A Mathematics Manifesto - Curriculum at a Glance

Allaun		- Curriculum at a G	tance									
Strand Topology and Commen	Grade 1 • Sasic Shapes : Introduction to recognising and naming basic	Grade 2 s Shapes and Attributes: Earther exploration of shapes by	Grade 3 • Parimeter and Length: Introduction to measuring the nucleus	Grade 4	Grade 5 Advanced Perimeter and Area: Expanding to calculate the	Grade 6 • Values Introduction: Understanded the convent of unions	Grade 7 s Properties of Bolseiner: Understanded the remountees of	Grade 8 • Introduction to Transformational Geometry: Learning about	Grade 9	Grade 10 • Euclidean Geometric Formal represent groots, trisionometric	Grade 11 a Coordinate Generalty in 10: Introducing the third discussion	Grade 12
and are contract	2D shapes such as circles, squares, triangles, and rectangles.	discussing attributes like the number of sides, corners, and	of simple shapes using non-standard units (e.g., paper clips,	rectangles and squares using standard units.	area and perimeter of more complex shapes, like triangles and		polygons, focusing on regular and irregular polygons, angles, as	nd rotations, reflections, translations, and dilations on the	perpendicular lines, and proofs in geometry.			curvature and geodesics, applying basic calculus to the study of
	Basic Transformations: Introduction to movement concepts like sliding (translation), flipping (reflection), and turning	equal lengths. • Symmetry: Begin identifying simple symmetrical shapes,	string) and understanding length.	 Shape Composition: Combining and decomposing shapes to the form larger or more complex shapes (e.g., combining triangles) 	parallelograms.	calculations using unit cubes. • Coordinate Geometry: Beginning to plot points in all four	side lengths. • Area and Volume of Composite Shapes: Calculating the area	coordinate plane. Understanding the relationship between	 Coordinate Geometry. More complex coordinate geometry, including calculating the slope of a line, midpoint, and distance 	similar figures. • Trippeometry: Introduction to the basics of sine, cosine, and	space.	curves and surfaces. 13 • Manifolds and Topology. An exploration of simple manifolds.
	instation with simple objects.	especially in nature and common objects.	as cubes, spheres, cones, and cylinders, and distinguishing	form squares or parallelosterns).	on a simple 2D and using positive numbers.	quadrants of the coordinate plane and understanding simple	of more complex shapes composed of basic shapes and the		between points using the distance formula.	tangent and their application in solving problems involving right-		such as the torus and sohere, and undenstanding their properties
	Spatial Awareness: Understanding the concept of inside,	Simple Transformations: More focused practice on reflecting		Reflections and Rotations: Deepening understanding of	Transformation Practice: Working with reflections and	relationships between coordinates.	volume of composite 3D shapes.	involving irregular polygions, circles (introduction to n), and	Topology: Basic topological concepts such as surfaces and	aneled trianeles.	trisionometry to solve real-world problems.	in both geometry and topology.
	outside, left, right, and relative positions of objects.	and rotating objects on paper and physically.	 Symmetry: Expansion of symmetry to include vertical and horizontal axes in everyday objects and patterns. 	transformations by working with patterns that reflect or rotate around a central point.	rotations in a more structured way, using graph paper or softwo	re • Translations and Scaling: Expanding on previous transformation concepts by introducing the idea of scaling	 Coordinate Geometry: Distance between two points on a coordinate plane and simple slope calculation. 	composite solids. • Tapalous Introduction: Introducting the concept of topology	edges, introducing ideas like the Mobius strip as an example of non-orientable surface.	 Topology: Introduction to the concept of Euler's characteristic and simple classifications of surfaces. 	 Topology: Exploring continuous deformations (homeomorphisms) and understanding topological invariants. 	 Advanced Geometry and Proofs: Advanced geometric constructions, proofs using vector and matrix methods, and the
						shapes up or down and translating them across a plane.		through simple ideas like deforming shapes without cutting or				geometry of transformations.
								tearing (e.g., stretching a rubber band into different shapes).				
