Nau mai

haere mai

Hui 6 – Engagement & diversity

THE LEARNER FIRST™

Diversity starts with balance

Procedural Fluency

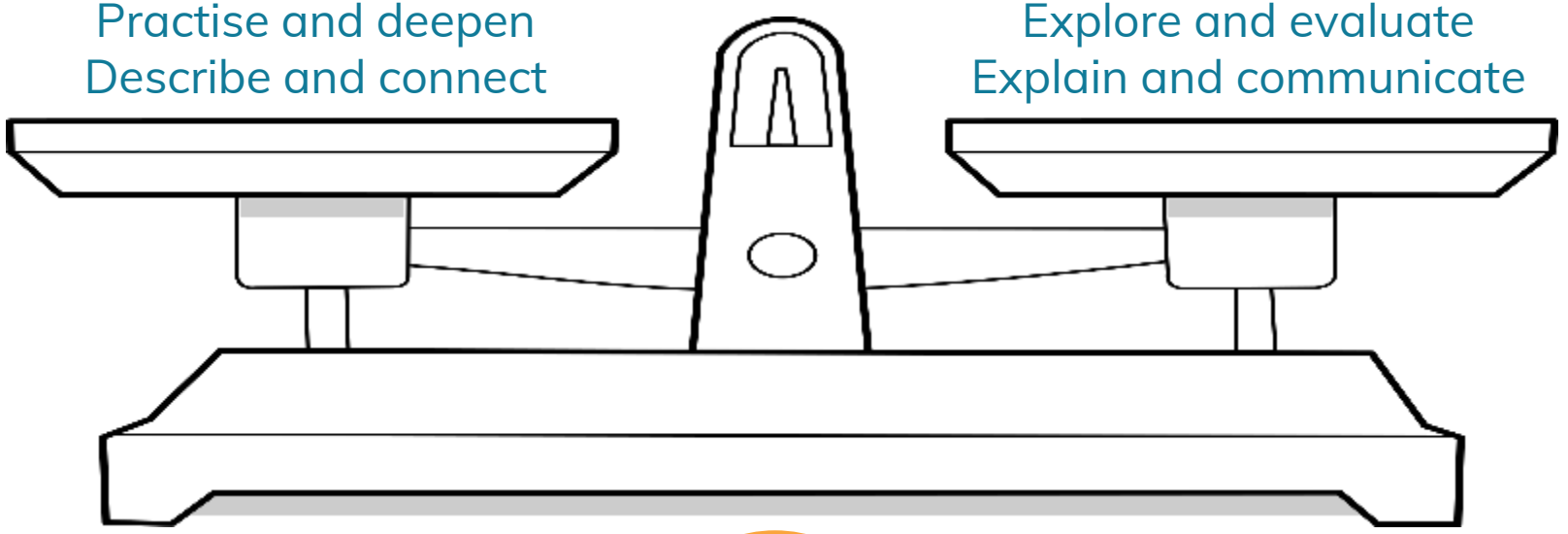
Conceptual Understanding

Adaptive Reasoning

Problem Solving

Practise and deepen
Describe and connect

Explore and evaluate
Explain and communicate

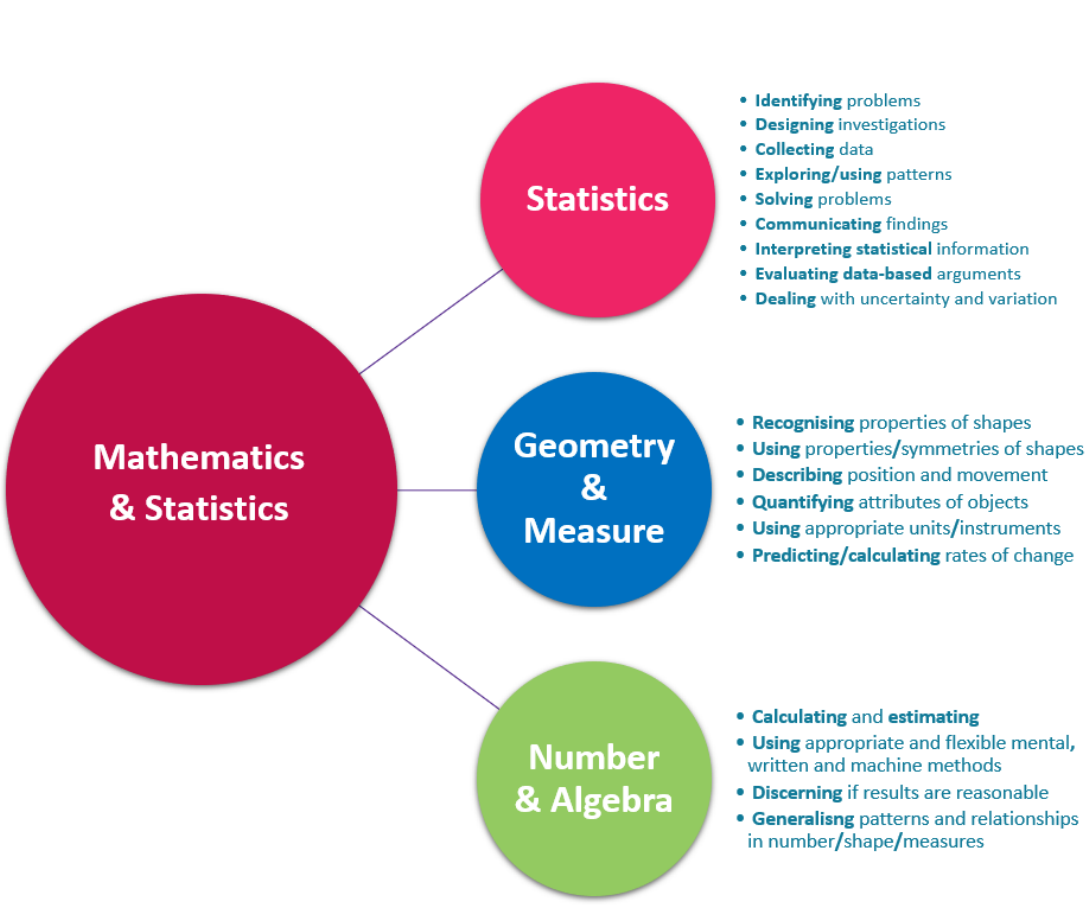


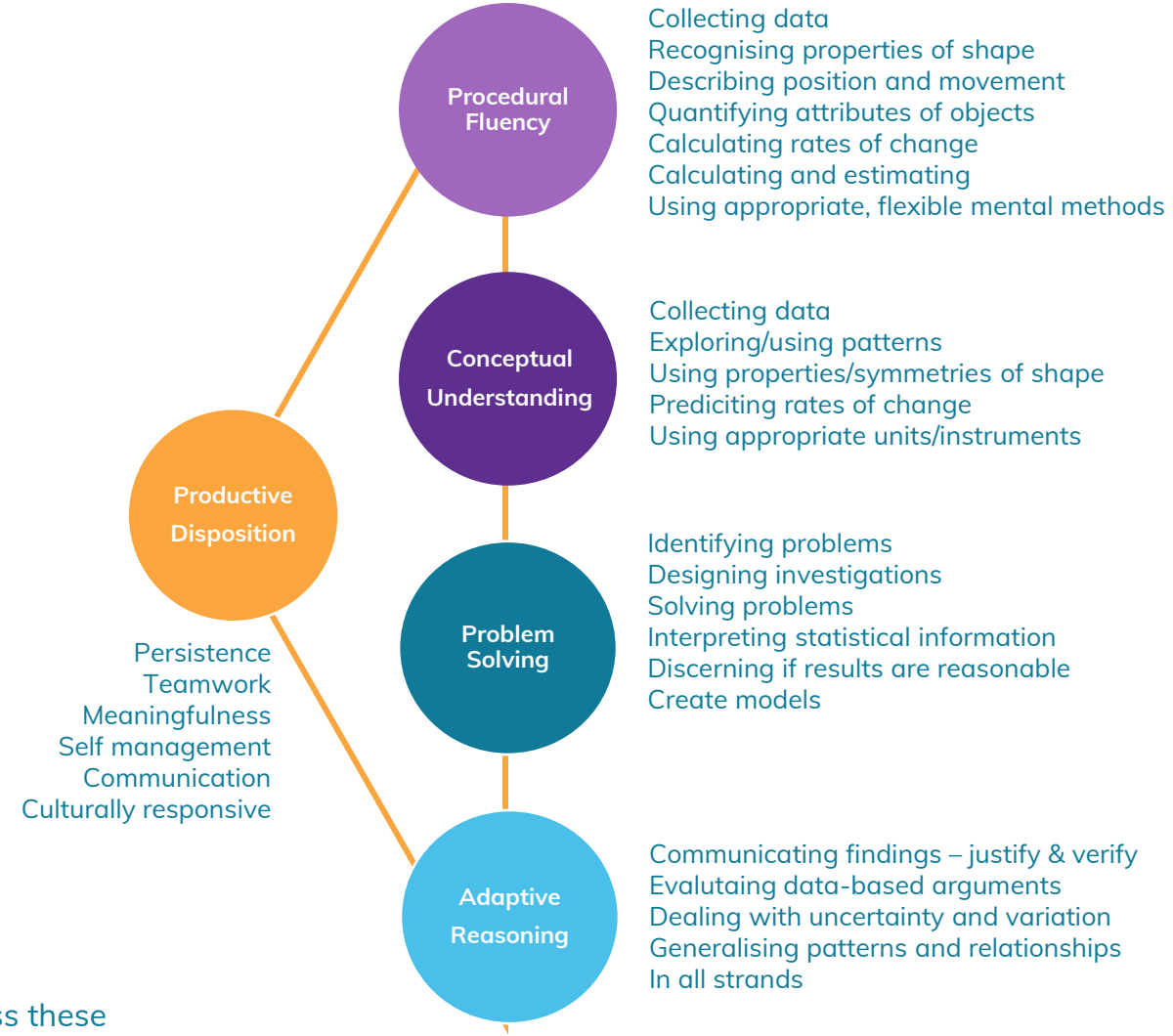
Mātauranga
Tataiako

Productive Disposition

Effective Pedagogies
Key Competencies

Diversity goes beyond procedures and facts





Ākonga explore relationships in quantities, space and data and learn to express these relationships in ways that help them to make sense of the world around them – cultural, scientific, technological, health, environmental and economic contexts.

