises, describes and draws geometric solids. Solves tasks and problems involving regular and irregular shapes [2-D and 3-D shapes].	Constructs a circle of given radius or diameter. Uses instruments to measure 2-D and 3-D shapes (For example – rulers, compasses and protractors) in a range of meaningful contexts.	Given defined dimensions, constructs a model / structure. Constructs triangles and quadrilaterals from given line or angle measurements. Uses software or code to construct and manipulate shapes.	Uses 2-D representation [illustrations or models] of 3-D objects to visualise and solve problems.

Shape and Space 15 – Transformation

* 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	**Transformation**										
Understanding and Connecting	Explores and engages with the movement of shapes.	Recognises that a shape may appear different when moved in some way.	Identifies shapes in a variety of different orientations.	Recognises and identifies the component parts of composite [combination of] shapes. Explores line symmetry of simple shapes and images.	Recognises and identifies known shapes repeated, rotated, dilated or reflected. Identifies shapes and combinations of shapes which tessellate in the environment.	Explores position and space with a range of polyominoes (Definition of polyominoes: shapes formed by joining one or more equal squares edge to edge). Explores and creates simple tessellations.	Explores rotational symmetry. Creates tessellations using more than one shape.	Explores reflection where the reflecting line is not horizontal or vertical. Explores rotational symmetry, identifying the order and angle of rotation.	Draw shapes on square paper and note the coordinates of the shape [which form the corners of the shape].	Translate shapes, noting its new co-ordinates. Reflect shapes on the x-axis, noting its new co-ordinates.	Investigates how scale [ratios] is used to enlarge and reduce shapes. Devises a range of steps to transform shapes.
Communicating	Attends to the language of movement and manipulation of shapes.	Discusses movement and manipulation of shapes using informal language.	Uses appropriate language (For example – turn, flip, slide, match, and fit) to describe movement and comparison of shapes.	Makes and describes composite shapes. Gives and follows instructions relating to the movement of shapes.	Identifies lines of symmetry and reflected lines or shapes in images or illustrations.	Completes missing reflections, of shapes or images.	Describes features of line and rotational symmetry. Explains how simple tessellations work.	Interprets and follows simple instructions to transform shapes across different reflecting lines.	Plots shapes and reflections using squared paper. Records and describes steps involved in simple terms	Plots translations and reflections using technology. Records and describes steps involved in simple terms	Instructs technology to perform a range of transformations. Devises creative ways to present new transformations.

	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	**Transformation**										
Reasoning	Observes the effects of shapes moving.	Visualises how a shape will look when moved.	Investigates shape movements and shape matching (For example – Will it fit if I turn it this way? Will it match if I turn it over?).	Makes and justifies predictions about the movement of individual shapes.	Predicts and justifies whether a shape covers a plane.	Visualises and predicts how an object will look when rotated through a half turn.	Visualises and predicts how an object will look when rotated through a quarter turn. Selects shapes to create tessellating patterns and justifies choice.	Makes and tests hypotheses about how shapes might transform. Explains the effects of flipping and rotating a shape [and any implications or tessellation].	Compares reflected and original co-ordinates of shapes.	Compares various translations of a shape	Make deductions based on the comparison of co-ordinates and analyse results.
Applying and Problem-Solving	Moves shapes for a purpose.	Solves and discusses simple spatial puzzles such as jigsaws or shape sorters.	Selects and manipulates shapes to copy a model or structure.	Engages in spatial puzzles or construction activities (For example – tangrams puzzles, block play) which involve moving, comparing or combining shapes.	Transforms shapes in various ways including art (For example – printing), paper folding and barrier games.	Manipulates models or materials (For example – by using tangrams) to make or create a structure or model.	Designs and creates tessellating patterns through shape rotation and / or reflection. Solves simple problems involving shape or line transformations.	Uses transformations or manipulations of shapes to solve a problem.	Uses software / technology to solve transformation-based problems in meaningful contexts.	Plans for and solves complex problem involving shape or line transformations.	Investigates creative expressive of tessellations for various purposes.

4. Examples of Children's Mathematical Learning

The Primary Mathematics Toolkit will include a range of examples of children's mathematical learning and development. These examples will illustrate teacher-child interactions, Cognitively Challenging Tasks, problem-based learning, learning in integrated contexts, play and playful learning, amongst others. In doing so it is intended that these examples will exemplify rich and engaging learning experiences and demonstrate good pedagogical practices in supporting children towards achieving learning outcomes and developing their mathematical proficiency.

The following list is not exhaustive but should help to convey what Examples of Children's Mathematical Learning might look like.

To support planning, teaching and assessment of the Learning Outcome ***Through appropriately playful learning experiences children should be able to develop an awareness that the purpose of counting is to quantify*** (Number: Numeration and Counting), examples of Children's Mathematical Learning might include:

- A video exemplar of teacher / child discussion
- List of key language or terminology
- List of common misconceptions or misunderstandings
- A list of open-ended questions to elicit, support and extend children's thinking and understanding
- Problem-solving tasks involving early counting
- List of resources and games
- List of stories, rhymes and songs
- Samples of teacher designed tasks
- Samples of formative assessment tools or strategies
- Tip sheets for parents

5. Support Materials

The Primary Mathematics Toolkit will include a range of examples of children's mathematical learning and development. These examples will illustrate teacher-child interactions, Cognitively Challenging Tasks, problem-based learning, learning in integrated contexts, play and playful learning, amongst others. In doing so it is intended that these examples will exemplify rich and engaging learning experiences and demonstrate good pedagogical practices in supporting children towards achieving learning outcomes and developing their mathematical proficiency.

The following list is not exhaustive but should help to convey what Examples of Children's Mathematical Learning might look like.

To support planning, teaching and assessment of the Learning Outcome ***Through appropriately playful learning experiences children should be able to develop an awareness that the purpose of counting is to quantify*** (Number: Numeration and Counting), examples of Children's Mathematical Learning might include:

- A video exemplar of teacher / child discussion
- List of key language or terminology
- List of common misconceptions or misunderstandings
- A list of open-ended questions to elicit, support and extend children's thinking and understanding
- Problem-solving tasks involving early counting
- List of resources and games
- List of stories, rhymes and songs
- Samples of teacher designed tasks
- Samples of formative assessment tools or strategies
- Tip sheets for parents

NCCA

An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment