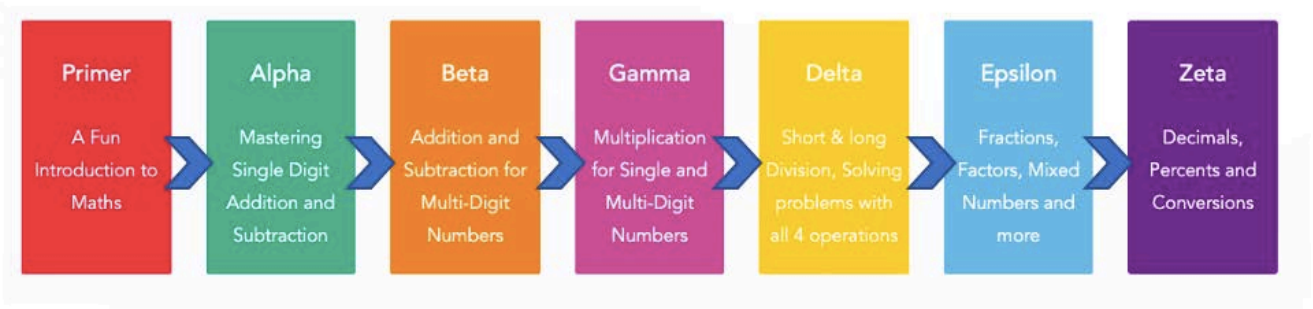
MASTERY APPROACH VS. SPIRAL APPROACH

Maths Australia recommends a sequential & mastery based approach to maths instruction. This approach is considered essential for students requiring intervention, and is also highly effective for all students where maths mastery is the desired outcome.

Each level of 'Math-U-See' focuses on mastery of a particular maths operation and uses our unique multi sensory approach to develop each student's foundational understanding & application.

As such, our focus is on addressing the student's current level of mastery, and progressing from there (hence our use of non-grade titles for each level offered).



The diagram below provides an overview of our recommended approach, and of how this relates to the national curriculum. Students using our methodology will master material within one year (or less) that is only addressed over several years within the national curriculum's spiral approach.

For example, Gamma Level may be completed by a year 3 student (or by any student of any age who has mastered addition and subtraction). In this level, the student will master multiplication and it's application, beginning at single digit and progressing to multi digit multiplication to develop a deep understanding of the when, how, why, what and where of multiplication. Within the national curriculum, this same content is introduced in Year 1 and only completed in Year 8, amidst all sorts of other mathematical concepts.

Math U See Level	F	1	2	3	4	5	6	7	8
Primer	•	•	•	•					
Alpha	•	•	•	•					
Beta	•	•	•	•	•	•	•		
Gamma		•	•	•	•	•	•	•	
Delta			•	•	•	•	•	•	•
Epsilon			•	•	•	•	•	•	•
Zeta				•	•	•	•	•	•

KEY

•	Addresses concepts at this year level
	Heavily addresses concepts at this year level
	Moderately addresses concepts at this year level
	Minimal concepts addressed at this year level

The following pages will also delve further into the topics that are mastered throughout the Math-U-See program as well as the alignment with the National Australian Curriculum.

Primer

	Australian Curriculum Year Level								
Math U See Level	**F**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Primer	●	●	●	●					

Primer is the beginning level in the Math-U-See program and heavily covers the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area across Foundation and Year 1. The major focus is on the content descriptors located in *Number and Place Value* and *Patterns and Algebra.*

Primer introduces students to the concept of number by making connections between number names, numerals and counting up to 20. Once students are confident with number recognition they are introduced to place value, simple addition and skip counting by using common everyday examples/objects (fingers, toes, coins).

Primer also covers content in the **Measurement and Geometry** strand relating to the content descriptors focused on *Shape* and *Using units of Measurement.* Students are required to group objects based on common characteristics and sort shapes and objects (rectangles, circles, triangles and squares). The unit of measurement introduced at the Primer level is time. With Math-U-See based on foundational mastery and sequential learning the approach to teaching students the concept of time is different to the sequence suggested in the Australian Curriculum. The Primer level demonstrates that once a student has mastered skip counting by fives, they are ready to learn how to tell the time with minutes and hours.

Primer also touches on the **Statistics and Probability** strand as a lesson is provided on tally marks, preparing students to collect, check and classify data.