1. Problem solving and reasoning

In a range of meaningful contexts, students will be engaged in

thinking mathematically and statistically.

Exploring
Questioning
Conjecturing
Explaining
Proving
Justifying
Generalising

All ākonga benefit from equitable access to problem solving
(see Workshop 2)

They will **solve problems** and **model situations**

that require them to ..

[link to Level objectives]

Authentic, rich tasks

- **translated into mathematical language, symbols and representations and,**
- **the solutions and solution pathways evaluated and communicated**

2. Procedural and Conceptual skills

Level 4 Deep Dive – Key ideas and elaborations

Number Strategies and knowledge – key ideas	Equations & Expressions – key ideas	Patterns and relationships – key ideas
Rational numbers can be represented and operated on in a variety of ways to solve problems.	Linear relationships between variables can be represented	Rules to describe the relationship between variables can

Level 3 Deep Dive – Key ideas and elaborations

Number Strategies – key ideas	Number knowledge – key ideas	Equations & Expressions – key ideas	Patterns and relationships – key ideas
Numbers can be partitioned and combined to solve more complex (operations.	Numbers can be represented in a variety of ways incl	Equations show relationships of equality between parts	Patterns and relationships can be used, represented and

Level 2 Deep Dive – Key ideas and elaborations

Number Strategies – key ideas	Number knowledge – key ideas	Equations & Expressions – key ideas
Numbers can be partitioned and combined to solve simple addition and su	Our number system is based on groupings of the number ten.	Number operations and strategies to solve number

Level 1 Deep Dive – Key ideas and elaborations

Number Strategies – key ideas	Number knowledge – key ideas	Equations & Expressions – key ideas	Patterns and relationships – key ideas
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 identify "how many' in sets of objects. They must produce word sequence accurately. One to-one matching- one word assigned to one object. Once counting by ones they can learn to skip count **e.g., 2s, 5s, 10s**	**Counting, grouping and equal sharing strategies can be recorded using words, numbers and pictures.** Students need opportunities to explain and represent their number strategies using combinations of words, numbers etc Using number lines to represent equations **4 + 3 = 7 (plus) 10 – 6 = 4 (minus) use "same as'**	**Some patterns are repeating, and some are sequential** Students learn that a repeating pattern has a consistent element of repetition. They identify this element and extend the pattern using symbols, numbers, shapes, sounds, moves. Students can also explore growth patterns and see and identify in the built and natural environment.
Number Strategies – elaborations NA1-1 Use a range of counting (on, back, double), grouping, and equal-sharing strategies with whole numbers and fractions.	**Number knowledge – elaborations** NA1-2 Know the forward and backward counting sequences of whole numbers to 100. NA1-3 Know groupings with five, within ten, and with ten	**Equations & Expressions – elaborations** NA1-4 Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.	**Patterns and relationships – elaborations** NA1-5 Generalise and explain counting, grouping, and equal sharing strategies, using words, numbers and pictures. NA1-6 Create and continue sequential patterns
NA1-1 Use counting on, back, double counting and skip counting. Eg **6 + 5; count 7,8,9,10,11** **12 – 3 counts back 11,10,9.** Grouping and equal sharing are simple ways to solve four operations and fractions of sets problems without counting every object. **Eg Knowing 4 + 4 is the same as 8** Skip counting, 5,10,15,20 to count four groups of five Sharing objects in ones, twos or threes to **find a quarter of a set of 12** At level solving 6 + 3, ākonga count on from 6	**NA1-2** Know fwd number word sequence to 100 as **0,1,2,3,4.....** Know bkd number word sequence from 100 as **100,99, 98.** Name the number before and after any given number **NA1-3** Learn visual and symbolic patterns for numbers to ten so they can be recognised without counting. Groupings within and with five (**2 + 3, 5 + 4)** Names for ten **(6 + 4 therefore 10 – 4)** Doubles to at least ten (**3 + 3, 4 + 4)** Groupings with ten (**10 + 6, 8 + 10 teen numbers)**	**NA1-4** Explain to others the number strategies they use (words, numbers or pictures). Write equations to express their findings **Eg (5 + 9 = 14)** Use their own and mathematical language. Develop diagrams to represent their strategies **Eg number lines**	**NA1-5** Understand link between cardinal and ordinal aspects of counting. Ordinal aspect involves the position of something Cardinal aspect involves how many of something. This count can be trusted and built upon. **NA1-6** Explore sequential patterns so further members are predicted. Reproduce a give pattern using objects, drawings, symbols Create and continue patterns with justification Communicate the rule of their patterns to others.
Measurement – key ideas	**Shape – key ideas**	**Position & Orientation – key ideas**	**Transformation – key ideas**
Objects have measureable attributes that can be compared. It is all about making comparisons - Direct comparison can be used for length and area as two objects are easily compared. Indirect comparison where string to measure circumference used to compare this to height Students understand what units of measure might be used for the particular attribute in question e.g., toothpicks along the length of the book.	**Objects can be sorted by their appearance.** (number of sides, size, looks like..., has sharp corners etc. Language is colloquial. Geometric language can be developed.	**Position and movement can be described.** Use everyday language to describe where something is; in front of, left of behind. Directions are given in simple units e.g., 8 steps, half turns, quarter turns. Imagining the shape or endpoint of movements help spatial reasoning.	**The position and appearance of an object can be changed by reflecting (flipping), translating (sliding) and rotating (turning) it.** Objects can be moved in space. Changes can be described in terms of transformation eg Reflect(flip)- described as mirrored Translate(slide) – shifts along a line look the same Rotate (turn)- circular motion, inside or outside the shape. The amount of the turn is called the angle of rotation.
Measurement – elaborations GM1-1 Order and compare objects or events by length, area, volume and capacity, weight (mass), turn (angle), temperature, and time by direct comparison and/or counting whole numbers of units	**Shape – elaborations** GM1-2 Sort objects by their appearance.	**Position & Orientation – elaborations** GM1-3 Give and follow instructions for movement that involve distances, directions, and half or quarter turns. GM1-4 Describe their position relative to a person or object.	Transformation – elaborations GM1-5 Communicate and record the results of translations, reflections, and rotations on plane shapes.

