Nau mai

haere mai

Hui 1 - Resources

THE LEARNER FIRST™

Self-Understanding | Connection | Knowledge | Competency

Resources to activate and assign competence

Adapted from Swafford & Kilpatrick

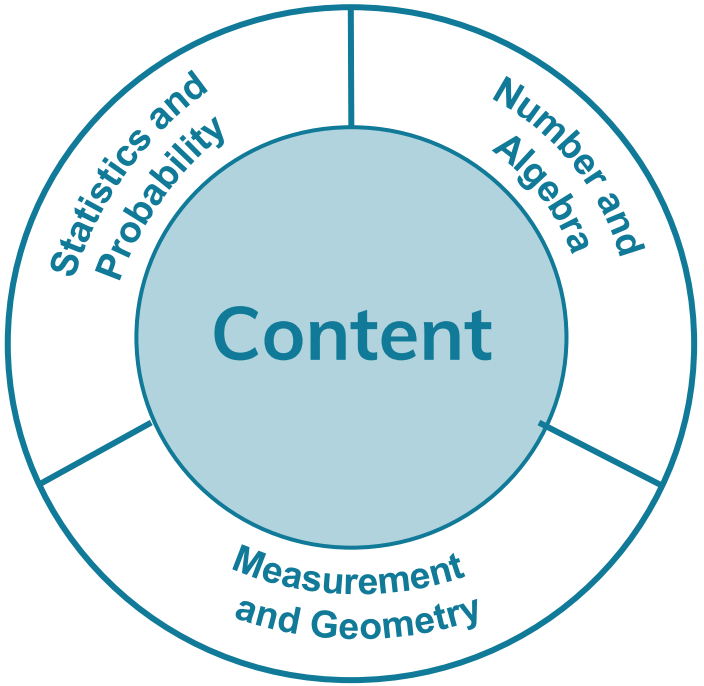
Procedural Fluency

Calculate with precision

Estimate with reasonableness

Recall definitions/facts

Use appropriate methods & measures



Deduce & defend arguments

Form logical conclusions

Prove generalisations

Identify and explain patterns

Adaptive Reasoning

Conceptual Understanding

Recognise representations

Describe & **express** ideas

Connect related concepts

Predict outcomes, relationships

Find & use a model

Solve & pose 'real' problems

Evaluate & adapt strategies

Justify reasonableness

Problem Solving

Productive Disposition

See mathematics as worthwhile

Identify meaning in their world

Believe in one's own efficacy

Participate effectively in groups

THE LEARNER FIRST™

Multiplying fractions – *Smith & Stein 1998*

Procedural Fluency

Memorise the rule

Worked examples and procedures without connections:

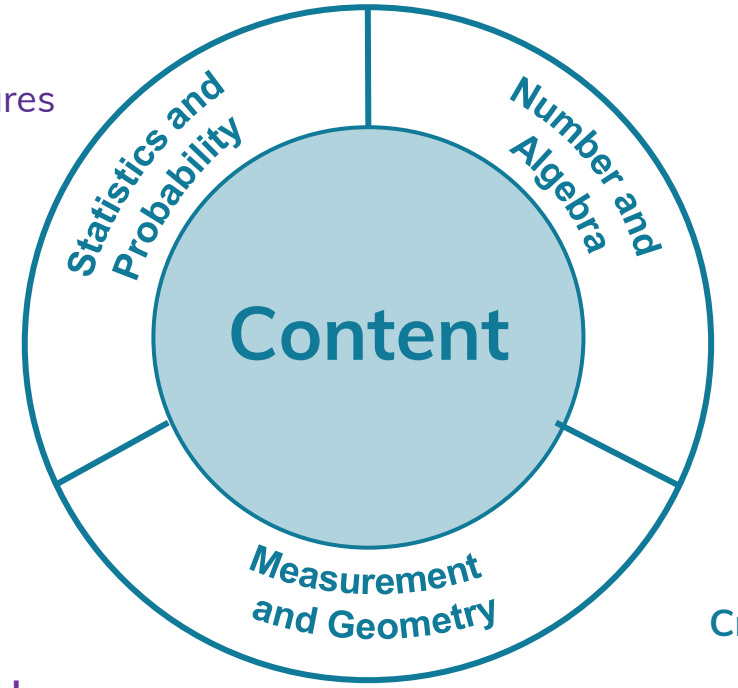
$\frac{2}{3} \times \frac{3}{4}$

$\frac{5}{6} \times \frac{7}{8}$

Conceptual Understanding

Procedures with connections

Find 1/6 of 1/2. Use pattern blocks. Draw your answer and explain your solution.



