Ānō me he whare pūngāwerewere.
Behold, it is like the web of a spider.

While much of the content of a maths curriculum is hierarchical with key knowledge building on to more foundational key knowledge we must not loose sight of the fact many of the key concepts are interconnected and related in many ways. The more you know the more complex thinking you are able to do and solving problems in multiple ways becomes much easier.

However the spiders web does not only involve the content (know) of the curriculum. We also need to consider why we learn mathematics and statistics.
Success in mathematics and statistics enables students to appreciate and draw on the power of abstraction and symbolic representation to investigate, interpret, and explain patterns and relationships in quantity, space, time, data and uncertainty.
Successful students discover inherent personal enjoyment and satisfaction in persistence, solving problems, identifying patterns, and seeing the beauty in mathematics and statistics. They come to appreciate the everyday use of mathematical and statistical tools in, for example, personal finance, music and dance, estimation and measurement. They recognise how their culture is included and valued in the learning area.

Learning in mathematics and statistics builds both literacy and numeracy. It contributes to student literacy by developing their skills in oral and written communication, meaning making (comprehension) and the use of specific vocabulary and symbols. Statistics and probability, in particular, support the understanding of tables, graphs and diagrams (visual language) as well as critical thinking about the quality of data and the stories told about it.

(Read the full purpose statement for mathematics and statistics on page 3 of Mathematics and statistics in the refreshed New Zealand Curriculum May 2023)

The spiders web also includes the big ideas behind mathematics and statistics (Understand)
When reading these "big ideas" teachers need to reflect on their own beliefs about mathematics and statistics. Some may find their beliefs challenged, I hope most will be enlightened and expand their beliefs around mathematics and statistics.
The refreshed learning area identifies five big ideas:

1. The world is full of patterns and structures that we use mathematics and statistics to understand.
They enables us to notice, explore, and describe similarities, regularities and irregularities, and trends in the natural, mathematical and technological and social worlds. They provide tools and ways of working that can reveal patterns and structures useful for decision making, understanding and predicting phenomena, and creating new insights.

2. The world is characterised by change and variation that we use mathematics and statistics to understand
The world embodies a multitude of temporary and permanent relationships in which change and variation occur. Some relationships are linear, others are exponential. Mathematics and statistics enable us to systematically describe and analyse different types of change and variation and to generate insights and make predictions about them.

3. Mathematical and statistical logic and reasoning enable us to identify and explain relationships and to justify conclusions.
Reasoning from observation (induction) and reasoning from theory (deduction) allow us to explore situations using mathematics and statistics. Mathematical and statisitical logic and reasoning differentiate what is probable from what is possible and allows us to draw reliable conclusions about what is reasonable or not.

4. The interface between matauranga Maori and matauranga mathematics and statistics offers opportunites for insights that uphold the integrity of each knowledge system.
Matauranga Maori and mathematics and statistics are different systems for viewing, understanding and organising the world and for guiding how we operate within it. Matauranga Maori makes meaningful and distinctive contributions to mathematical inquiry and knowledge in Aotearoa New Zealand, just as mathematical and statistical insights contribute to matauranga Maori. When considering concepts, processes and artifacts from te ao Maori, we maintain their integrity by exploring the matauranga Maori associated with them before formulating mathematical and statistical hypotheses about them.

(This is the big idea that being a non- maori I have the greatest challenge with as I do not currently have sufficient knowledge of the Matauranga Maori view of mathematics and statistics. I have had some wonderful philosophical discussions with a variety of Maori (Including one I met while fishing the Tukituki) and we have always reached the conclusion our cultures have more in common than in difference.)

5. Mathematics and statistics have a continuous, evolving human history.
Mathematics and statistics have been constructed over thousands of years across the globe as we have grappled with the notions of quantity, numerical representation, measurement, dimension and pattern. They continue to be constructed from ideas drawn from many cultures. In Aotearoa New Zealand, our location in Te Moana-nui-a kiwi, with its multiple cultures, artifacts, and knowledge - contributes to mathematics and statistics.

Did you know?
Two historical points in the world of mathematics that have had a significant impact on the mathematics taught in schools today are firstly the inclusion of zero as a number. (Just over 2000 years ago). The definition of a number requires it to represent something, so for zero to be a number it has to represent nothing of something and not just nothing. Without the number zero we do not have our base 10 place value system. The zero in the base 10 representations of numbers represents nothing of the value of the column. 304 zero = nothing of tens

Earlier this week I was working with a small group of year 4 students introducing them to using rounding and compensating but recording 3 digit additions in a standard vertical form as they could round but were having difficulty in recording the procedure to arrive at an answer.

        345   rewritten as   344   (They knew basic facts are repeated in each column)
     +199   +200

They could see the answer would be 544 but had no idea that the ten and the ones columns represented 4 + 0. They explained you just bring down the 44. It did not occur to them that zero played any part.

0 is the additive identity - when you add it to a number it does not change the number

The second historical point is the invention of decimal numbers. About 1500 years after the base 10 system was used to represent whole numbers, a system for representing fractions was invented. However the fractions had to be expressed in powers of 10 - this we call the decimal number system. It allows us to work with fractions obeying the same rules and procedures that work for whole numbers.