Let us see how place value is sequentially developed

THE LEARNER FIRST

Maths – Ideas and insights TLF

2. Procedural and Conceptual skills

NA2-4

Develop an **additive view** of whole number place value e.g.,

456 is 4 hundred, 5 tens and 6 ones

Understand the **nested view** of place value eg (**456 has 45 tens and 456 ones)**

Expose to **456 + 70 = [], or 456 – {] = 396 to promote nesting in calculations**

NA3-4

Have a multiplicative view of whole number place value. eg **239 456 the 3 means 3 groups of 10 000**

Understanding the **Base 10** scaling view- **10 of these is 1 of those**- as digits move right or left

Understands the **nested view** e.g., **239 456 has 23 ten thousand, 2394 hundreds, and 23 945 tens.**

Expose to exercises like this: 2004 – 700 requires us to think of 1000 as ten hundreds so 20 hundred take 7 hundred

Know **one hundred thousand is ten times as much as ten thousand**, and one hundred is result of dividing one thousand by ten. Eg **4200 is ten times more than 420, 43 divides by 10 is 4.3**

NA4-2 Express decimals as fractions and vice versa

e.g., **2.47 = 2 + 4 tenths + 4 hundredths or 247 hundredths.**

Solve add/sub **e.g., 13.2 – 5.79 = 7.41 and ¾ + 7/8 = 1 5/8. (**Denominators must be related multiples)

****Formal algorithms taught when students have the place value knowledge to understand them****

3. Putting it together

openups

1. Roll the dice 4 times and create two different 4-digit numbers
   eg 3451 and 1543
2. Find the ***sum*** and ***difference*** of your two numbers

3. Place your numbers on a number line and justify your positions

   |----------|

4. Chose one of your numbers and represent it using renaming (nesting)
   eg 3451 = 34 hundreds and 51 ones, 345 tens and 1 one

