



The Wilkie Way

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Planning a Whole School Mathematics Programme

Planning a comprehensive mathematics programme that follows the key learning progressions across all strands is a huge task for most schools. Why should each school have to work from “scratch” and why should we have to wait for a curriculum rewrite to set out what students should be able to do, know and understand?

Mathematics is probably the easiest of the curriculum learning areas to set out in a progression as mathematics learning is essentially hierarchical - you cannot work with numbers higher than 100 until you know the names and symbols for these numbers, until you understand how numbers work and what you can do with them - joining, separating, sequencing, grouping, sharing.

The challenge for teachers is knowing all the little bits of learning from 8 different progressions that need to be experienced and connected for students to make sense of mathematics and to be able to use and communicate their mathematics across other learning areas and every day life.

Another challenge is finding appropriate learning experiences. We are very lucky to have NZMaths as a resource but first you must know when and why you are using a particular unit or activity.

Over the last few years in working with schools and identifying their specific needs I have developed a set of comprehensive planning documents for Wilkie Way membership schools to use and amend to meet their specific organisational and school setting needs. In the planning folder on the directory are further folders labeled Year 1 & 2, Year 3 & 4, Year 5 & 6 and Year 7 & 8. In each folder are more folders.

Folder 1:

A one year coverage plan for year 1 and a one year coverage plan for year 2 - the strands are blocked but the number units depend on student progress within the class.

A two year curriculum coverage plan - year 3 & 4 year 5& 6 year 7 & 8

The eight unit blocks can be rearranged as number and algebra are on going with just a shift in focus. These plans can be used for a wider year group range with adjustments made to the next level of planning.

Folder 2:

A unit plan for each term - giving the curriculum links, the key concepts and key knowledge to be developed and broad learning outcomes for the unit.

(This is the plan that outlines what is expected to be taught in the the term. If the teacher leaves for any reason and a new teacher starts then this is the plan they should be given so they know what is expected in that class. These plans provide the consistency and continuity across the school.)

Folder 3:

All other information for building teacher knowledge to understand the what and why of the curriculum content. This draws from curriculum elaborations, learning progressions as well as my own professional understanding of the teaching and learning of primary mathematics.

Sitting outside the folders I have recently added the detailed learning outcomes for weekly and daily planning. One set for a focus on additive thinking and another set for a focus on multiplicative thinking. Both sets include a focus on patterns and relationships and using symbols and expressions.

Folder 4

Student tracking sheets

There are two sheets for each curriculum level and as students gradually move from one sheet to the next there will be a time when they have items highlighted on two sheets.

You DO NOT need to assess a student before highlighting a statement but use your professional judgment and your observations of the students to decide whether you think yes they do know or can do - every student will forget and need reminding of what they already know.

These tracking sheets can be passed on to the next teacher to give them an idea of what knowledge and skills the students should have and can be reminded they have.

This gives a teacher far more information than a number that has been entered into a student management system.