Number and Algebra	**Measurement and Geometry**
• Number recognition • Writing numerals • Place value • Counting to 20 • Missing numbers in a pattern • Comparison of amount (longer, shorter, lighter, heavier, bigger, smaller, more, less) • Vertical Addition of single-digit numbers • Counting to 100 • Skip counting by 5s and 10s • Addition of 10s and 100s • Number bonds to 10 • Introduction to Subtraction	• Common 2D Shapes: - circles - triangles - squares - rectangles • Telling time with minutes and hours • Area (brief introduction) **Statistics and Probability** • Tally marks

Alpha

Math U See Level	Australian Curriculum Year Level								
	F	1	2	3	4	5	6	7	8
Alpha	●	●	●	●					

Alpha level heavily covers the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area across Foundation, Year 1 and Year 2. The major focus is on the content descriptors located in *Number and Place Value* and *Patterns and Algebra.*

Alpha level has a heavy focus on developing student's understanding of place value and partitioning, which is a necessity to function in the decimal system. The program's manipulatives are introduced at this level and student's are taught to develop confidence with number sequences to and from 100, including skip counting by 2s, 5s and 10s. Along with teaching students single-digit addition and subtraction and how they relate to one another, this level is very explicit in developing student's skills and strategies to problem solve, such as, understanding commutative properties, doubling and identifying the number bonds of 10.

Alpha also covers content in the **Measurement and Geometry** strand relating to the content descriptor focused on *Shape.* Students are introduced and are able to explore the obvious features of common 2D shapes; circles, triangles, rectangles and squares.

Number and Algebra	Measurement and Geometry
• Place value • Partitioning • Counting to 20 • Addition of single-digit numbers • Counting on • Commutative properties of addition • Counting to 100 • Subtraction of single-digit numbers • Relationship between addition and subtraction • Identify the missing element • Skip counting by 2s, 5s and 10s • Number bonds to 10 • Problem solving strategies • Doubling	• Common 2D Shapes: - circles - triangles - squares - rectangles

Beta

Math U See Level	Australian Curriculum Year Level								
	F	1	2	3	4	5	6	7	8
Beta	●	●	●	●	●	●	●		

Beta level continues to cover the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area mainly addressing concepts across Year 2, Year 3 and Year 4. The major focus is on the content descriptors located in *Number and Place Value* and *Money and Financial Mathematics.*

Beta level has a heavy focus on further developing student's understanding of the relationship between addition and subtraction, whilst introducing the concepts of regrouping (carrying and borrowing). Skip counting continues to be developed at this level, but this time with an emphasis on working with money. The decimal point is also introduced in conjunction with dollars and cents. Students are made aware of the important strategy of rounding and estimating and are encouraged to continue to utilise this skill throughout the program.

Beta also covers content in the **Measurement and Geometry** strand relating to the content descriptor focused on *Using units of measurement.* The measurement of time, length and temperature are explored, exposing students to the different units of measurement that are used and raising their awareness of conversion between units.

The **Statistics and Probability** strand is also covered with a focus on *Data representation and interpretation,* introducing students to the concept of collecting information and representing this through a graph for ease of interpretation.

Number and Algebra	Measurement and Geometry
• Place value (thousands) • Word problems • Rounding • Estimation • Addition of multiple digits • Regrouping (carrying and borrowing) • Money • Decimal point • Subtraction of multiple digits • Relationship between addition and subtraction • Skip counting by 2s, 5s and 10s • Problem solving strategies	• Time (hours and minutes) • Temperature • Length (centimetre and metre) (perimeter and millimetre) **Statistics and Probability** • Bar graphs • Line graphs • Tally marks

Gamma

Math U See Level	Australian Curriculum Year Level								
	F	1	2	3	4	5	6	7	8
Gamma									

Gamma level is the 'multiplication level' as it heavily focuses on the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area mainly addressing concepts across Year 3, Year 4 and Year 5. The major focus is on the content descriptors located in *Number and Place Value* and *Patterns and Algebra.*

Gamma introduces the concept of multiplication with an approach that covers the proficiency strands *Understanding* and *Fluency.* Although multiplication facts are introduced independent of each other it is unlike the old rote 'times tables approach'. The concept of skip counting is the foundation, along with the understanding of the connection between repeated addition and multiplication facts. The more familiar and confident students become with these approaches the more fluent they will become with recalling multiplication facts. The concept of commutative properties also assists students to not become overwhelmed with learning multiplication facts. The use of the Math-U-See manipulatives and the factors/products rectangle concept adds another dimension of understanding and builds depth to ensure the *Reasoning* proficiency strand is also covered. As does the concept of equivalent fractions along-side multiplication/skip counting).

Mathematical terms are introduced to students from the very beginning (eg. factors, products, commutative property, distributive properties) which assists with students having the ability to explain their reasoning and provides opportunities to use the language in everyday relevant circumstances (rather than just for testing preparation).