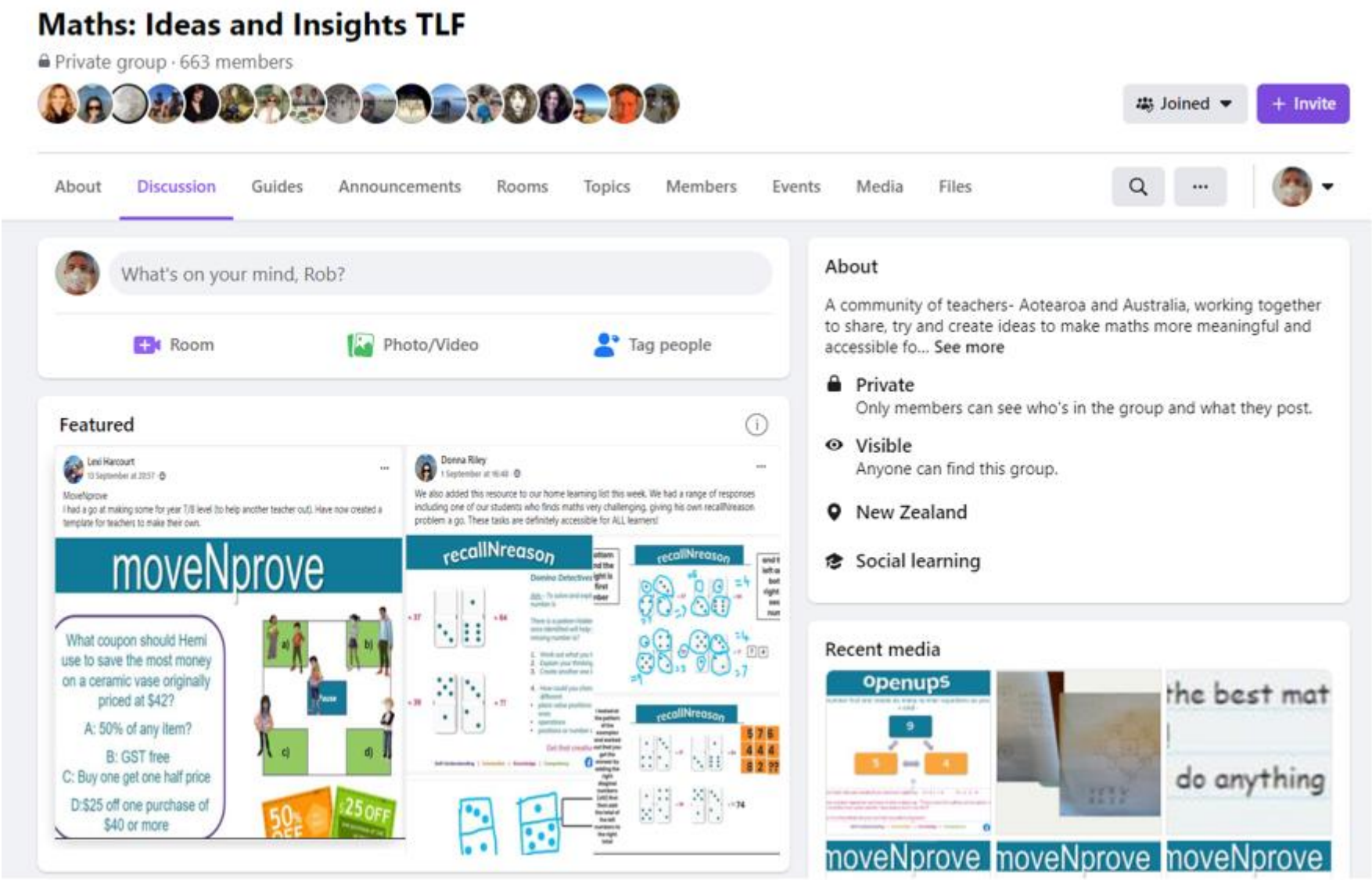
5. Find a partner who has a sum or difference similar to yours and see how many numbers you can create using each others' dice rolls.

6. Can you find any numbers similar to yours in your home, local news, out in the community. What is the context?

Level down content by using 3-digit or 2-digit numbers
Level up content by using 5-digit, tenths, hundredths, use rounding.
A can deepen content by getting them to justify and explain their findings, look for patterns and relationships in their solutions, compare their strategies for finding sums and differences

Low floor and high ceiling that make all proficiencies and comptences free to be explored

A way to spread your great work



A few tips for SEL

Ākonga can use a combination of home language and maths lanaguage when communicating

Ākonga can access problem solving through visual challenges and problems

Key vocabularlay from the ‘ideas and elaborations’ can be on display and role modelled throughout the unit