Early Level 2 - Mid Level 2		
		
Name _____		
Class _____		Date Started _____
Number & Algebra	Geometry & Measurement	Statistics
Recalls doubles & halves to 20	Recognises & names regular and irregular 2D shapes	With assistance:
Uses doubles to recall near double addition facts	(Including but not limited to: square, circle, triangle, oblong, pentagon, hexagon, octagon)	Poses and answer questions based on a pictograph or bar chart
Recalls addition & subtraction facts within 10	Recognises & names common 3D shapes (Including but not limited to: cube, cuboid, cylinder, cone)	Identifies the data to be collected to answer a specific questions
Knows addition & subtraction patterns based on facts to 10	Recognises and names common features: corner, edges, faces	Uses a tally chart to collect data
Expands a two digit number into tens and ones	Creates patterns using reflective symmetry	Creates a pictograph
Gives the number of groups of ten in a two digit number	Identifies left & right	Uses sorting tools – Venn diagrams & Carroll Diagrams
Gives the number 10 more or ten less than any number	Rotates self, clockwise or anticlockwise	Identifies events as possible or impossible
Rounds 2 digit numbers to closest decade	Follows simple directions	Identifies events as certain
Recognises and uses patterns on a hundred square	Gives simple directions	Explores events involving uncertainty
Adds a single digit to a double digit number using a part whole strategy (Not counting on)	Describes different viewpoint	
Subtracts a single digit from a double digit number using a part whole strategy (Not counting back)	Names & orders months of the year	
Recalls 10 x table	Reads o'clock on analogue & digital clocks	
Recognises an array to represent equal grouping	Reads half past on analogue & digital clock	
See relationship between doubles and skip counting in twos and recalls 2x table	Estimates length in cm using a benchmark	
Identifies odd and even numbers	Uses a ruler to measure in centimetres	
Recognises half, quarter, third and fifth of a shape	Knows names of standard units of length	
Can name unit fraction symbols	Estimates mass using a benchmark	
Shares equally to find a unit fraction of a set	Knows names of standard units of mass	
Finds a half of a number by recalling doubles facts	Estimates capacity & Volume	
Finds a quarter of a number by repeated halving	Knows names of standard units of capacity & volume	

We seem to have gone a full circle - and arrived back at what worked 30+ years ago for consistency and continuity in a mathematics programme of work rather than the more recent “supermarket” approach of finding good activities on line without really understanding why we are doing them.

How we deliver the content should certainly look very different with a much greater emphasis on using problem solving as a pedagogical tool. However there is still a place for direct teaching. Students still need to have time for practice of skills but just completing endless worksheets or filling in a workbook is not sufficient to teach students the ways mathematics is used in the 21st century. Good activities now have a specific purpose and fit into a programme of work.

Building knowledge is important and teaching students to use the knowledge they have helps knowledge into long term memory.

Just in time knowledge is far better retained than just in case knowledge.

Building in the use of technology into mathematics has elevated the need for estimation skills which require a deeper understanding of the number system than carrying out calculation procedures. Our goal must be to develop number sense not a goal of having multiple ways (procedures) of reaching an answer. Calculate with precision actually only requires one method.

Whole school subscriptions are paid via an invoice and are dependent on school size:

Up to 100 students \$150 + GST

101 - 300 students \$250 + GST

301+ students \$350 + GST

[Contact charlotte@ncwilkinsons.com](mailto:charlotte@ncwilkinsons.com)

Every person with a school email account can create an account (using their school email address) which will be activated under the school subscription. New teachers can be added at any time during the subscription period.

Small schools with 3 or less accounts required can have the number of account x \$45 on a school subscription.

New Resources for Wilkie Way Members

Subscriptions purchased at the online store at www.wilkieway.co.nz

Individual \$45 - paid via paypal

NZ School paid via invoice - complete form at online store

Up to 100 students \$150+GST

101 - 300 students \$250 + GST

300+ students \$350 + GST

Non NZ School \$400 - paid via paypal



Detailed learning outcomes for number & algebra progressions - find in the planning folder and the learning progressions folder