	 Recognising Patterns: Introduction to identifying and describing simple patterns in numbers and shapes. Recognising 	Building on Patterns: Continue exploring and extending	Introduction to Multiplication and Division: Explore multiplication as repeated addition and division as repeated.	 Properties of Arithmetic Operations: Explore the commutative and associative properties in multiplication and addition. 		 Introduction to Variables and Algebraic Expressions: Pupils besin workins with variables to recreased unknown quantities in 		Solving Systems of Equations: Solve more complex systems		 Cyclic Groups: Explore cyclic groups and how elements repei in a cycle is al., modular arithmetic). Understand how cyclic 		
Group Theory		and resided the next elements in a sensence	subtraction. Build fluency in these new operations.	Understand why the order of adding or multiplying numbers doe	understanding or now the commutative (a + b + b + a) and associative properties apply in real-world arithmetic and simple	equations, linking operations with symbolic representations.	Strengthen the link between operations and symbolic alrebra.	interact.	identity, and inverses. Explore simple examples, such as the	structures underlie many étous operations.	dylation is also defined. like rational numbers). Show how these	
	colours or shapes).	 Addition and Subtraction Mastery: Strengthen undenstanding 	· Patterns in Multiplication: Introduce multiplication tables an	not change the result.	algebraic expressions.	 Expanded Symmetry Concepts: Explore more detailed 	 Exploring Symmetry in 2D and 3D Shapes: Deepen the 	Cyclic Structures in Arithmetic: Introduction to cyclic	symmetries of a square.	. Subgroups: Introduce the concept of subgroups, or subsets of	extend the idea of groups.	group).
	Sasic Arithmetic Operations: Simple addition and subtraction united concepts objects in a countries seeks or cubes?	of addition and subtraction as operations, with attention to		 Inverses in Arithmetic: Introduction to the idea that subtraction is the inverse of addition and division is the inverse. 		geometric transformations, such as rotations and reflections in	understanding of symmetry in both 2D and 3D objects, explore box different transformations (relations, sefer-tional ran by		Permutations: Introduce permutation groups, showing how	groups that themselves satisfy the group properties. • Applications of Group Theory. Besin exploring the practical	Group Homemorphisms: Begin exploring the concept of homemorphisms, or sharing a consension many behavior strong.	Applications in Cryptography and Coding Theory: Investigate
	Introduction to understanding operations as actions.	multiplication as repeated addition.	. Introduction to Symmetry: Basic exploration of symmetry in	of multiplication.	parts (e.g., 12 = 2 = 2 = 3).	Introduction to Simple Equations: Begin solving one-step	combined.	Basic Transformations and Group-Like Structures: Digin	this forms a group.	applications of group theory, such as symmetries in nature,	. Advanced Symmetry Groups: Explore the symmetry groups of	f (e.g., RSA encryption) and error-correcting codes.
			shapes and objects, focusing on reflection symmetry.	Symmetry Expansion: Explore more complex symmetry in 2D	 Symmetry and Transformations: Introduce more complex geometric transformations, linking them with the structure of 		 Introduction to Systems of Equations: Begin solving systems simple linear equations, learning how to combine and 	of understanding transformations as operations that can be combined and reversed, building the foundation for	 Group of Symmetries: Deepen understanding of symmetry be exploring the group of transform ations for regular polygons (e.g. 	physics, and art.	3D objects, such as the cube, and how group theory applies to crystallography and molecular structures.	 Group Actions and Symmetry: Study how groups act on sets and explore applications in physics, computer science, and
				snapes and introduce the concept of transformations (rotations translations).	operations and how numbers interact.	their inverses.	nampulate multiple equations.	compined and reversed, custaing the foundation for understanding group operations.	explaining the group of transform atoms for regular polygons (e.g. rotations of an equilateral triangle).		crystalography and molecular soluctures.	and expore applications in physics, computer science, and other fields.
Functional Analysis an	Introduction to Functions: Undentiand the basic concept of a	Functions in Everyday Contexts: Identify simple functions in	Patterns in Arithmetic: Begin recognising that operations suc-	ch . Understanding Graphs of Functions: Introduce the concept of	Composing Functions: Introduce the idea that multiple	• Inverses of Functions: Explore the idea of inverse functions,	Exploring More Complex Functions: Nove into more comple	x • Composition of Transformations: Explore more complex	Introduction to Linear Algebra: Begin introducing the concep	Introduction to Functional Analysis: Explore the idea of	Normed Vector Spaces: Introduce the concept of normed	Operator Theory: Explore operator theory more formally,
Operator Theory		real-life contexts, such as turning a switch on and off (input-	as addition and subtraction can be seen as transformations	plotting simple functions on a graph, where pupils can visualise s the relationship between input and output. Start with linear	functions can be composed to create new functions (e.g., first	where an operation can be undone by another (e.g., subtraction		transformations by composing functions, such as relating a	of vectors and linear transformations. Explore how linear functions can be applied to vectors and matrices, preparing	functions as objects in their own right, rather than just processe that take inputs to outputs. This introduces pupils to the idea th	s vector spaces, where functions (or vectors) have a length or	examining how linear operators act on functional spaces.