Gamma also covers content in the **Measurement and Geometry** strand relating to the content descriptor focused on *Using units of measurement.* The Year 4-5 concepts of area are introduced (in relation to multiplication facts) which again lends to the proficiency strands *Understanding* and *Reasoning.* Relating mathematical understandings across mathematical strands is very important. The units of measurement Litre, Centimetre, Metre, Kilometre, Kilogram and Tonne are explored along with connecting decimal representations to the metric system.

<table>
<tr><th colspan="2">Number and Algebra</th></tr>
<tr><td>• Multiplication facts
• Skip counting
• Factors and products
• Commutative properties
• Solving for the unknown (preparing for division and basic algebra)
• Equivalent fractions
• Double digit
• Multiple digit multiplication (2 by 1 digits) – distributive properties
• Multiplication by multiples of 100</td><td>• Australian currency (100 cents to a dollar)
• Multiple digit multiplication
• Prime and composite numbers
• Rounding
• Place value through to the millions</td></tr>
<tr><td></td><td>Measurement and Geometry</td></tr>
<tr><td></td><td>• Area of a rectangle
• Litres
• Converting units of measurement (cm-m, kg-t)
• Kilo = 1000</td></tr>
</table>

Delta

Math U See Level	Australian Curriculum Year Level								
	F	1	2	3	4	5	6	7	8
Delta									

Delta level is the 'division level' as it heavily focuses on the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area mainly addressing concepts across Year 4 and Year 5. The major focus is on the content descriptors located in *Number and Place Value* and *Patterns and Algebra.*

Delta introduces the concept of division building on from the multiplication lessons covered in the Gamma level. Division is described to students as trying to find the missing factor and it is most important that students have mastered multiplication facts before commencing with the Delta level. Along with the different symbols to represent division, this level ensures students also are familiar with the language that assists with recognising division is required (eg. Divided by, how many threes can I count in nine?, two times what is the same as twelve? etc). Toward the end of the level the notion of long division (referred to as dividing with double digit factors) is covered in a way that allows students to demonstrate their understanding, their ability to problem solve and explain their reasoning (all important *Proficiency strands* as required in the Australian Curriculum). The beginning level of fractions is also introduced in this level.

Delta also covers content in the **Measurement and Geometry** strand across Years 5-7 relating to the content descriptor focused on *Using units of measurement* by establishing the formulas for areas of rectangles, triangles and parallelograms and use these in problem solving. Another content descriptor covered is *Geometric reasoning* with a focus on parallel and perpendicular lines and the properties of triangles and parallelograms. Volume is also introduced at this level.

Number and Algebra	**Measurement and Geometry**
• Multiplication facts • Skip counting • Factors and products • Division facts • Solving for the unknown • Language and common terms • Long division • Expanded notation • Division with remainders • Fractions (basic concept) • Roman Numerals	• Area of a parallelogram, triangle, trapezium • Parallel and perpendicular lines • Volume • Converting (mm-cm) **Statistics and Probability** • Calculating the mean (average)

Epsilon

Math U See Level	Australian Curriculum Year Level								
	F	1	2	3	4	5	6	7	8
Epsilon									

Epsilon is the 'fractions' level and focuses on the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area mainly addressing concepts across Year 5, Year 6 and Year 7. The major focus is on the content descriptors located in *Fractions and Decimals / Real Numbers.*

Epsilon begins with ensuring students understand that fractions are equal parts of a whole, and use the Math-U-See manipulatives to transfer this understanding. Students at this level should be very familiar with the concept that the green block represents *one*, so using this understanding Epsilon introduces the overlays (breaking the one block into equal parts). The important concept of understanding the line separating the numerator and denominator symbolises division, assists students to truly understand the function of fractions. Until students are competent with division they should not be introduced to fractions (hence the importance of students mastering the Delta level prior to commencing Epsilon).

This level then continues to demonstrate how to problem solve using fractions. Rather than just simply providing rules to follow when adding, subtracting, multiplying or dividing fractions, Epsilon level provides the visual breakdown to demonstrate not only the 'how' to work with fractions, but also develops students understanding of the 'why' we work it out this way. This builds an indepth understanding of the function of fractions, which then provides students with a solid base to move into working with decimals and percentages (covered in the next level, Zeta).

Although Epsilon is mainly focused on the concept of fractions there are a few levels that further introduced students to algebra. The areas covered address the *Patterns and Algebra* content descriptors at the Year 7 level.

Epsilon also covers content in the **Measurement and Geometry** strand reviewing some areas introduced at earlier levels. However, the Year 8 concept of investigating the relationship between features of circles such as circumference, area, radius and diameter is introduced.