This lead to a measurement system based around powers of ten - French scientists of the late 18th century created the first practically implemented version of the metric system. In opposition to the traditional systems horribly inconsistent mix of different fractions, the metric system would use only decimal fractions and it would relate units at different scales by the use of decimal prefixes.

In 1875 the major world powers including the USA signed the Treaty of the Metre which gave the metric system its first official recognition as the international standard of measure. The creation of the International system of Units (SI units) in 1960 was intended to become the only system of measurement on earth – a logical mathematical language that all nations could share. The commonwealth began its transition towards the new measurement system in the 1960's. Australia formally announced it had completely transitioned to the metric system in 1988.

But not all countries use the international system of units - USA - gallons, UK - miles and why do people still weigh fish and babies in pounds and ounces?

A good read: The Story of Mathematics by Ian Stewart (ISBN: 978-1-84724-017-0)

The Wilkie Way Teacher Challenge

This one is not too tricky. You might like to share it with your students.

Use the numbers   **1   2   3   4   5   7**   just once each to complete the two equations.

$$\boxed{} + \boxed{} = \boxed{}$$

$$\boxed{} - \boxed{} = \boxed{}$$

More than one solution is possible.

PLD 2024

If you are considering professional learning development in 2024 and wish to apply for regionally allocated funding then the close off date for applications is 15th September.
(Note: This is your last chance to apply to this fund in 2023 and no decisions have been made for possible applications in 2024)

I am now taking expressions of interest from schools who are considering Maths PLD in 2024.

I will be able to assist with connecting the refreshed Mathematics and Statistics learning area with current practice, ensuring "baby isn't thrown out with the bath water" and making any alterations to the content of your maths programme and any shifts in practice required.

I am also happy to provide you with a quote for school funded professional learning development.

I am limited in the number of schools I can work with in any one year so please register your expression of interest.
I travel from my home base in Rotorua.

email charlotte@ncwilkinsons.com

Addition & Subtraction Refresh

Phase 1: Addition & Subtraction with identified "worry point" if not achieved during the progress.

Must achieve during first six months	Must achieve during first year	Must achieve during second year	Progress outcome by end of year 3 Number & Algebra	Maths Aotearoa
• Join and separate groups of of up to 10 objects and find the result by grouping and counting	• Join and separate groups of up to 20 objects, and find the difference by grouping and counting	• Add and subtract numbers up to 100 by grouping and using number patterns	I know that: Numbers can be composed and decomposed in different ways using patterns The commutative property applies to addition (e.g. 2 + 5 = 5 + 2) The additive identity is 0 (e.g 4 + 0 = 4 and 5 - 0 = 5) I know how to: • Add and subtract two and three digit numbers • Recall addition facts to 20 and their corresponding subtraction facts • Use the additive identity (0) and commutative property	Book 1a: Unit 2 Unit 3 Unit 4 Book 1b: Unit 1 Unit 4 Book 2a: Unit 1 Unit 3 Unit 5 Book 2b: Unit 1 Unit 3 Unit 5

Phase 2: Addition & Subtraction wih identified "worry point" if not achieved during the progress

Must achieve during year 4	Must achieve during year 5	Progress outcomes by end of year 6	
• Use their recalled addition and subtraction basic facts to solve problems • Add and subtract two and three digit numbers reliably and efficiently • Add and subtract using the commutative property	• Add and subtract whole numbers reliably and efficiently	I know that: The associative property applies to addition e.g 3 + 5 + 7 = 3 + 7 + 5 I know how to: • Add and subtract whole numbers and decimal numbers to 2 decimal places • Use the associative and commutative properties	Book 3a: Unit 2 Unit 4 Unit 5 Book 3b: Unit 2 Unit 4 Unit 5

Phase 3 Addition & Subtraction
Progress Outcomes by end of year 8

I know that: Positive and negative numbers can be added and subtracted The inverse property applies to addition (3 +- 3 = 0) The commutative, associative and identity properties work the same for all numbers. I know how to: • Add and subtract decimals to three decimal places • Add and subtract fractions with the same denominator • Add and subtract integers	Book 4a: Unit 1 Unit 2 Book 4b: Unit 1 Unit 2

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Overviews of the progress steps and progress outcomes in the curriculum refresh are available in both the blog (free to all) and also in the members area in the curriculum refresh folder.

- Addition & Subtraction
- Multiplication & Division
- Fractions
- Place Value
- Algebra

"Must achieve" describes what is deemed necessary for a student to be able to build on the following year's expected content.

September Featured Resource

The Wilkie Way Maths Gym
Multiplication & Division

Name _____

Class _____

Session One
Understanding Arrays

- Coaching Session
- Warm Up
- Workout
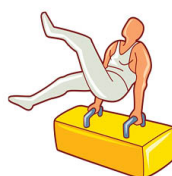- Cool Down

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The Wilkie Way Maths Gym
Multiplication & Division

Name _____

Class _____

Session Six
Doubling x2 x4 x8

- Coaching Session
- Warm Up
- Workout
- Cool Down

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Maths Gym

A series of 10 learning sessions for the teaching and learning of the multiplication tables

Exploring the patterns and relations working towards recall of multiplication & division facts

2 Agility Packs of activities to promote recall of multiplication & division facts

Find this resource under **Learning Support** on the directory