	pressing a button produces a sound). This lays the groundwork for more formalised function concepts in later years.	specific outcomes is key to later studies of operators.	appare to numbers. Init builds toward understanding functions as transformations of inputs to outputs.	functions such as y = x or y = x + 2.	add 2, then mustply by a). This loss is central to understanding operators later on.	is the inverse of addition). This prepares pupils for more abstractions of inverse operators.	 Introduction to Linear Functions: Explore linear functions (r) 	shape and then reflecting it. This builds an understanding of	nunctions can be applied to vectors and matrices, preparing qualls for operator theory.	functions can be studied and manipulated as mathematical	et size. I res prepares pupis for understanding spaces of functions in functional analysis	 Introduce examples from physics, such as operators in quantum mechanics (e.g., Hamiltonians).
	. Si reple Input-Output Relations: Recognise basic input-output	. Exploring Number Operations: Pupils continue exploring the	• Introduction to Function Machines: Use simple "function	Operations as Functions: Explore how basic arithmetic	Visualising Functions on a Graph: Explore more detailed	Functions and Mapping: Deepen understanding of functions a	s mx + b1, understanding how changing the slope or intercept	Exploring Inverse Functions Further: Apply inverse functions	Matrices as Operators: Introduce the idea that matrices can	erities	a Exploring Discovalues and Electrostopy Scale exploring	Applications of Functional Analysis: Discuss how functional
	patterns, such as "if you add 1 to a number, you get the next number." This helps build the conceptual framework for	effect of adding, subtracting, and multiplying numbers, reinforcing the idea of applying an operation to an input to get an	machines" where an input goes through a process (operation) to	to operations (addition, subtraction) act as functions mapping one	graphing of functions, including non-linear functions (e.g., y = x ²). Visualising these transformations helps connect the conce	processes that map inputs to outputs, reinforcing this with	changes the graph. These concepts lay the foundation for lines operators in functional analysis.	or algebraic contexts, such as solving for x in y = 2x + 3. This reinforces the conceptual framework needed for operator	represent linear transformations (or operators) applied to vectors. This helps transition from arithmetic to the more	Unear Operators: Study linear operators (transformations that preserve the operations of addition and scalar multiplication)	t eigenvalues and eigenvectors in the context of matrix	analysis is used in areas such as optimisation, machine learning,
	functional analysis.	output.	forming the basis for later functional and operator theory.	number to answer.	of operations to functional analysis.	functions on shapes).	operators in outcome anagem.	theory.	abstract world of linear operators.	and apply them to vector spaces. Use concrete examples like	· Functional Spaces: Discuss functional spaces (e.g., spaces	of cutting-edge technology.
									Solving Systems of Linear Equations: Degin solving systems		continuous functions) and how these are important in studying	
									linear equations using matrices, setting the stage for understanding linear operators in vector spaces.	 Applications of Operators: Explore real-world applications of operators in contexts like physics is al., rotations and forces) an 		problems in applied contexts, showing how functional analysis and operator theory are central to solvine these problems in
										economics (e.g., linear optimisation).		engineering and science.
Category Theory	Basic Serting and Classification: Pupils begin by sorting	Expanded Classification: Classify objects into multiple	• Relationships Setween Groups: Explore relationships between	nn • More Complex Mappings: Explore mappings that pair multiple	Building on Set Theory: Strengthen the concept of sets and	Relations and Functions: Explore functions in more depth,	Refining Composition of Functions: Continue developing the	Introduction to Categorical Structures: Pupils are introduced	Further Exploration of Categories: Explore more complex	Natural Transformations: Introduce the concept of natural.		
	objects into categories based on shared attributes (e.g., size,	categories simultaneously (e.g., sorting by both colour and share). Basin to recognize that objects can below in more than	groups of objects (sets), such as recognising that one group	objects in one set with objects in another. Begin discussing the et idea that one set can map to another in more complex ways,	operations between sets (e.g., unions, intersections,	understanding how one set of objects relates to another and ho	w idea of function composition, applying this to more abstract relationships between sets. Pupils will learn to think about how	to categories formally. Categories consist of objects (sets, in the	s examples of categories, such as categories of geometric shape and their transformations. Beein to study more abstract	s transformations, which provide a way of relating functors. Natural transformations are macoines between functors that	(sets with an associative binary operation and an identity element) and show how they relate to categories. Public will	colimits in category theory, which generalise the ideas of more transfer or and covered and covered transfer and transfer.