Productive Disposition

Adaptive Reasoning

Doing maths

Create a real world situation for

$\frac{5}{6} \times \frac{7}{8}$

Problem Solving

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Try this with Level 3 or 4 - Swafford and Kilpatrick

Estimate and explain why this is right or wrong

9.83 x 7.65 = 7519.95

Procedural focused students may

- withdraw from doing it without a calculator
- revert to pen and paper methods (not understanding estimate)
- if calculating this have a 50% chance of a procedural error

Students with a conceptual understanding of place value concepts and operations immediately knew it was not right.
"This is 10 x 8 so I think they have just put decimal in wrong place. I am thinking its meant to be 75.1995"

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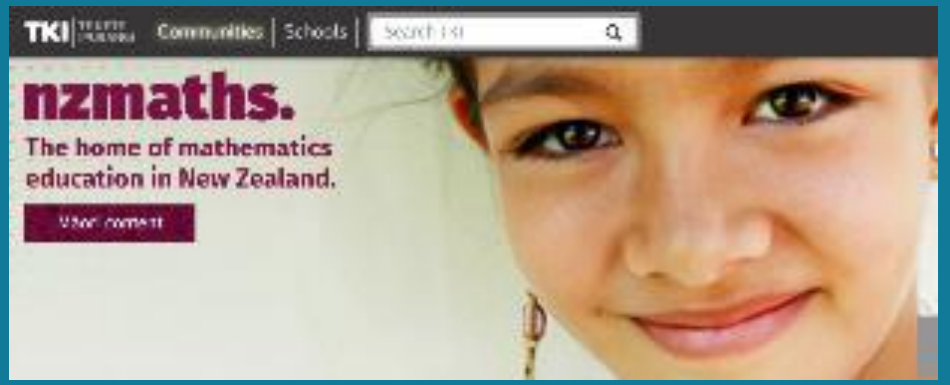
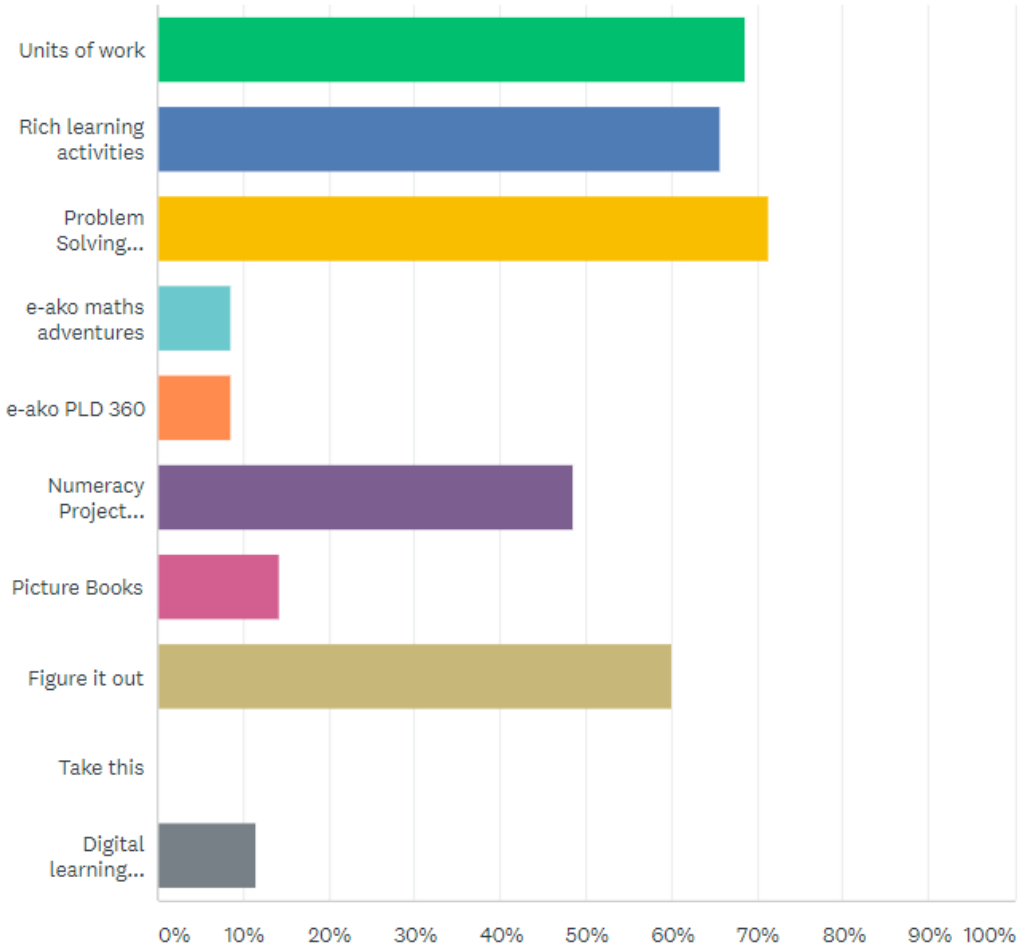
1 Delve into NZMaths



Self-Understanding | Connection | Knowledge | Competency

What resources are we using?



The Units of work are proving popular

Planning space

Manage and create teaching plans.

Long-term plans.

Long-term plans

These long-term plans provide a starting point for planning a mathematics teaching programme for a year.

	Full-year plans	Plans, by term, in the Planning Space			
		Term 1	Term 2	Term 3	Term 4
Early level 1					
Late level 1					
Early level 2					
Late level 2					
Early level 3					
Late level 3					
Early level 4					
Late level 4					

Units offer sequenced activities suited to 2 week blocks

Term One	Term Two	Term Three	Term Four
Houses (Thematic unit)	Fill It Up - Flat Space (Measuring area)	Fraction Benchmarks (Ordering fractional numbers)	Slosh, Dribble and Plop (Measuring with capacity, metric units for capacity)
Place value with whole numbers (Whole numbers)	Starting from Scratch (Properties of 2D shapes, polygons)	Breakaway Bars (Decimal fractions)	Which graph with Excel? (Interpreting, choosing, and making graphs)
Street Maps (Co-ordinates, compass directions, simple scale maps)	Eggs and a little bacon (Multiplication and division of whole numbers)	Building patterns (Patterns and relationships)	Cups and Cubes (Equations and expressions)
Equality with multiplication and division (Properties of multiplication and division)	What's in the bag? (Probability)	Making Benchmarks: Volume or Party Volumes (Measuring volume)	Getting the point (Decimal fractions)
Carrots or Fridge Pickers (Statistical inquiry cycle, graphing and representing data)	Matariki Level 3 (Thematic unit)	Dividing Fractions (Division with fraction answers (quotients))	Polyhedra (3D Shapes) (Properties of 3D shapes)

This plan is a starting point for planning a mathematics and statistics teaching programme for a year. The resources listed cover about 50% of your teaching time.