Ākonga can communicate through manipulatives, jottings, drawings, symbols

What teachers have tried

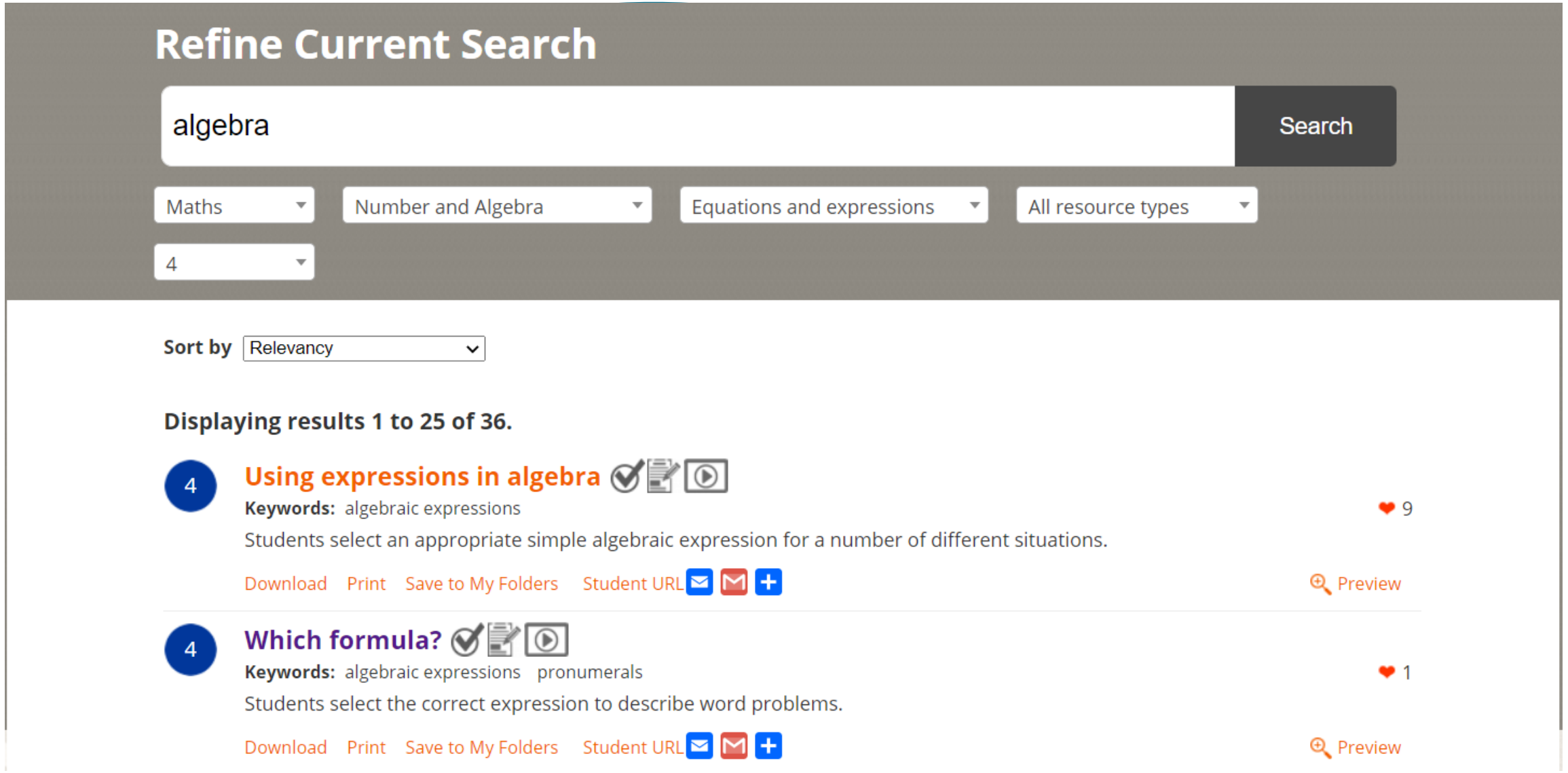
I survey all my ākonga to express their maths experiences, their strengths, hobbies and plan maths to link to this each week,

All my kids are diagnosed and realise they all have a maths strength somewhere. This is often the first hurdle of getting them.

I use the elaborations to help level up/ down. Ākonga at stage 3 in Level 4 can still access these tasks and get challenged.

Every day includes an open tasks and for these kids it opens their mind, their creativity and there sense of identity.

Recap on ARBs



A myriad of ways to utilise

4 **Which formula?**

Keywords: algebraic expressions pronumerals

1

Students select the correct expression to describe word problems.

Download Print Save to My Folders Student URL Preview

I can

- preview task
- download it
- print a copy
- save to my space
- send url to ākonga

A myriad of ways to utilise

This task is about using algebraic expressions to describe situations.

The letter **t** stands for the number of teeth Jacob has. His baby sister has only half as many teeth as he does. Which formula would you use to show how many teeth his baby sister has?

- 2 × t
- t – 2
- t ÷ 2
- 2 ÷ t
- 2 – t

The letter **d** stands for the number of dollars Siri's bank account had left in it after she took out $50. Which formula would you use to show how much money was in Siri's bank account **before** she took out the money?

- 50 – d
- d + 50
- 50 ÷ d
- d × 50
- d – 50

The letter **w** stands for Jesse's weight in kilograms. He weighs only a quarter of his father's weight. Which formula would you use to show his father's weight in kilograms?

- w ÷ 4
- 4 + w
- w – 4
- 4 ÷ w
- 4 × w

Overview

Using this Resource

Connecting to the Curriculum

Marking Student Responses

Diagnose using a moveNprove.

Small group explicit instruction

Consolidation tasks

Make them discuss and defend when proving

Create their own to share

A myriad of ways to utilise

Level: 4
Curriculum info:
Maths, Number and Algebra, Equations and expressions
Keywords:
algebraic expressions, pronumerals
Description of task:
Students select the correct expression to describe word problems.
Learning Progression Frameworks
This resource can provide evidence of learning associated with Using symbols and expressions to think mathematically, sets 4-5 within the Mathematics Learning Progressions Frameworks.
Read more about the Learning Progressions Frameworks.