	foundational concept in category theory.	one category, introducing the idea of multiple perspectives on	can have relationships with objects in another set.	leading toward thinking about functions as relationships.	relationships between sets can be structured.	. Introduction to Equivalence Relations: Introduce the concep	relationships themselves can be transformed.	Explore simple categories, such as sets and their functions.	categories beyond sets.	preserve the relationships between categories.	learn that moroids are examples of categories with a single	concepts are used to find universal properties of objects in
	 Understanding Relationships: Recognise basic relationships between objects, such as larger vs. smaller, or heavier vs. 	the same objects. • Introduction to Sets: Deale exploring the idea of sets through	Introduction to Mapping: Start exploring the concept of	 Inverse Mappings: Explore the idea that mappings can have inverses, where every object in the output set maps back to the 	Composition of Functions: Introduce the idea that two	of equivalence relations, where objects are grouped together	Exploring Categories of Sets: Begin discussing sets as object	ts * Identity Morphisms: Introduce the concept of identity s morphisms, where each object (set) has a morphism that maps	Introduction to Functors: Introduce functors, which are mappings between categories that preserve the structure of	More Advanced Functorial Thinking: Begin exploring more	object. • Functorial Relationships: Deepen understanding of functors	categories. • Advanced Functorial Applications: Explore advanced
	lighter. This helps build early thinking about objects and their			inverses, where every object in the output set maps back to the input set. This introduces the idea of isomorphisms in category					categories. Functors map objects in one category to objects in			applications of functors and natural transformations in different
	Interactions.	common characteristics. This introduces pupils to thinking about	concept of morphisms (amous) between objects in category	theory.	theory's idea of morphism composition.	by their relations.	theory, where pupils explore sets as categories.	 Associativity of Composition: Explore the idea that the 	another, and map morphisms between objects as well.	objects.	world mathematical problems. Explore how functors relate	areas of mathematics. For example, use functors to relate
		collections of objects.	theory.					composition of morphisms (functions) is associative, meaning that the certer in which have lives are composed down? change	Applications of Functors: Explore how functors are used to relate different areas of mathematics. For example, depending.	 Isomorphisms in Categories: Continue building on the concept of isomorphisms, where objects and morphisms in one 	different areas of mathematics. • Mentional of Calaston Theory Discuss how a sharps theory	different algebraic structures, such as rings and modules.
								the result. This is another key principle of category theory.	transformations can be thought of as functors between	category are structurally the same as those in another category	is used in areas such as computer science (e.e., protramming	category theory is used in cutting-edge mathematical research.
									categories of shapes.		languages, databases) and physics (e.g., quantum mechanics)	including homotopy theory, algebraic geometry, and higher- dimensional categories.
												dimensional categories.
Graph Theory and	Introduction to Simple Connections: Publis begin to explore	s Espanded Connections: Introduce more structured	a Basic Graphs and Rather South Introductor the concept of	• Simple Graphs: Introduce the idea of staphs as a collection of	a Destroys of a Made: introduce the convent of the destroy of a	a Introduction to Trace: Introduce the concept of a tree as a	. Weighted Greeker Introduce assistant storchy where each	a Grank Trausreal Albiert these Introduce streets street trausreal	a Stance Graphy introduce the concept of classic draws when	a Advanced Graph Abirel three Dunion more advanced stock	a Granth Compartituity and Carty Evolute the concept of streets	Advanced Topics in Network Science: Explore more advanced.
Network Science	connections between objects (e.g., connecting dats or drawing	connections, such as pairing elements in groups (e.g., matching	paths in graphs. For example, show how a pupil can "walk" from	m nodes (vertices) connected by edges (lines). Pupils create	node (how many edges are connected to it). Explore how	special kind of graph with no cycles. Use real-world examples	edge has a value or weight. Use examples like transportation	algorithms, such as breadth-first search (BFS) and depth-first	the stuph can be drawn on a plane without any edges crossing.	alricethms, such as Dilkstra's alricethm for finding the shortest	connectivity and cuts, where a shaph is divided into separate	topics in network science, such as small-world networks and
	lines between points). This introduces the concept of linking elements, a basic idea in stach theory.	pupils to desks). This builds on the concept of relationships between objects.	one point to another by following edges in a graph. • Exploring Networks in the Real World: Recognize basic	simple graphs to represent relationships between people, objects, or places.	different nodes can have different degrees, helping pupils understand the structure of graphs.	like family trees or organisational charts to show how trees work • Connected Graphs: Explore connected graphs, where every	networks (where weights represent distances) to show how	search (DFS). Help pupils undenstand how these algorithms are used to explore staphs and find paths.	Explore the applications of planar graphs in geography and mag- makins.	path in weighted graphs. Introduce pupils to the idea of using alreadings to solve real-world stash problems.	parts by removing certain edges or nodes. Discuss how this concept is used in network dealers to ensure robustness.	scale-free networks. Discuss how these types of networks appear in nature, technology, and society.
