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Whole School Approach to Mathematics

At Anula Primary School we believe that the teaching and learning of Mathematics is a whole school commitment.

Our school believes the following about the teaching and learning of mathematics:

- Timetabled daily
- Students must have access to concrete materials
- It must cater for all abilities and diversities including EAL/D learners
- It should allow all students to be successful when accessing the Australian Curriculum Achievement Standards
- Student data and assessment is used and monitored
- It should involve whole class teaching, small group teaching, individual instruction, independent learning, guided learning, Investigations and continual practice
- It should be linked authentically to other curriculum areas where appropriate
- Students should be exposed to a range of contextualised problems
- Proficiencies are incorporated

PEDAGOGICAL FRAMEWORK

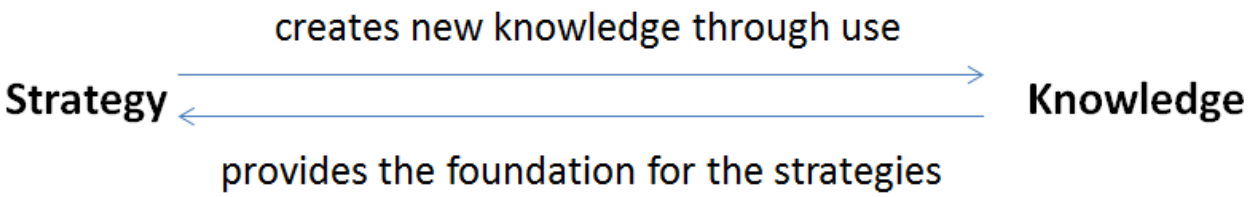
Anula follows the Australian Curriculum (Version 8.4) to inform our programming and assessing. The Meaningful Maths pedagogy (NZ Maths) guides teachers on how to explicitly deliver Mathematics in their classroom. Anula is part of a professional network of schools that work closely together to provide professional development for teachers who follow the NZ Pedagogy, with an NT twist. This approach is referred to as Meaningful Maths (M2).

The Number Framework is broken up into two main areas – Number Knowledge and Number Strategies

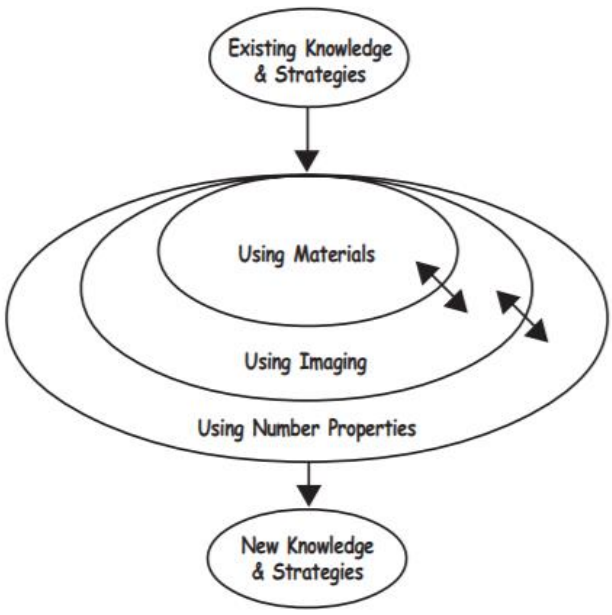
Number Knowledge
This is the knowledge about the number system including numeral identification, number sequences and place value; and basic number facts using the four operations.

Number Strategies
This is the knowledge of mental and written strategies used to perform calculations.

In Meaningful Maths, we believe that this targeted approach creates new 'Knowledge' and provides the foundation for a range of 'Strategies'.



Teachers at Anula Primary School ascertain students existing knowledge and strategies before introducing concepts. Teachers follow a progression from "Using Materials" to introduce new learning to "Using Imaging" by masking materials and asking anticipatory questions. Students require opportunities to develop increasingly difficult number strategies and this forms part of the teacher's explicit teaching.



The Strategy Framework is describes the strategies students use to solve number problems in each of three operational domains. Students' progress through these stages as they become better at solving number problems. The stages are identified below:

			Addition Subtraction	Multiplication Division	Proportions Ratios
Counting	Zero	Emergent			
	One	One-to-one Counting			
	Two	Counting from One on Materials			
	Three	Counting from One by Imaging			
	Four	Advanced Counting			
Part-Whole	Five	Early Additive Part-Whole			
	Six	Advanced Additive– Early Multiplicative Part-Whole			
	Seven	Advanced Multiplicative– Early Proportional Part-Whole			
	Eight	Advanced Proportional Part-Whole			

What does this look like in the classroom?