Overview

Using this Resource

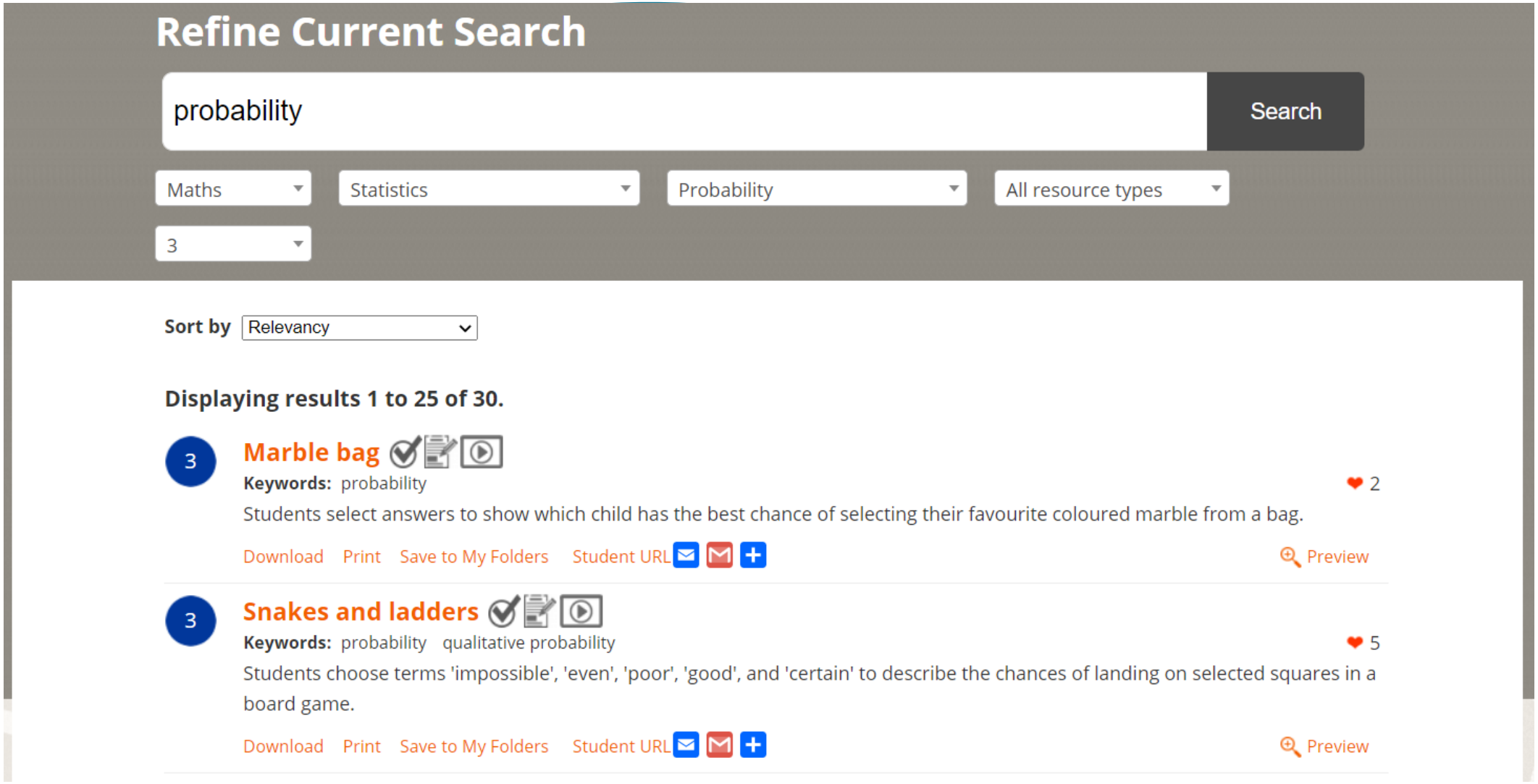
Connecting to the Curriculum

Marking Student Responses

How does this connect to the NZC?

I could show my ākonga the statement and show them what this looks like as 'visible learning'

Recap on ARBs



Recap on ARBs

People roll a fair dice to see if they win a prize at a school gala.

Roll a 1, 2 or 3	Roll a 4	Roll a 5	Roll a 6
No prize	Win a biscuit 	Win a biscuit 	Win an ice cream 

Roll a 1, 2 or 3	Roll a 4	Roll a 5	Roll a 6
No prize	Win a biscuit 	Win a biscuit 	Win an ice cream 

James rolls the dice. Which of these is true? *(select one)*

- James is more likely to win a biscuit than an ice cream.
- James is more likely to win an ice cream than a biscuit.
- James is just as likely to win a biscuit as an ice cream.

Explain your answer

Overview

Using this Resource

Connecting to the Curriculum

Marking Student Responses

Working with Students

These multiple chopice could be used in rapid routines.