	Basic Networks: Receipte simple networks in evenday	Visualizing Networks: Simple visual representations of	networks in real life (e.e., transportation systems, neighbourhou	od • Undirected and Directed Graphs: Introduce undirected staph	. Cycles in Graphs: Besin exploring cycles in stachs, where a	node can be reached from every other node. Help pupils	Exploring More Complex Trees: Build on the concept of trees.		Graph Isomorphisms: Introduce the idea of stuch		Network Flow Algorithms: Introduce network flow algorithms.	Graph Theory in Cryptography, introduce qually to the role of
	contexts (e.g., family trees or friends in a classroom). Pupils	networks, such as connecting points to form shapes (e.g.,		(where connections go both ways) and directed graphs (where				s. cycles and paths, such as Hamiltonian and Eulerian paths. Use				graph theory in cryptography, showing how secure
	explore how objects can be linked together, forming a basic understanding of nodes and edges.	squares, triangles). This reinforces the idea that nodes can be	world connections.	connections go one way). Explore simple examples like directional street many	for more complex graph theory concepts like Eulerian and	networks. • Graph Colouring: Introduce the idea of staph colouring, when	show and world applications	puzzles and real-world examples (e.g., the Seven Bridges of Köninbern) to introduce these concepts.	If they look different. Help pupils recognise when graphs are equivalent	and search engines (link analysis). Show pupils how graph theor helos structure lante-scale networks.	y maximised in networks. Explore real-world applications, such a traffic systems and losistics networks.	 Application is built on complex networks of relationships. Applications in Machine Learning and Al: Explore how graph
					Network Diagrams: Use network diagrams to visualise	each node is assigned a colour, and no two connected nodes	. Paths and Shortest Paths: Introduce the idea of finding the	*Social Networks: Explore how graph theory applies to social	Networks and Flow: Begin exploring how flow works in	*Bipartite Graphs: Introduce bipartite graphs, where nodes are	· Graph Theory in Biology: Discuss how graph theory is applied it	n theory and network science are used in machine learning and
					relationships in graphs, reinforcing the idea that graphs can	can have the same colour. This introduces combinatorial	shortest path between two nodes in a graph. Use simple	networks, showing how people can be connected through node n and edges. Discuss concepts like "degrees of separation" and	networks (e.g., water flow through pipes, traffic flow through	divided into two sets, and edges only connect nodes from different sets. Explore examples like job assignment problems		artificial intelligence, such as in recommendation systems (e.g.,
					represent many kinas or rear-word associates.	theory.	a map.	how networks influence communication.	helps solve problems in network design.	and matching in graphs.	biological systems.	A Marianian, e-continuos panantini.