- Children taught in smaller groups
- Greater emphasis on developing mental strategies
- Discussion is encouraged
- Teachers question for thinking
- Children record their mathematics in a variety of ways
- Less use of text books – teacher to use modelling books
- Teachers and children use a variety of concrete materials
- Visible Learning Intentions and Success Criteria
- The language of MM is understood by teachers and students – e.g. stages, naming a strategy etc.

PROGRAMMING EXPECTATIONS

At Anula Primary School we use the Australian Curriculum to guide our programming and planning and assessment and reporting. Meaningful Maths is used as the method or pedagogy within our school. Alignments between the Australian Curriculum and Meaningful Maths can be found on the portal.

All non-negotiable components (see below) are expected to be evident in programs and classrooms.

Teachers are expected to:

- Use Anula's Mathematics Planning Template
- Evaluate the previous terms teaching – what went well, challenges and where to next?
- Include relevant Whole School Data focus' and Tracker Students
- Incorporate Student Data and Groupings – JAM, GLoSS and IKAN
- Identify student learning needs and goals
- Include specific year level/s Australian Curriculum Achievement Standards, Yearly Overview, Unit Rational, Specific Year Level Proficiencies and Classroom Routines
- Have a detailed Term Overview

NON-NEGOTIABLES

The following non-negotiables should be evident in your classroom:

- Displayed Learning Intentions and Success Criteria
- A Task Board outlining group activities
- Group Boxes which include materials, activities and stationery
- Modelling Book to record the learning intentions and success criteria as well as evidence of explicit teaching and recording
- Rotations – students are grouped at developmental level with appropriate knowledge and strategy activities
- Readily available concrete materials to facilitate the teaching and learning
- All assessments carried out as per Anula Assessment Timelines for each year level.
  - Typically, the Early Years will conduct a JAM Assessment and the Primary Years will conduct a GloSS Assessment to ascertain students Strategy stage.
  - Students who are working at Stage 4 and above complete an IKAN Assessment to ascertain their Knowledge stage
- Teachers use the provided planning templates (Early Years and Primary Years)

ANULA PRIMARY WHOLE SCHOOL MATHEMATIC SCOPE AND SEQUENCE

At the beginning of the year planning teams will use the Anula Curriculum Overview (developed by Gunbalunya School) to determine what will be taught each term. This map must be included in teacher programs.

A copy of these are found here:

Transition Templates

Year 1 Templates

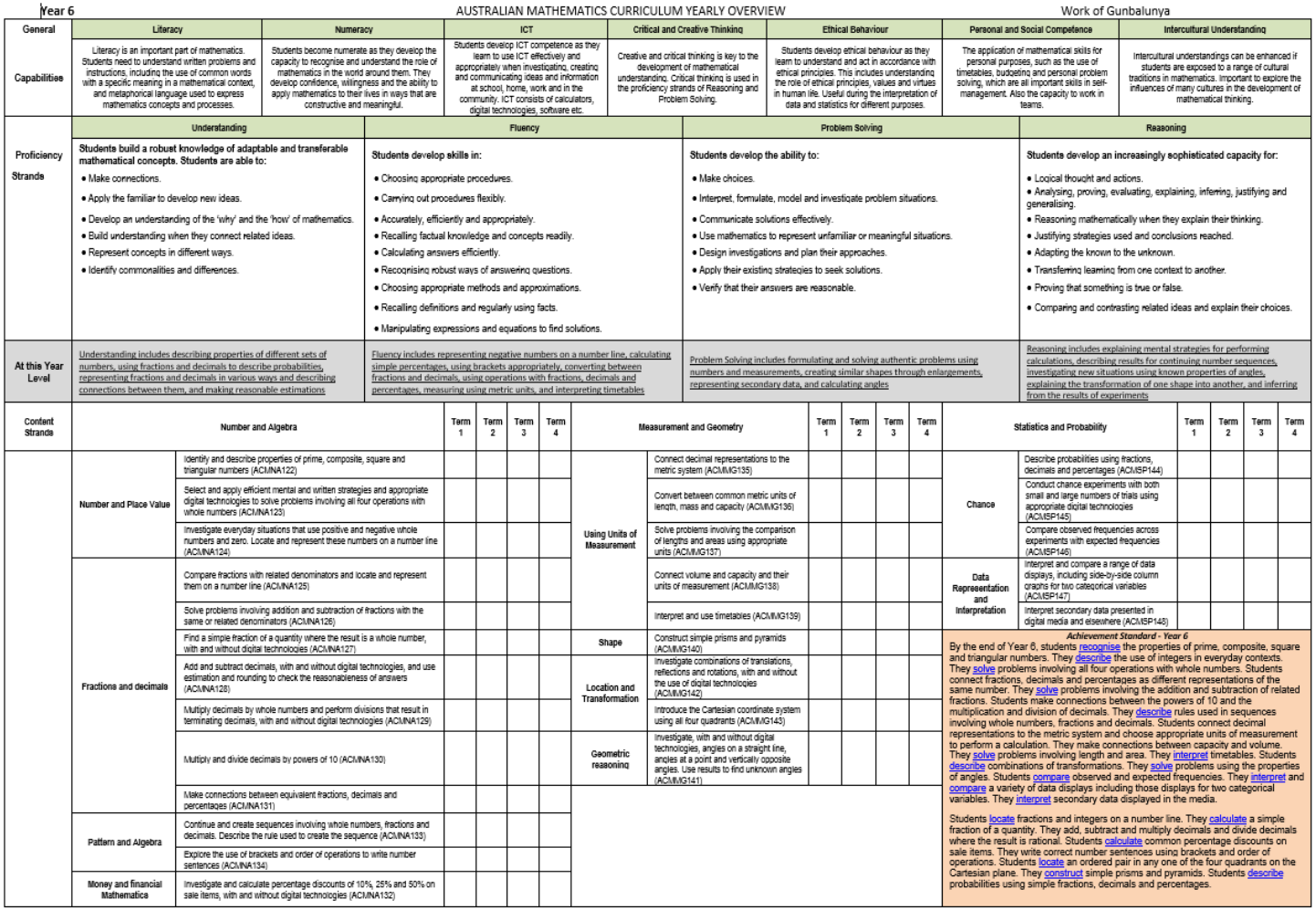
Year 2 Templates

Year 3 Templates

Year 4 Templates

Year 5 Templates

Year 6 Templates



Year 6 — AUSTRALIAN MATHEMATICS CURRICULUM YEARLY OVERVIEW — Work of Gunbalunya

General Capabilities	Literacy	Numeracy	ICT	Critical and Creative Thinking	Ethical Behaviour	Personal and Social Competence	Intercultural Understanding
	Literacy is an important part of mathematics. Students need to understand written problems and instructions, including the use of common words with a specific meaning in a mathematical context, and metaphorical language used to express mathematics concepts and processes.	Students become numerate as they develop the capacity to recognise and understand the role of mathematics in the world around them. They develop confidence, willingness and the ability to apply mathematics to their lives in ways that are constructive and meaningful.	Students develop ICT competence as they learn to use ICT effectively and appropriately when investigating, creating and communicating ideas and information at school, home, work and in the community. ICT consists of calculators, digital technologies, software etc.	Creative and critical thinking is key to the development of mathematical understanding. Critical thinking is used in the proficiency strands of Reasoning and Problem Solving.	Students develop ethical behaviour as they learn to understand and act in accordance with ethical principles. This includes understanding the role of ethical principles, values and virtues in human life. Useful during the interpretation of data and statistics for different purposes.	The application of mathematical skills for personal purposes, such as the use of timetables, budgeting and personal problem solving, which are all important skills in self-management. Also the capacity to work in teams.	Intercultural understandings can be enhanced if students are exposed to a range of cultural traditions in mathematics. Important to explore the influences of many cultures in the development of mathematical thinking.

Proficiency Strands	Understanding	Fluency	Problem Solving	Reasoning
	Students build a robust knowledge of adaptable and transferable mathematical concepts. Students are able to: • Make connections. • Apply the familiar to develop new ideas. • Develop an understanding of the 'why' and the 'how' of mathematics. • Build understanding when they connect related ideas. • Represent concepts in different ways. • Identify commonalities and differences.	**Students develop skills in:** • Choosing appropriate procedures. • Carrying out procedures flexibly. • Accurately, efficiently and appropriately. • Recalling factual knowledge and concepts readily. • Calculating answers efficiently. • Recognising robust ways of answering questions. • Choosing appropriate methods and approximations. • Recalling definitions and regularly using facts. • Manipulating expressions and equations to find solutions.	**Students develop the ability to:** • Make choices. • Interpret, formulate, model and investigate problem situations. • Communicate solutions effectively. • Use mathematics to represent unfamiliar or meaningful situations. • Design investigations and plan their approaches. • Apply their existing strategies to seek solutions. • Verify that their answers are reasonable.	**Students develop an increasingly sophisticated capacity for:** • Logical thought and actions. • Analysing, proving, evaluating, explaining, inferring, justifying and generalising. • Reasoning mathematically when they explain their thinking. • Justifying strategies used and conclusions reached. • Adapting the known to the unknown. • Transferring learning from one context to another. • Proving that something is true or false. • Comparing and contrasting related ideas and explain their choices.
At this Year Level	Understanding includes describing properties of different sets of numbers, using fractions and decimals to describe probabilities, representing fractions and decimals in various ways and describing connections between them, and making reasonable estimations	Fluency includes representing negative numbers on a number line, calculating simple percentages, using brackets appropriately, converting between fractions and decimals, using operations with fractions, decimals and percentages, measuring using metric units, and interpreting timetables	Problem Solving includes formulating and solving authentic problems using numbers and measurements, creating similar shapes through enlargements, representing secondary data, and calculating angles	Reasoning includes explaining mental strategies for performing calculations, describing results for continuing number sequences, investigating new situations using known properties of angles, explaining the transformation of one shape into another, and inferring from the results of experiments