Number and Algebra	
• Fractions • Addition and subtraction of fractions • Equivalent fractions • Multiplying and dividing fractions • Common factors • Simplifying fractions • Mixed numbers • Improper fractions • Addition of mixed numbers • Subtracting mixed numbers	• Dividing and multiplying missed numbers • Multiplication of three fractions • Solving for an unknown (algebra) • Fractions / Decimals / Percentages • Multiplicative inverse / additive inverse • Coefficient
	Measurement and Geometry
	• Area and circumference • Properties of a circle

Zeta

Math U See Level	Australian Curriculum Year Level								
	F	1	2	3	4	5	6	7	8
Zeta									

Zeta level focuses on the **Number and Algebra** strand in the Australian Curriculum Mathematics Learning Area mainly addressing concepts across Year 6 and Year 7. The major focus is on the content descriptors located in *Fractions and Decimals / Real Numbers.*

Zeta begins with the concept of decimals and how they relate to the place value system. After the concept of tenths and hundredths is covered students are then introduced to decimals being expressed as fractions. This allows students to enhance their understanding of decimals and fractions both representing parts of a whole (building on the previous level Epsilon which focused heavily on fractions). Expanded notation is also introduced to assist with the partitioning of decimals and how they relate to fractions. Percentages are then introduced by using the Math-U-See overlays to assist students to understand that a whole can be divided into 100 equal parts. By relating percentages to fractions and then to decimals students begin to understand how the three can be applied, how they relate and the equivalents across all areas. Once understood students are then required to multiply and divide decimals and problem solve using fractions and percentages. Toward the end of this level Algebraic expressions are further explored, preparing students for the harder mathematical concepts in Years 8 -10.

Zeta level also covers content in the **Measurement and Geometry** strand across Years 6-7 relating to the content descriptor focused on *Using units of measurement* by delving further into the metric system by connecting decimal representation to the metric system and converting between units of measurement. The Year 8 concept of investigating the relationship between features of circles such as circumference, area, radius and diameter are also covered.

The **Statistics and Probability** strand is also covered by the Zeta level with a focus on data representation, probability and determining the mean, median and mode all concepts which are required to be covered in Year 6 and Year 7.

Number and Algebra	Measurement and Geometry
• Indices • Decimal place value • Expanded notation • Addition/subtraction of decimals • Decimals and fractions • Finding percentages • Multiplying decimals • Algebra (coefficient) • Division of and by decimals	• Origin of the metric system • Converting units of measurement • Angles • Area and circumference • Properties of a circle
	Statistics and Probability
	• Pie graph • Mean, median and mode • Probability

Shannon Russell
Education Consultant

Shannon Russell has 10 years of experience in the Education system. Throughout her career she has worked as a classroom teacher, a Principal in remote schools and as a consultant with the Assessment and Reporting team in the Department of Education and Children's Services. One of her main responsibilities as a consultant was to align the NAPLAN assessment items to the Australian Curriculum. This assisted teachers throughout the Northern Territory to identify areas in which students require further support. In 2013, Shannon formed her private business 1 to 1 Darwin Tutoring Services.

"I first contacted Esther because I was searching for a numeracy program that provided students with the opportunity to not only learn '**how'** to do math, but explained '**why'**.

Many of my students attend tutoring knowing how to complete basic problems, but are unable to explain **what** they are doing and **why** this is the way to solve the problem. The biggest issue for students is their lack of understanding of *place value.* This is where I believe Math-U-See addresses and rises above other programs. The *Decimal Street* concept is the best explanation I have come across yet. Students respond in such a positive way and just cannot get enough. Their parents have nothing but thanks and praise for the change in their child's attitude toward math and I give full credit to this program.

Throughout the last few months I have been aligning the program to the Australian Curriculum. The progression of Math-U-See is quite different to the progression of the National Mathematic Curriculum, so it is very important that clients ensure they are addressing the required areas.

What we have found is that the concepts covered in each level of Math-U-See are spread across several year levels. We are in the process of creating a lesson by lesson alignment document for each level of the program, as well as a Year Level document listing each of the content descriptions from the curriculum and indicating in which lesson this concept is addressed. These documents will assist clients to easily demonstrate:

- which curriculum areas they have addressed
- how they have addressed them, and
- how they have successfully assessed their student's acquisition of this concept.

It is evident that the Math-U-See program will actually see students progressing their mathematical understandings in the Number and Algebra substrand ahead of the expectations of the Australian Curriculum."

MATHS AUSTRALIA