Nontinear Dynamics	 Introduction to Patterns: Explore basic repeating and growing patterns in numbers, shapes, and colours (e.g., alternating 							 Exploring More Complex Dynamical Systems: Introduce more to complex dynamic systems, such as predator-crey models. 			 Advanced Chaos Theory Concepts: Explore advanced chaos theory concepts, such as atranse attractors, which describe ho 	Nonlinear Dynamics in Physics and Engineering: Explore how
and Chaos Theory				spirals in shells or branching in trees. This introduces pupils to the idea that natural systems often follow predictable patterns,				to complex dynamic systems, such as predator-prey models, where one population affects another. Pupils will explore how				
	to the idea of predictable and repeating behaviours in systems.	sequence and explain why.	evolve and change.	but sometimes show unexpected behaviours.	preparing them for more complex behaviours in later grades.	feedback) or stability (negative feedback).	outcomes. This is a key concept in chaos theory, often referred	d these systems can exhibit oscillatory behaviour (cycles of grow	h lead to multiple solutions or no solutions at all.	real-world examples like population dynamics or chemical	time. Use computer simulations to visualise these attractors.	electronics or mechanical systems). • Advanced Chaos Theory and Predictability: Discuss the limits
	Simple Growth Sequences: Introduce simple sequences that	Introduction to Number Sequences: Begin looking at simple	Introduction to Predictability: Pupils explore what it means for a second to be a second to	for * Introducing Time Sequences: Begin exploring sequences that a change over time, helping pupils think about systems that	Real-World Nonlinear Growth: Use real-world examples, like	 Simple Dynamical Systems: Begin exploring simple dynamic 	at to as the "butterfly effect."	and decline).	Introduction to Chaos Theory: Formal introduction to chaos	reactions to Bustrate these ideas. • Siturcation and the Onset of Chaos: Introduce the concept of	Application of Chaos in Real-World Systems: Show how	Advanced Chaos Theory and Predictability: Discuss the limits
	gow or snank (e.g., counting by twos or tives). This propares pupils for the concept of dynamic systems where values change	erouth or decay. Examples include sequences that add or	sequence or pattern). They learn that some systems are easier	evolve. Examples could include tracking the phases of the moo	discussing how some systems grow faster and faster, while	For example, bouncing a ball or watching how water levels	equations that describe how systems change over time. These	patterns repeat at different scales. Explore fractals in nature.	and the unpredictability of certain systems.	bifurcation, where a small change in a system's parameters can	prediction (the "butterfly effect"), stock market fluctuations, an	
	over time.	subtract a constant amount.	to predict than others.	or the growth of a plant.	others slow down.	change in a tank.	could include exponential growth or simple logistic models of	such as the branching of trees or the shapes of coastlines, as	Exploring Chaotic Systems: Use computer simulations or simple experiments in explore chaotic systems, such as double.	lead to a sudden change in its behaviour, such as the onset of	population dynamics. • Exercise and Scaling Derives more advanced fractal seconds	complex systems.
						 Predictability vs. Unpredictability: Discuss the difference between systems that are easy to predict (e.s., resular patterns 		examples of how chaos can produce complex patterns. Chaotic Behaviour in Simple Systems: Explore simple systems		Nonlinear Dynamics in Technologic Discuss how nonlinear		
						and those that are harder to predict (e.g., systems that have	systems, such as weather patterns or ecosystems, that are	such as pendulums or water flow, that can exhibit chaptic	simple rules can lead to unpredictable behaviour.	dynamics and chaos theory are used in technology, such as in	as the design of networks or the analysis of biological growth	applied in modern technologies, such as cryptography,
						unexpected changes).	sensitive to small changes and can behave unpredictably.	behaviour. Pupils will learn that even simple systems can become unpredictable under certain conditions.		the design of secure communication systems or weather	patterns.	computer algorithms, and machine learning.
Mathematical Logic	Introduction to Simple Logic: Deals with simple logic	Building on True/False Statements: Continue exploring	- Name Andread Recognition States are assessed	Introduction to Logical Puzzles: Begin using logical puzzles.	- Industrial and the Research of Participation (Section 1988)	- Francis Landard Photograph in Mathematics State and a	- Factories Many Complete Lorde Streeters State Complete	re . Lagical Operators in Algebra: Explore logical operators (e.g.	- Formal International State of Toronto.	Predicate Lasic: Suid on propositional lasic by introducing	Advanced Proof Techniques: Continue developing proof	Gödel's Incompleteness Theorems: Introduce publis to
and Computability		true/fable statements and beein combining simple statements	tasks where pupils use multiple pieces of information to make a	a where pupils must deduce the correct solution based on class	the idea of systematically checking all possible cases to prove	logical reasoning within mathematics itself, such as deciding		le conjunction, disjunction, negation) within algebraic confests.		predicate losic, where statements include variables and	techniques, introduciné more complex methods such as	Gödel's incompleteness theorems, which show that in any