Content Strands	Number and Algebra		Term 1	Term 2	Term 3	Term 4
	Number and Place Value	Identify and describe properties of prime, composite, square and triangular numbers (ACMNA122)				
		Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers (ACMNA123)				
		Investigate everyday situations that use positive and negative whole numbers and zero. Locate and represent these numbers on a number line (ACMNA124)				
	Fractions and decimals	Compare fractions with related denominators and locate and represent them on a number line (ACMNA125)				
		Solve problems involving addition and subtraction of fractions with the same or related denominators (ACMNA126)				
		Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies (ACMNA127)				
		Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128)				
		Multiply decimals by whole numbers and perform divisions that result in terminating decimals, with and without digital technologies (ACMNA129)				
		Multiply and divide decimals by powers of 10 (ACMNA130)				
		Make connections between equivalent fractions, decimals and percentages (ACMNA131)				
	Pattern and Algebra	Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence (ACMNA133)				
		Explore the use of brackets and order of operations to write number sentences (ACMNA134)				
	Money and financial Mathematics	Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies (ACMNA132)				

Measurement and Geometry		Term 1	Term 2	Term 3	Term 4
Using Units of Measurement	Connect decimal representations to the metric system (ACMMG135)				
	Convert between common metric units of length, mass and capacity (ACMMG136)				
	Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)				
	Connect volume and capacity and their units of measurement (ACMMG138)				
	Interpret and use timetables (ACMMG139)				
Shape	Construct simple prisms and pyramids (ACMMG140)				
Location and Transformation	Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies (ACMMG142)				
	Introduce the Cartesian coordinate system using all four quadrants (ACMMG143)				
Geometric reasoning	Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles (ACMMG141)				

Statistics and Probability		Term 1	Term 2	Term 3	Term 4
Chance	Describe probabilities using fractions, decimals and percentages (ACMSP144)				
	Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies (ACMSP145)				
	Compare observed frequencies across experiments with expected frequencies (ACMSP146)				
Data Representation and Interpretation	Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)				
	Interpret secondary data presented in digital media and elsewhere (ACMSP148)				

Achievement Standard - Year 6

By the end of Year 6, students recognise the properties of prime, composite, square and triangular numbers. They describe the use of integers in everyday contexts. They solve problems involving all four operations with whole numbers. Students connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students make connections between the powers of 10 and the multiplication and division of decimals. They describe rules used in sequences involving whole numbers, fractions and decimals. Students connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation. They make connections between capacity and volume. They solve problems involving length and area. They interpret timetables. Students describe combinations of transformations. They solve problems using the properties of angles. Students compare observed and expected frequencies. They interpret and compare a variety of data displays including those displays for two categorical variables. They interpret secondary data displayed in the media.

Students locate fractions and integers on a number line. They calculate a simple fraction of a quantity. They add, subtract and multiply decimals and divide decimals where the result is rational. Students calculate common percentage discounts on sale items. They write correct number sentences using brackets and order of operations. Students locate an ordered pair in any one of the four quadrants on the Cartesian plane. They construct simple prisms and pyramids. Students describe probabilities using simple fractions, decimals and percentages.

ASSESSMENT

Each student from Transition – Year 6 will complete the following assessments:

JAM
The JAM assesses the achievement of a student in typically from Transition to Year 2. The assessment consists of 11 modules. Each module can be used as a separate assessment, or the modules can be combined to provide a broader assessment. Teachers will need to use the Keynote (digital assessment) and select the modules that are relevant to the needs of their students. The Algebra, Geometry and Measurement modules do not assess all concepts in these strands. All modules (except Patterns and Algebra and Measurement) need to be completed every semester.