Teaching Points can support formative benchmarks

Breakaway Bars

Description of Mathematics

This unit builds on the idea that the need for fractions and decimals arises from division situations in which ones (wholes) do not give an adequate degree of precision. Lack of closure of whole number under the operation of division creates the need for rational numbers. The division situations can be either partitive (sharing) or quotative (measuring). In this unit sharing of a decimat model is used to connect fractions and decimals.

Specific Teaching Points

A key idea is that decimals are a restricted form of equivalent fractions. For example, three quarters has decimal representation of 0.75 because 3/4 = 75/100. As with whole numbers the place values in decimals are connected although separate columns are used to write numbers. For example, 0.75 has can be expressed in different decimal forms, such as 7 tenths and 5 hundredths, 75 hundredths, 750 thousandths, 7.5 tenths, etc. Flexibility in the way students think about decimal place value supports their fluency with calculation. Central to fluency is students' understanding of how decimal place value units can by partitioned and combined. For example, 2.3 – 0.7 requires a one in 2.3 to be partitioned into 10 tenths if subtraction is used, or 10 tenths to be combined to form a one if adding on from 0.7 is used.

We can use consolidation tasks to practice these

Prior experience highlights pre-requisite skills

Activity

Prior Experience

Students would benefit from previous experience with fractions, particularly using partitioning of areas to form equal parts and the naming of collections of those as non-unit fractions. This unit uses an area model, the decimat, that is based on tens frames used for whole number place value. It is expected that students will understand whole number place value in a flexible way. They are expected to see place value as a nested system, in that, place value units are nested in others. For example, 230 can be renamed as 23 tens. It is also expected that students will have a range of strategies for solving addition and subtraction problems with whole numbers, that include using standard place value (hundreds, tens and ones, etc.) and tidy numbers (rounding and compensating).

Session One

1. Show the students a copy of the Breakaway Chocolate bar (Copymaster 1). You may like to house paper copies in the coloured sleeve provided so the chocolate bar looks more authentic. Ask the students why the bar might be suitable to share between two or ten people as is claimed on the wrapper. Students might say that the bar is about the right size or it divides easily into two or ten equal pieces. Slide out the paper 'bar' and ask the students what they notice about the snap lines. Discuss how the lines might be used to share a bar into either halves or tenths.
   So imagine we share the bar equally among ten people, how much bar does each person get? How could we record this mathematically?
2. Students may need to connect to story shells such as "Bindi has 24 comic books. She shares the comics equally among 6 friends. How many comics does each friend get?" Through likeness they may see that the chocolate sharing can be expressed as division.
   Ways to express the division answer quotient are: 1÷10 = 1/10 or 1÷10 = 0.1
   (A scientific calculator provides both decimal and fraction answers)
3. Ask the students to express the sharing between two people as division: 1÷2 = 1/2. "What is the decimal for one half?" Most students know that 0.5 is the decimal for one half though many are unaware of why that is true. "If two people share the bar, how many tenths do they get each?" (five tenths). So the five in 0.5 means, 5 tenths. So, 1÷2 = 5/10 = 0.5 . You may need to use pattern of dividing by ten to extend the decimal places to the right beyond what your students are used to.

Rich learning activities

Rich learning activities

Differentiated activities at Levels 1 to 5 of the NZC.

Activities have been developed at Levels 1 to 5 of the NZC.

- **Level 1 rich learning activities**
- **Level 2 rich learning activities**
- **Level 3 rich learning activities**
- **Level 4 rich learning activities**
- **Level 5 rich learning activities**
- **Counting Collections** (number sense activities for levels 1 to 5)
- **Differentiated units** (level 4 and 5 units with cross-curricular links)

Geometry and Measurement

- How long is a piece of string? (GM3-1)
- Standing order (GM3-1, NA3-1)
- Sugar rush (GM3-1, NA3-1)
- Parking cars (GM3-1, GM3-4)
- Where is the epicentre? (GM3-1, GM3-5)
- Across Lake Taupo (GM3-1, NA3-1)
- Noah's mystery parcel (GM3-1, GM3-2)
- Folding Boxes (GM3-2)
- Platonic crackers (GM3-3)
- Polygon puzzle (GM3-3, GM3-4)
- Banana cake (GM3-5)
- A case for a new phone (GM3-6)

Statistics

- Big Feet (S3-1)
- Books vs Bean Bags? Part i (S3-1)
- Books vs Bean Bags? Part ii (S3-1)
- Books vs Bean Bags? Part iii (S3-1)
- Listening to music (S3-2)
- What are we eating? (S3-2)
- Penalty shoot-out (S3-3)