Learning Progressions	Addition Subtraction & Whole Number Place Value Learning Outcomes	Resources		
		Maths Aotearoa	Wilkie Way	Pearson Mathematics
<i>AT Signpost 5 P&R Signpost 3 S&E Signpost 3</i>	<p>Students will be able to:</p> <ul style="list-style-type: none"> Recall addition & subtraction facts within 10 Use addition & subtraction facts repeated in the tens column Round a two digit number to the closest decade Can make a reasonable estimate for an addition or subtraction situation Uses add or subtract 10 to add or subtract 9 Use tens and doubles to derive addition and subtraction facts to 20 Adds & subtracts a single digit to/from a double digit number without counting on or back. Uses the = symbol as a balance between equivalent expressions 	<p>Book 2a Unit 3 Addition & Subtraction Student Book 2a Chapters 9 – 12</p> <p>Book 2a Unit 5 Addition and Subtraction Student Book 2a Chapters 15 – 17</p>	<p>Level 2a Workbooks 6 Add & Subtract decades, rounding to closest decade 7 Multi Digit + using facts to 10 8 Multi Digit - using facts to 10 9 Using 10 and Decades 10 Number Facts to 20 12 + single digit to a double digit 13 - a single digit from a double digit</p>	<p>Book 2a Unit 3 Addition & Subtraction Student Book Chapters 9 – 12</p> <p>Book 2a Unit 5 Addition and Subtraction Student Book 2a Chapters 15 – 17</p>
<i>AT Signpost 5 - 6 P&R Signpost 4 S&E Signpost 3-4</i>	<p>Students will be able to:</p> <ul style="list-style-type: none"> Recall or derive addition & subtraction facts within 20 Recall and use basic addition & subtraction facts and place value knowledge in double digit addition & subtraction calculations. Recognise the difference between operational symbols and relationship symbols Uses symbols = < and > to show equivalent and non- equivalent expressions 	<p>Book 2b Unit 1 Addition, Subtraction & Place Value Student Book 2b Chapters 1 – 5</p>	<p>Level 2b Workbooks 14 Double digit addition 15 Double digit subtraction 16 Numbers to 999 17 Working with money</p>	<p>Book 2b Unit 1 Addition & Subtraction & Place Value Student Book 2b Chapters 1 - 5</p>
<i>AT Signpost 6 P&R Signpost 4 S&E Signpost 4</i>	<p>Students will be able to:</p> <ul style="list-style-type: none"> Name columns in whole numbers place value Know the value of the digit from its position in a number Can read and write larger numbers Understand the relationship between 10, 100, 1000 Expand a number to a standard partition and regroup (200 + 30 + 4 = 100 + 120 + 14) Build place value knowledge and number sense through exploring different ways of working with numbers in addition and subtraction calculations. Round 3 digit numbers to the closest hundred and closest decade Make reasonable estimates for addition and subtraction Select an efficient mental strategy for addition & subtraction 	<p>Level 2b Unit 3 Addition & Subtraction Student Book 2b Chapters 9 – 11</p> <p>Level 3a Unit 2 Using the number system for addition & subtraction Student Book Chapters 4 – 6</p> <p>Book 3a Unit 5</p>	<p>Level 2b Workbooks 21 Rounding & Estimating 22 Adding 3 digit numbers 23 Subtracting 3 digit numbers</p> <p>Level 3a Workbooks 2 Addition & Subtraction 3 Larger Numbers</p>	<p>Level 2b Unit 3 Addition & Subtraction Student Book 2b Chapters 9 – 11</p> <p>Level 3a Unit 1 Addition & Subtraction Student Book 3a Chapters 1 – 3</p> <p>Book 3a Unit 4 The Four Operations Student Book 3a</p>