GloSS
The GloSS assessment is used to determine the student's stage for all three strategy domains. For stages 5-8 students can be rated as either early or at that stage. There are four versions of the interview:

- Odd Years – GloSS 1 in Semester 1 and GloSS 2 in Semester 2
- Even Years – GloSS 3 in Semester 2 and GloSS 4 in Semester 2

For each form there is an interview book and a set of student cards. Typically, students in Year 3 to Year 6 will be assessed with a GloSS assessment.

IKAN
The IKAN is used to determine a student's stages (Stage 4 and beyond) on the knowledge domains. There are four versions of the IKAN:

- Term 1 – IKAN 1
- Term 2 – IKAN 2
- Term 3 – IKAN 3
- Term 4 - IKAN 4

Other:

All data must be recorded in GradeXpert.

In addition to the school wide requirements teachers develop and use classroom summative and formative assessments to inform teaching. Summative assessments to be uploaded each term into the Assessments Folder.

IMPLEMENTATION

Class Organisation:
From analysis of assessment data (GLoSS & IKAN, JAM, PAT) students are grouped into developmental ability for group teaching and to identify areas requiring more work and/or extension.

A Typical Lesson:
Daily Mathematics sessions will include whole-class, group teaching (practise and extension) and individual practise that meets the various ability levels within the class. Concrete material must be available to students at all times (T-6) and used to introduce new concepts.

Monday	Tuesday	Wednesday	Thursday	Friday
Tuning In/Reflection Hot Spot Whole-class teaching Reflection	Tuning In/Reflection Hot Spot Group work Reflection	Tuning In/Reflection Hot Spot Group work Reflection	Tuning In/Reflection Measurement and Geometry Strand Reflection	Tuning In/Reflection Statistics and Probability Strand Reflection

Tuning In (2 minutes): Learning Intention and Success Criteria

Hotspot (5-10 minutes): A hotspot is in essence a Warm Up activity (number knowledge activity) prior to your lesson. It is encouraged to use the analysis of assessment data (including informal) to provide a relevant hotspot to launch into a lesson. Historically, have done poorly in i.e. problem solving.

Problem Solving: We believe that by solving problems students get a much better feel for what mathematics is all about, what it can do and how it does it. The term 'problem solving' means finding solutions and not just answers to mathematical problems. A written problem is given twice a week: in primary this could be a question from NAPLAN that students complete. Problem Solving books are available in the library or on the NZ Maths website.

Whole-class (40 minutes): This is where students are explicitly taught a concept at the beginning of the week and consolidated through the remainder of the week. Students can be 'peeled off' and continue individual or paired work that provides practise and extension to concept, whilst teacher scaffolds for remaining students. This approach is to ensure that all students have an opportunity to be exposed to year level curriculum.
OR
Group Work (15-20 minute rotations): Teacher explicitly teaches a group of students at same developmental level on concept taught on Monday. Independent group activities may consist of but not limited to:

- Games related to concept
- Strand based activities
- Practise number knowledge and basic number facts
- Card/dice games
- Problem solving/rich task/Figure It Out
- Revision from previous terms
- ICT – iPad, computer.

It is important that students are familiar with the task and process. Change activities each week to reflect the learning and maximise engagement.

Reflection: occurs at the beginning of a lesson, during the lesson and at the end of the lesson and will inform future lessons. This is an opportunity to collect formative assessment and reflect on your LI and SC.

RESOURCES

Teachers are encouraged to use the following websites to assist their understanding of Meaningful Maths.

NZ Maths Website - http://www.nzmaths.co.nz/

Meaningful Maths Aligned to the Australian Curriculum
http://web.ntschools.net/w/ntnzmathsacalignment/Pages/default.aspx

Concrete Resources:
Each class will be given a resource box at the beginning of the year. It is the teacher's responsibility to return the box at the end of the year with all items.

Additional resources are available for Early Years classes only in Area 1 resource room and the WLA resources are also useful. Primary resources are available in the compactors located in the library. (Early Years can also access these items).

All teachers are allocated a support staff that will make additional resources at the teacher's request. These resources belong to the school.

Information and Communication Technology:
ICT is used to support teaching and to motivate children's learning. ICT available includes computers, iPads, calculators and interactive whiteboard. Note that ICT does not replace the use of concrete material.

Other
In addition to this, the Meaningful Maths Network have a calendar of events such as Inductions, Workshops and New Zealand Maths Consultants that will be offered throughout the year to support new and existing staff.