Number and Algebra

- Carbon offset (NA3-1, NA3-2)
- Standing order (NA3-1, GM3-1)
- Sugar rush (NA3-1, GM3-1)
- Bill's dollars (NA3-1, NA3-2, NA3-6)
- Cricket with no ticket (NA3-1, NA3-6)
- WiFi units (NA3-1, NA3-2, NA3-6)
- Loads of sugar (NA3-1, NA3-4, NA3-6, GM3-1)
- A share of the spoils (NA3-1, NA3-5)
- Fraction circles (NA3-1, NA3-5)
- Domino donuts (NA3-1, NA3-6)
- A close game (NA3-1, NA3-7)
- Across Lake Taupo (NA3-1, GM3-1)
- Camping groups (NA3-2, NA3-6)
- Vege rows (NA3-3, NA3-8)
- The seventh wave (NA3-3, NA3-8)
- Sports tops (NA3-3, NA3-7, NA3-8)
- Broken Sparkles (NA3-4)
- Lunchtime Activities (NA3-5)

This supports our procedural and conceptual skills

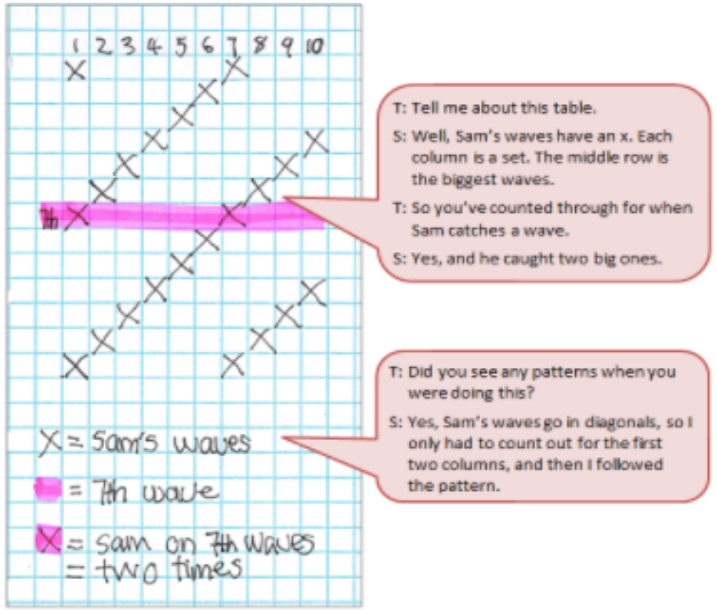
The procedural approach (hide)

- The student is able to use appropriate strategies, including imaging and skip counting to solve a problem involving sequences.

Prompts from the teacher could be:

1. How many waves are there in each set?
2. Could you make a table or a sequence of images to represent of each set of waves?
3. Use your table or images to mark out which of the waves will be Sam's.
4. Find how many of the waves that Sam rides, are the seventh (biggest) wave.

Click on the image to enlarge it. Click again to close.



Problem Solving activities

Problem solving activities

An extensive collection of problem solving sessions.

- Level 1 Problems
- Level 2 Problems
- Level 3 Problems
- Level 4 Problems
- Level 5 Problems
- Level 6 Problems

Geometry

Grace's kitchen floor
The treasure map
Copycats

Measurement

Tim's trip
Adam's watch
A thousand seconds
Parking meters

Statistics

Dressing in the dark
Grabbing CDs
Coin shake up
Training

Number

Basketball caps
Pocket money
Legs in the barn
500 problem
At the movies
The Fathers Day card
My dogs
Calculator count to 1000
Super darts
Darts
Even more pizza
Gulls
The rock pool
Lollies, lollies, lollies
$3 and $5 stamps
Make 4.253
Invent a problem
Big magic squares
Decimal magic squares
Triangle sums

Algebra

Shaking hands
Toothpick squares
Race to 100
Take Two
The farmer's sheep I
Sara's table
Number plates
Multiples of a
Triangular numbers

Logic and Reasoning

Brian's pegboard I
No three in a line

Supports to develop pedagogical content knowledge

Solution

This can be done by using equipment, by drawing, by algebra (see Toothpick Squares problem), or by using a table such as this.

	0	1	2	3	4	5	6	7	8	9	10
Freda	30	32	34	36	38	40	42	44	46	48	50
Fred	1	4	7	10	13	16	19	22	25	28	31
	11	12	13	14	15	16	17	18	19	20	21
Freda	52	54	56	58	60	62	64	66	68	70	72
Fred	34	37	40	43	46	49	52	55	58	61	64
	22	23	24	25	26	27	28	29	30	31	32
Freda	74	76	78	80	82	84	86	88	90	92	94
Fred	67	70	73	76	79	82	85	88	91	94	97
	33	34	35								
Freda	96	98	100								
Fred	100										