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Learning Progressions	Multiplication, Division & Fractions Learning Outcomes	Resources		
		Maths Aotearoa	Wilkie Way	Pearson Mathematics
<i>MT Signpost 3 P&R Signpost 2-3 S&E Signpost 2</i>	<p>Students will be able to:</p> <ul style="list-style-type: none"> Count forwards and backwards in twos, fives and tens Recognise patterns in counting sequences Solve an equal grouping type problem using a skip counting sequence Draw or model with equipment an equal grouping type problem Begin to use a repeated addition to record an equal grouping situation Recognise the symbol = as "is the same as" and "is equal to" Recall doubles and halves to 20 Begin to see a connection between doubles and counting in twos Recognise odd and even numbers Know half as two equal parts and two halves as equal to one whole Know quarters as four equal parts and four quarters as equal to one whole Recognise the symbols $\frac{1}{2}$ and $\frac{1}{4}$ Connect the denominator with the number of equal parts Explore relationship between halves and quarters 	<p>Book 1b Unit 2 Combining Comparing & Ordering Cards Unit 2 Nos. 5 – 15 BLM 1b Unit 2 Nos 7 – 9</p> <p>Book 1b Unit 3 Beginning Fractions Cards Unit 3 Nos. 1 - 13</p>	<p>Level 1b Workbooks 18 Equal Grouping 19 Working with Doubles 20 Fractions of Shapes 21 Equal Sharing 22 Fractions of numbers</p>	<p>Level 1 Unit 22 Using skip counting & sharing Cards Set 3 Stage 4 Nos. 21 & 22</p>
<i>MT Signpost 3 - 4 P&R Signpost 3 S&E Signpost 3</i>	<p>Students will be able to:</p> <ul style="list-style-type: none"> Identify any number as odd or even Solve equal grouping type problems using a skip counting sequence or repeated addition Use knowledge of doubles to recall the two times table Connect the ten times table with the symbolic representation of a number Be able to say how many groups of ten in any 2 digit number Represent an equal addition statement with a x statement Use the x symbol in an expression to represent a number of equal groups Explore the relationship between the 10 times table and the 5 times table Recognise patterns in the five times table Explore arrays and notice that multiplications are commutative Know thirds as three equal parts and three thirds as equal to one whole Knows fifths as five equal parts and five fifths as equal to one whole Recognises symbols for $\frac{1}{3}$ and $\frac{1}{5}$ To find a unit fraction of a set by equal sharing using the denominator of 	<p>Book 2a Unit 2 Beginning Multiplication & Place Value Student Book 2a Chapters 6 - 8</p> <p>Book 2a Unit 4 Understanding Fractions Student Book 2a Chapters 13 & 14</p>	<p>Level 2a Workbooks 4 Multiply by 2, Odd & Even numbers 5 Multiply by 10 & Multiply by 5 11 All about halves and quarters</p>	<p>Book 2a Unit 2 Beginning Multiplication & Place Value Student Book 2a Chapters 6 - 8</p> <p>Book 2a Unit 4 Understanding Fractions Student Book 2a Chapters 13 & 14</p>

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The Wilkie Way Teacher Challenge



Guess my number with a negative twist

If I am NOT a multiple of 4, then I am between 60 and 69
If I am a multiple of three, I am between 50 and 59
If I am NOT a multiple of 6, I am between 70 and 70

What number am I?



I recently found a piece of work published in February 2022 by Evidence Data and Knowledge , Ministry of Education called **Which angle is a right angle?**

It looks at the strengths and weaknesses on Mathematics Questions in the International Timms Assessment by year 5 students

Key Findings:

- Students were strongest on questions involving data and those that required them to use reasoning to solve.
- They struggled most with questions asking them to apply their knowledge to solve, and those involving numbers, measurement and geometry, and expressions, equations and relationships.
- Questions with three-digit numbers, simple equations and geometry vocabulary were specific weaknesses
- Compared to the international average results, students underperformed most on questions with few words and involved mostly numbers, shapes and symbols only.

The geometric language that was specifically mentioned as most problematic was parallel and perpendicular lines but as the teachers said most year 5 students have not yet met this in their geometry experiences. In the Maths Aotearoa books the chapter on parallel and perpendicular lines is in the book 3b.

Implications for our teaching is we need to be ensuring our students have learning experiences which involve working with three digit numbers adding, subtracting, multiplying (by a single digit) and dividing (by a single digit)

Focus on the Using symbols and expressions progression paying particular attention on the concept of the equals symbol as a relationship between two expressions. Misunderstanding of the equals symbol is a barrier to learning early algebra and understanding the equals sign as meaning “has the same value as” rather than “makes” or “leaves” or “gives the answer” would likely help students to be more successful in dealing with algebraic equations.

(BSM had the wording “is the same as” and in the “olden days” when even single digit addition and subtraction equations were presented vertically the issue of the misunderstanding of an equals symbol did not occur as readily as when simple equations are presented horizontally.)

The widening of the decline between 2014 and 2018 was most significant in the expressions, simple equations and relationships area - how much could be attributed to the change in “expected” classroom practice with emphasis on: explain your thinking, do it in your head, no need to write it down?

Look closely at the Patterns and relationships and Using symbols and expressions to think mathematically progressions in the curriculum progress tools to ensure these feature strongly in your maths programme as well as additive and multiplicative thinking.

(The learning outcomes for these progressions have been including in my specific learning outcomes for additive thinking and multiplicative thinking.)