Theory	false. Pupils explore basic reasoning by deciding whether	using "and" and "or" to create more complex logical conditions.	decision (e.g., "VI finish my homework AND it is sunny, I can	(e.g., "Who owns the red car?" logic puzzles). This helps pupils	that a statement is true or false. This helps them understand th	e whether statements about number properties (e.g., "All even	problems where they must deduce the answer from a set of	Pupils begin understanding that logic applies to both numbers	contradiction. Pupils practice using logical reasoning to justify	quantitiers (e.g., "for all," "there exists"). Pupils learn how to	induction and counterexample. Pupils begin working with more	
	everyday statements are correct or incorrect. • Lorical Connections: Introduce the idea of simple connection	 Introduction to Patterns and Sequences: Simple reasoning a problems based on number and shape patterns help pupils think 		develop skills in deduction and inference. • Basic Problem-Solvins with Legic Continue emission inside	importance of structure in logical reasoning, • Basic Logical Connectives: Descen understanding of "and."	numbers are divisible by 2") are true or false. • Introduction to Simple Algorithms: Explore the idea of an	class. This builds formal logical thinking skills. • Introduction to Sets and Logic: Explore set theory and how	and statements. • Introduction to Truth Tables: Introduce truth tables, which	mathematical statements. • Propositional Logic Introduce propositional logic, where	write logical statements in a more structured way. • Many there and Efficiency: Explore many complex about these	formal mathematical proofs. • Formal Computability Theory: Introduce more formal ideas in	cannot be proven to be true or false. This highlights the limits of
	between statements (e.g., "and," "or," "not"). Use everyday	logically about how elements follow a rule or pattern.	. Introduction to Conditionals: Introduce conditional logic with	neasoning in simple problem-solving contexts, such as math	"or," and "not" with more formal practice. Pupils begin to	algorithm as a sequence of steps to solve a problem. Pupils	sets can be combined or intersected using logical operations.	allow pupils to explore all possible combinations of truth values	statements are represented using variables (e.g., p, q) and	and introduce the idea of efficiency. Pupils compare different	computability theory, such as Turing machines and the Church	Complexity Classes and Computability: Explore the idea of
	examples, such as "if it is raining AND I have an umbrella, then will stay div."		"F., then" statements. Pupils practice understanding consequences is at., "If it is cold, then I will wear a lacket" i.	word problems where multiple conditions must be satisfied to find the corner arrower	understand how to combine logical statements in structured	begin working with simple algorithms (e.g., following steps to so murphers or shares).	t This introduces pupils to the foundational concepts of logic in mathematics	for logical statements. Truth tables help pupils understand how compound statements are evaluated.	logical connectives. Pupils learn to manipulate and evaluate these statements systematically.	algorithms for solving the same problem and discuss which one is more efficient	Turing thesis. Pupils learn how mathematicians model. computation and explore problems that are computable versus	complexity classes (e.g., P vs. NP), where pupils learn about
	wa say ery.		consequences (e.g., "in it is cold, then (will wear a jacker).	ting the correct answer.	ways.	 Proofs in Mathematics: Introduce simple proofs, where pupil: 		 Simple Recursive Algorithms: Explore recursive algorithms. 	Introduction to Computability: Explore the idea of	Exploring Computability and the Limits of Alabrithms: Serin		solve (ND). This introduces them to one of the most important
						provide reasons why a mathematical statement is true. This ca	algorithms by introducing flowcharts or step-by-step procedure	s where a problem is solved by breaking it into smaller	computability, where pupils begin to understand what kinds of	exploring more advanced ideas in computability theory, such as	. Exploring Algorithms in Logic: Study algorithms used to solve	unsolved problems in computer science.
						include basic geometric proofs or number-theory statements.	for solving problems. Pupils begin to understand how computer	rs subproblems. Use simple examples, such as the Fibonacci sequence to introduce percentage.	problems can be solved by following a set of instructions (an alsorithm). Discuss the importance of losic in designing	the limits of what can be computed. Introduce basic problems that are known to be unsolvable by alder@how.	logical problems, such as satisfiability problems (e.g.,	Applications of Logic and Computability in Technology: Discuss have mathematical logic and computability theory are applied in
							the light to some process.	requests, or monace recorder.	agonomi, uscuss the importance or logic in designing computer programs.	than any Anadem to the unaccessful by algorithms.	Discuss how logic is used in computer science to design	modern technology, such as in designing secure communication
											algorithms.	systems, artificial intelligence, and cryptography.
Mathematical	Number Sense and Counting: Introduction to basic number	Espanded Place Value: Working with numbers up to 1000 in	Multiplication and Division Introduction: Exploring concepts	 Expanded Place Value: Working with numbers up to 10,000 and introducing decimals up to two places in bases 10, 4, and 8 	Mastering Fractions and Decimals: Operations with fraction and decimals: Installed assessment between the	Introduction to Negative Numbers: Understanding and	Proportional Reasoning Understanding ratios, rates, and	 Algebraic Manipulation in Multiple Basex: Solving equations and manipulating expressions using the concept of an unknown 	Polynomial Operations: Addition, subtraction, and		 Introduction to Calculus: Easic concepts of limits, derivative and introductory integration. 	 calcutus Mastery: In-depth study of derivatives, integration techniques, and applications to real-world problems.