at 1 and

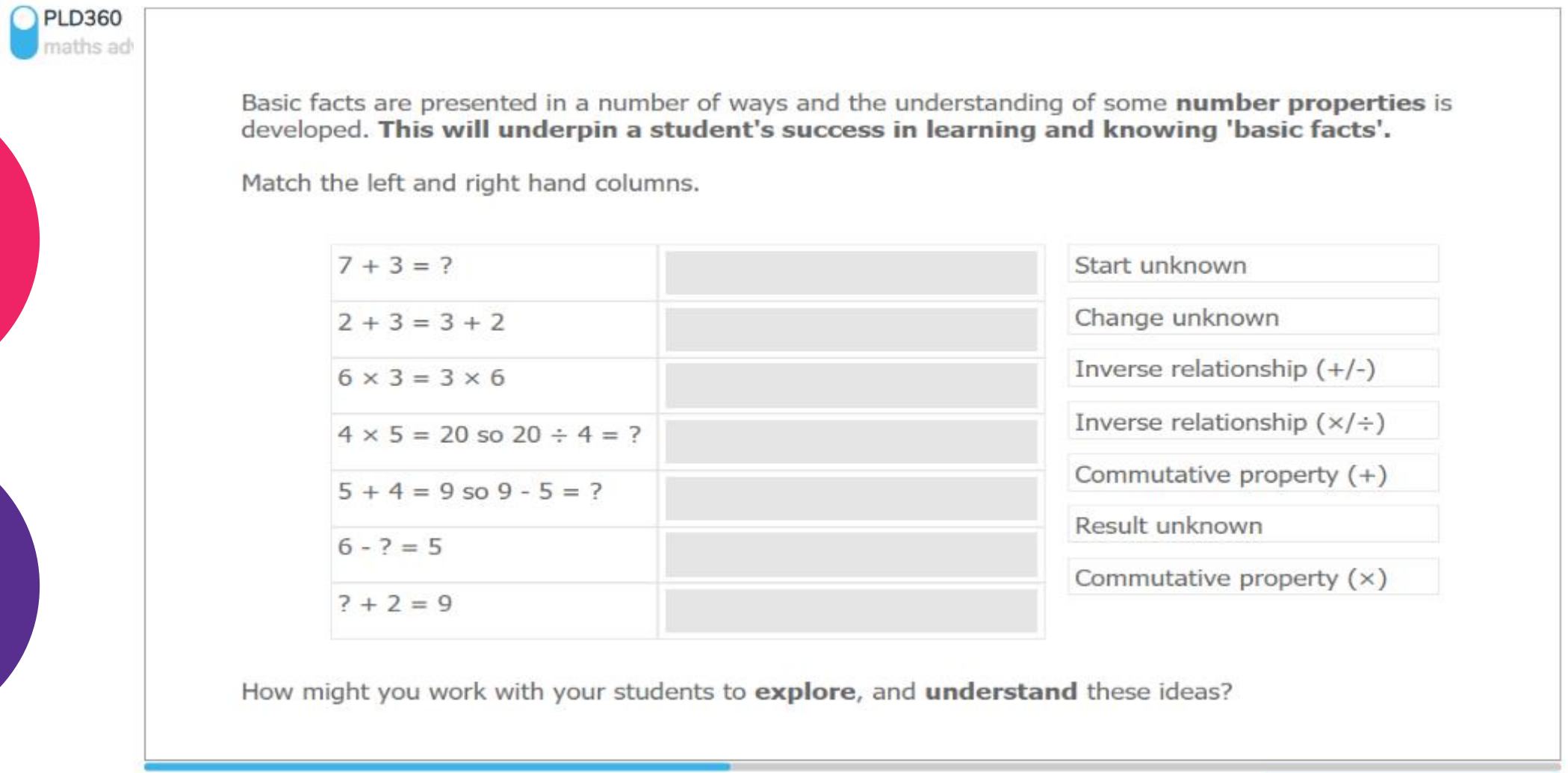
lem eg,

The table shows that Fred gets to the 100th square and has to wait two jumps for Freda to catch up.

E-Ako – PLD360 for kaiako

Subject Matter Knowledge

Pedagogical Content Knowledge



E-Ako – Maths adventures for ākonga

e-ako

PLD360 maths adventures

Rosa and Robbie talk about the data they have collected.

Complete what they are saying by writing in each box.

Year level	Main way of travelling to and from school					
	Walk	Cycle	Car/van	Bus	Skateboard/ scooter	Total
Year 1	10	0	12	1	0	23
Year 2	14	0	12	0	0	26
Year 3	16	0	12	0	0	28
Year 4	14	2	11	1	1	29
Year 5	4	4	6	4	3	21
Year 6	9	8	6	1	2	26
Total	67	14	59	7	6	153

The data from our school questionnaire tell us that, of the total 153 students at Kiwi School, 67 of them more often walk to and from school than travel any other way.

We also found from another question, that 25 students ***sometimes*** walk.

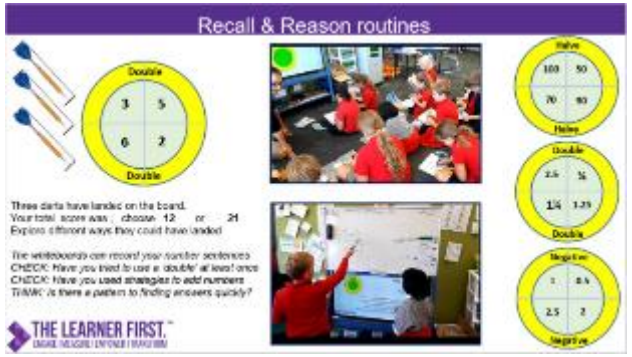
That means there can be up to 92 students walking to and from Kiwi School!

So we want to know,
How safe are the students who walk to and from our school?