The ‘explain’ prompt promotes communication, terminology

Recap on ARBs

Level: 3
Curriculum info:
Maths, Statistics, Probability
Key Competencies:
Using language, symbols, and texts
Keywords:
probability, independence
Description of task:
Students recognise equal and different likelihoods when playing a game of chance and explain their reasoning.
Curriculum Links:
This resource can be used to provide evidence of students' understanding of *ordering probabilities*.

Key competencies

This resource involves *justifying a conclusion using written communication*, which relate to the Key Competencies: *Using language, symbols and text*, and *Thinking*.

For more information see http://nzcurriculum.tki.org.nz/Key-competencies

Learning Progression Frameworks
This resource can provide evidence of learning associated with
Interpreting statistical and chance situations, sets 3-4
within the Mathematics Learning Progressions Frameworks.
Read more about the Learning Progressions Frameworks.


Overview


Using this Resource


Connecting to the Curriculum


Marking Student Responses

Aha , it can be used to collect evidence of *ordering probabilities*.

The notes on key competencies could be a useful way to integrate these as already 'built in'

The link to Learning Progressions could help too

Recap on ARBs

Answers/responses:

			Y7 (03/2010)
a)	i) ii)	A Any **1** of: • Gives the probabilities (or odds) [Above Year 6]. There is a 2 out of 6 chance for a biscuit when an ice cream is a 1 out of 6 chance. [probability] There is a 2/3 chance to get a biscuit over an ice cream. [odds] • Gives the frequencies [At Year 6]. Because there is only 1 ice cream but there's 2 biscuits. There are two chances to get a biscuit and one to get an ice cream. Two is greater than one so there are more chances of getting a biscuit.	easy moderate moderate (both correct)
b)	i) ii)	C Any **1** of: • Gives the probabilities (or odds) Because there is a 3 in 6 chance to win something and to not win something. [probability] Getting no prize is a 3/6 chance and getting no prize is a 3/6 chance. [probability] There is a 3/3 chance to get a prize or not. [odds] • Gives the frequencies [At Year 6]. There are 3 chances to win and 3 chances to win nothing. Because there are six numbers on a dice and you can win [with] 3 and you can lose [with] 3. There are three chances of getting no prize and three chances to get a prize. Three is equal to 3 so the chances are 50-50.	moderate difficult difficult (both correct)

Overview

Using this Resource

Connecting to the Curriculum

Marking Student Responses

Working with Students

This could help support consistency when marking across the cohort.

The ‘easy’, ‘moderate’ guide could help me determine how to level up and level down in future

Recap on ARBs

Teaching and learning:

This resource looks at uncovering students' conceptions and misconceptions in probability reasoning. The explanation is more revealing of students' thinking than the multiple choice response.

Diagnostic and formative information:

Common incorrect answers
There are many well known misconceptions about probability. Examples of these follow.

For more information click on the link Probability concept map: Common misconceptions. The letters [A], [B] or [C] in each example below is the response the student chose in the multiple choice part of that question.

	Likely misconception
a) b)	**Equiprobability** The student sees events as equally likely even when they have different probabilities. Because there is a biscuit and an ice cream in the competition [C]. Because there is 3 chances of getting a prize and there is only one chance of getting no prize [B]. I looked at the chart. There are more prizes than no prize [B]. Because they would all get one [prize] [A].
a) b)	**Outcome approach** Some students may respond to situations involving chance by stating that you just can't tell anything when it comes to probability. [It] depends on what he rolls. He might not always win [C]. Because you can't make the dice land on a 5 or a 4, it just lands on what it lands on. Because you could get any number [C]. Elle may win a prize, she may not win a prize. The best thing is she had a go. She may have better luck next time [C].
a) b)	**Regency (a form of representative bias)** Students often think that if a particular event has happened more often than they expect, then it will be less probable to occur (negative regency) or more likely to occur (positive regency).

Overview

Using this Resource

Connecting to the Curriculum

Marking Student Responses

Working with Students

These insights could help me give the right feedback and interventions.

I could use ākonga responses to create a rapid routines.

Recap on ARBs

For more information click on the link Probability concept map: Common misconceptions

- Fruit in school
- Hot air balloon
- Marble bag
- Counters in bag
- Favourite All Black
- Square spinner
- Hundred coin throws
- Spinner probabilities
- Spin a surprise
- Snakes and ladders
- Spinner chances
- Even Stevens
- Nuka Island
- Probability Concept Map

Overview

Using this Resource

Connecting to the Curriculum

Marking Student Responses

Working with Students

I can plan some consolidation tasks to allow me to target specific groups whilst others work independently

What they can support us with

	Number strategies	Num & Alg knowledge	Measurement & Geometry	Statistical inquiry
Procedural Fluency	✓	✓	✓	✓
Conceptual Understanding	✓	✓	✓	✓
Problem Solving				
Reasoning	✓	✓	✓	✓
Productive Disposition				
Support teacher judgements	✓	✓	✓	✓
Offers flexibility	✓	✓	✓	✓

Not explictly PS, but could be adapted to assess this

With the right words, actions and expectations

Contribute to the self-efficacy and self-agency