Grammar	concepts (counting up to 100, skip counting, and basic place value with ones and tens) in base 10.	base 10, exploring hundreds, tens, and ones. Pupils also expand to base 5, using objects and visual models.	using arrays and visual models (multiplication up to 10x10) in base 10 and expanding to base 4.	 operations with Larger Numbers: Multi-digit addition, 	 Multi-Digit Multiplication and Division: Solving problems will 	operating with negative numbers on the number line. • Arithmetic in Multiple Bases: Continued practice with bases.	percentages, erm approacons in multiple cases (e.g., base 5, base 12).	and manipulating expressions using the concept of an unknown base. Pupils practise switching between bases to deepen	 resultiplication of polynomials using a generalised base approach. Foundations of Probability: Probability with independent and 	 equations, and their applications using the generalised base approach. 	and introductory integration. • Complex Numbers: Understanding the complex plane,	 Advanced Trigonometry and Complex Analysis: Fourier series.
				subtraction, and early multiplication techniques across multiple				understanding.	dependent events, and introduction to permutations and	• Trigonometry Expansion: Exploring the unit circle,		and exploring trigonometric identities in depth.
	20 using physical objects and visual aids in base 10. • Introduction to Multiple Bases: Introduction to base 2 (binary)	100, including regrouping in base 10 and applying similar	and introduction to decimals as parts of whole numbers in base	 bases (base 20 and base 6). Fractions and Decimals: Adding and comparing fractions. 	in bases 10 and 12. • Measurement Concepts Introduction to volume and	and prepare for algebraic thinking. • More Complex Fractions: Multiplication and division of	thinking is introduced as working in an unknown base, connecting the concept of place value across different bases to	Solving Multi-Step Equations: Solving equations involving	combinations. • Graphing Quadratic Functions: Introduction to parabolas and	trigonometric identities, and graphs of trigonometric functions.	equations with complex solutions. • Advanced Probability and Statistics: Hypothesis testins.	Namerical Methods: Techniques for solving equations numerically and approximation solutions to differential
	using simple counting and addition to develop the concept of	· Introduction to Measurement: Using non-standard and	Perimeter and Area Basics: Measuring and calculating the	understanding equivalent fractions in base 10.	converting between units (e.g., cm to m).	fractions and mixed numbers in base 10.	variables.	generalised base approach.	their properties, connecting to algebra in a generalised base.	transformations, including shifts, stretches, and reflections.	probability distributions, and introduction to inferential statistic	s. equations.
	place value beyond base 10.	standard units (e.g., length with rulers).	perimeter and area of simple 2D shapes.	Geometry: Understanding lines, angles, and basic transformations (reflection, solution)	Basic Probability and Combinatorics: Introduction to	· Area and Volume Mastery. Calculating the area of irregular	Geometry and Transformations: Understanding congruence	 Introduction to Pythagorean Theorem: Applying it to solve 	. Algebraic Expressions and Inequalities: Solving systems of	. Probability Distributions: Introduction to normal distribution,	Discrete Mathematics: Introduction to graph theory, logic, an	d • Mathematical Proofs and Logic: Formal proof methods,
	 Shapes and Spatial Reasoning Recognising and naming basi 2D shapes (circle, triangle, square) and simple patterns. 	 Shapes and Simple Symmetry. Recognising and drawing simple 3D shapes (cube, sphere) and identifying basic 	 Introduction to Probability: Simple probability with coin flips and dice rolls. 	transformations (reflection, rotation).	combinations and predicting outcomes of simple events.	shapes and the volume of 3D shapes (e.g., cubes, rectangular prisms).	and similarity, exploring reflections, rotations, and translations the coordinate plane.	in problems involving right triangles. • Basic Triangemetry: Introduction to sine, cosine, and tassient	equations and inequalities graphically and algebraically.	mean, and standard deviation.	algorithms.	including induction and contradiction, with applications in various fields like abstract alrebra and topology.
		symmetry.				•Introduction to Algebraic Thinking: Solving simple equations	Introduction to Functions: Exploring linear functions and	in right triangles.				
						and introducing variables as preparation for algebra in an	graphing them on the coordinate plane.					
						UNDOWN DAME.						Consists Mad McCourt MA