Building a Just-in-Time Community

TLF Maths - Ideas and Insights

Private group · 246 members



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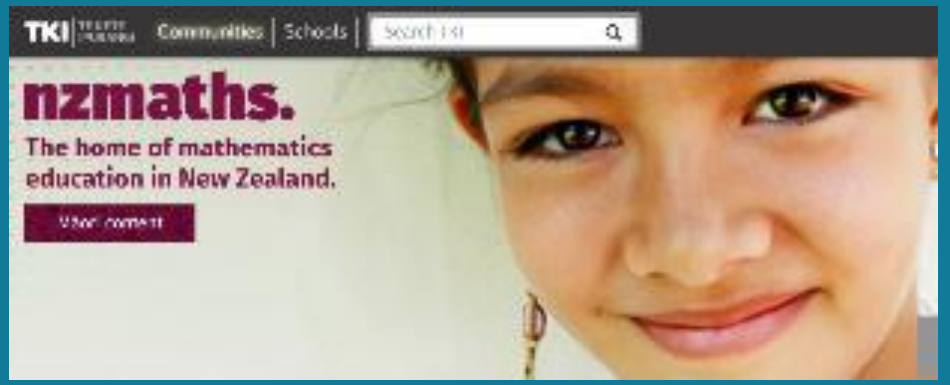
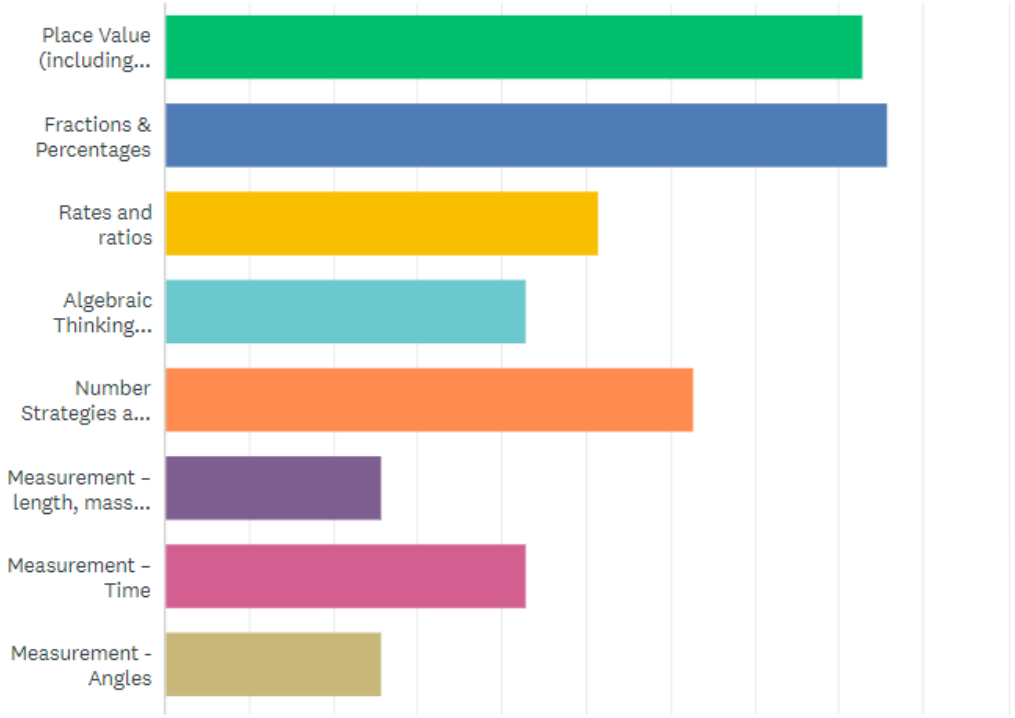
Content insights

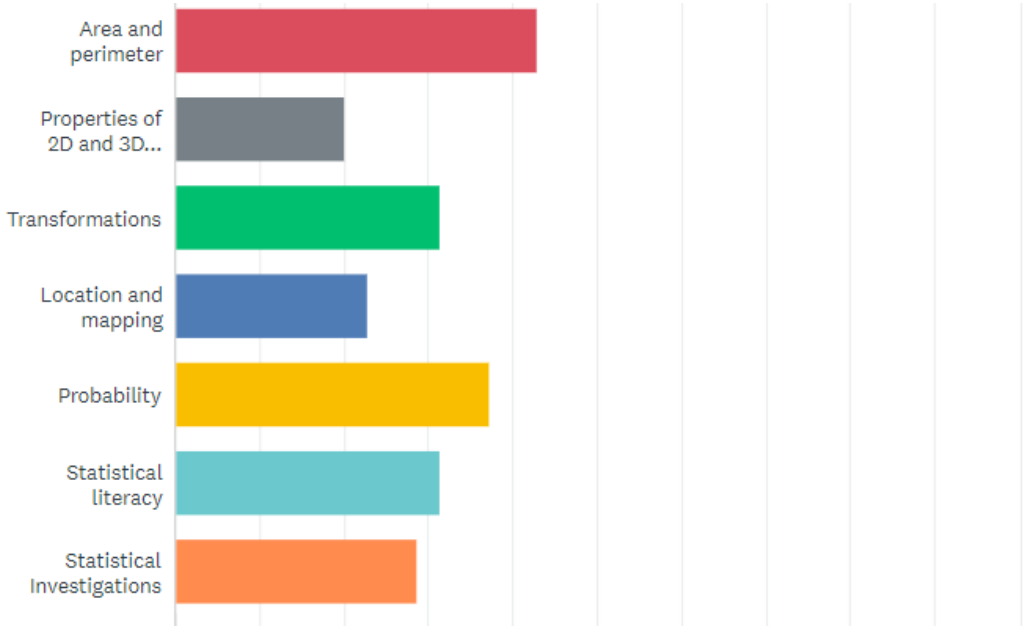


Self-Understanding | Connection | Knowledge | Competency

What sub strands are causing issues?

“If they cannot apply, it could be due to misconceptions”(Carpenter & Lehrer, 1999)In your experiences which of the following sub strands do you encounter a growing need to revisit, reteach or remediate?:





A deep dive into the descriptors

	Number Strategies – Key ideas	Number Knowledge – Key ideas
Level 1	Counting can be used to solve number problems. Students see numbers as made up of ones, and to operate with numbers need to count the individual items. There are two main counting strategies: **Counting from one.** **Counting on**	Objects in a set can be counted. Students are learning to count with understanding and identify "how many' in sets of objects. There are two elements involved in counting the objects in a set: **Number word sequence**, **One-to-one** , **This moves to 'skip counting' eg 2s, 5s, 10s**
Level 2	Numbers can be partitioned and combined to solve simple addition and subtraction problems. Students recognise part-whole thinking and apply it to derive results from known facts. Strategies include Compensation eg **7 + 6; 6 + 6 = 12, so 7 + 6 = 13** PV partitioning eg **23 + 13; (20 + 10) + (3 + 3) = 30 + 6 = 36**	Our number system is based on groupings of the number ten. Students develop an understanding of place value. "Houses' can be used to show columns eg **7 in tens represents 70 ones.**
Level 3	Numbers can be partitioned and combined to solve more complex (multi step) addition and subtraction and simple multiplication and division problems eg **53 – 28; 53 – 30 = 23, 23 + 2 = 25** **43 – 38; solve as 38 + [ ] = 43** **If i know 5 x 5 = 25 then I know 6 x 5**	Numbers can be represented in a variety of ways including fractions, decimals and percentages for representing small numbers. The fraction ¾ , 4 is division of equal parts, 3 is number of the parts Decimals extend the PV system. Each column to the right of point is worth ten times less (a tenth of) Percentages thought of as fractions (out of 100 parts)
Level 4	Rational numbers can be represented and operated on in a variety of ways to solve problems. Rational numbers include; natural (1,2,3,4), whole numbers (0,1,2,3,4), Integers (-2,-1,0,1,2) represented by number lines, exponents, expanded + standard form Strategies that can be used include reversibility, doubling and halving, compensation, place value partitioning, using the distributive law.	

Choosing resources to target objectives

NA4-1 Use range of multiplicative strategies when operating on whole numbers.

A practical understanding of these when solving problems
(including the ability to make initial estimations)

37 + 41 + 40 + 38	**as**	**4 x 40 – 4**
24 x 35	**as**	**(20 x 35) + (4 x 35)**
13 x 6	**as**	**10 x 6 + 3 x 6**
14 x 9	**as**	**2 x (7 x 9)**
9 x 78	**as**	**9 x 80 – 9 x 2**
276 ÷ 12	**as**	**240 ÷ 12 + 36 ÷ 12**
12 x 33	**as**	**4 x 99**
216 ÷ 12	**as**	**216 ÷ 2 ÷ 2 ÷ 3**
354 ÷ 6	**as**	**6 x [ ] = 354**

Why is their a difference between (20 ÷ 10) ÷ 2 and 20 ÷ (10 ÷ 2)

Why this is currently an important area

TIMSS Year 5

Maths item analysis

The report looked at Year 5

Linguistic Complexity	International average % correct	NZ average % correct	Average difference
Knowing	58	48	-10
Applying	52	45	-7
Reasoning	40	36	-4

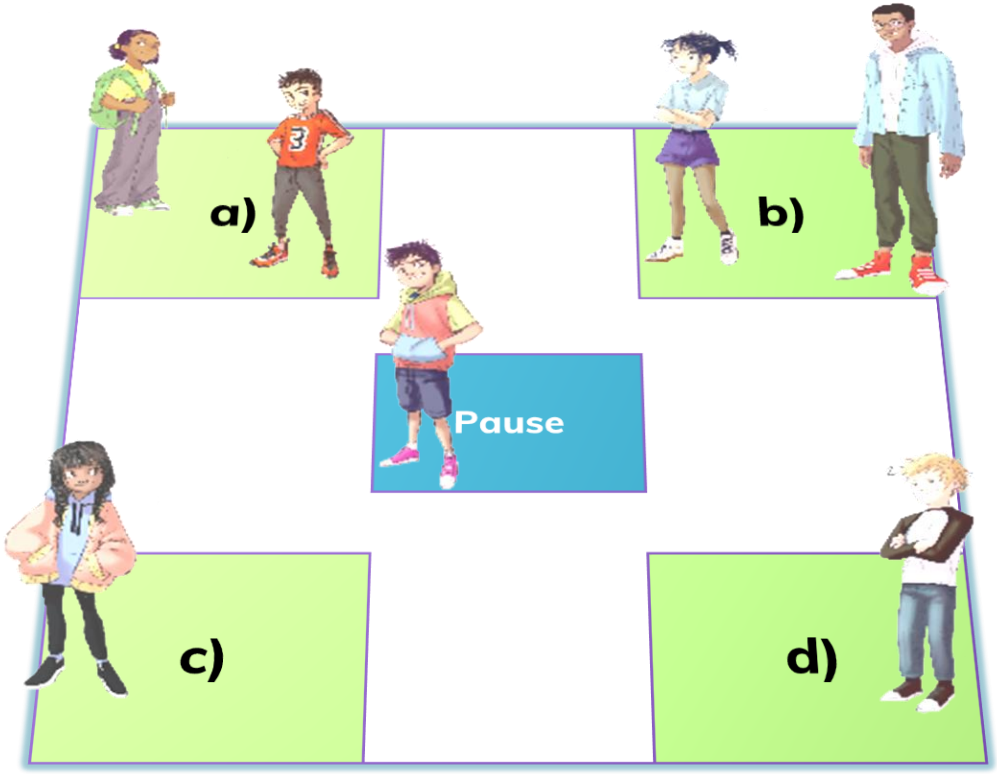
90% of students reported they had been taught this

MoE Data Report: TIMMS	International Average %	New Zealand %
27 x 43 =	53	16
Add 385 to 5876	67	26
Number added to 73 with sum of 1068	49	25
3126 + 845 + 72 =	72	39
6 x 312 =	65	30
927 divided by 3 =	46	19
0.2 + 0.02 + 2.2	55	21

moveNprove
before unit

Which of these has the largest value?

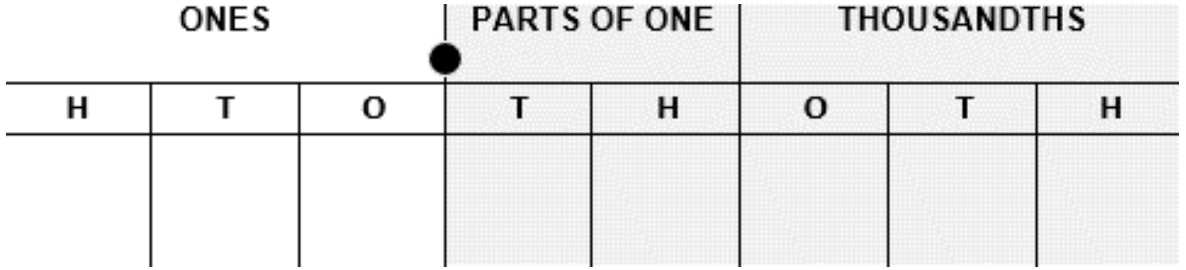
0.2
0.02
0.22
0.202



0.2	0.02	0.22	0.202
18%	**3%**	**41%**	**38%**

Ideas from Unit for explicit teaching groups

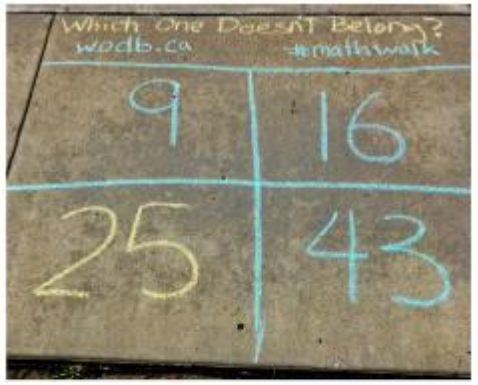
0.2	0.02	0.22	0.202
18%	3%	41%	38%
7%	1%	14%	78%



0	2	0	0	
0	0	2	0	
0	2	2	0	
0	2	0	2	

A great find for visual problems

[Math Walks - Feb 2021 (google.com)]

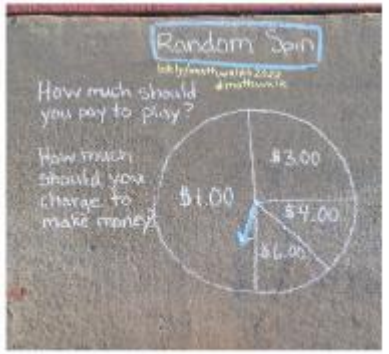


Which One Doesn't Belong

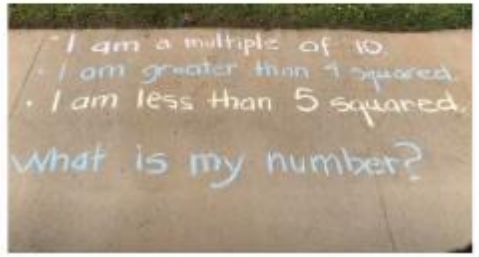
Open Middle Problem

Splat

Submitted by Kay McHeffey



Random Spin



Submitted by Kay McHeffey

Many sources we use including...

Any recommendations?

We still use all problem types eg Application

Sione's luggage has a mass of 7.5kg. He had to remove his tablet that had a mass of 750g. What is the mass of his luggage now?

The Kuhui Ako is organizing a kapa haka competition with all the schools. If there are 534 people going and a bus can carry 48, how many buses will be needed?

My daily runs on FitBit so far this week have been 8.6km, 9.4km, 10.9km, 7.75km and 8.1km. If my target is 50km by this evening, how much do I need to run today?

- **Reactivate or consolidate procedural fluency.**
- **Connect inquiry process to explicit teaching of method**
- **Diagnose what knowledge students have, pre teaching**

***Learning can become stuck in "methods of calculating"**