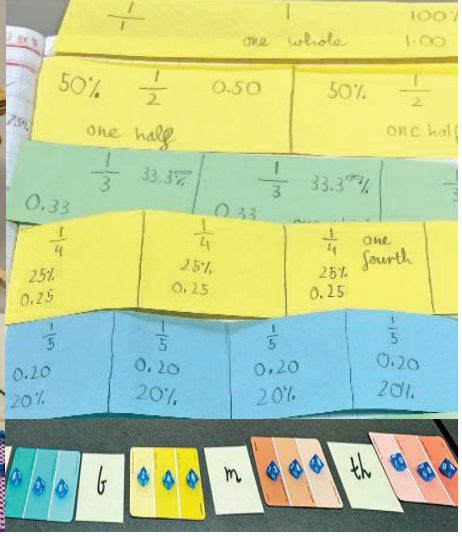


Real-Life Numeracy Years 3-6

Planning Package

Sequential units with hands-on, real-life numeracy for Year 3, Year 4, Year 5 and Year 6 students

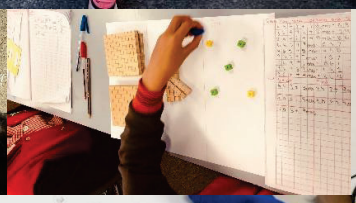
Ten years of development in Australian classrooms.

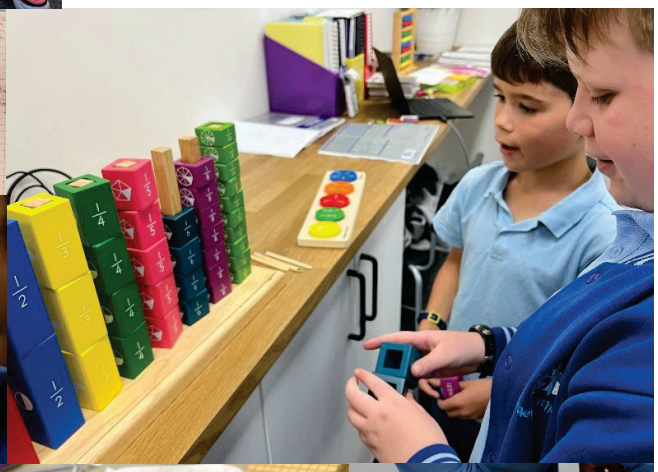
Genuinely high engagement and conceptual understanding in middle to upper primary numeracy.

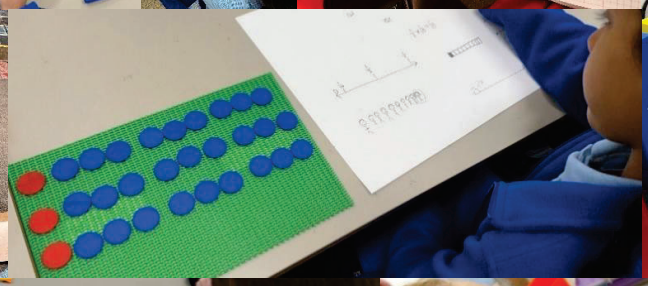
Comprehensive differentiation for wide ranges: Pre-planned and workable enabling and extending prompts for every lesson.

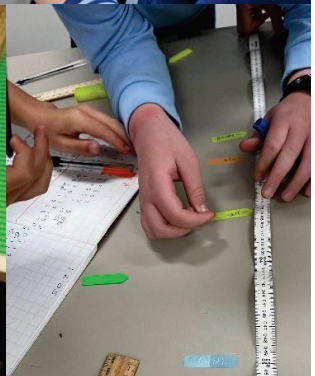
High-impact, high-relevance professional learning on a daily basis to support planning.

Comprehensive diagnostic and formative assessments to target each sequential point-of-need.









Please note: It is not intended for teachers to attempt to deliver every lesson in this sequence, nor read the unit in full.

Units are designed as **a menu of options**, depending on the points-of-need for each class, with enabling and extending prompts included for every lesson.

Please choose lesson options based on assessed points-of-need (units are directly linked to the assessments), using either Top Ten's or other **strategy-focused diagnostic pre-assessments.** We recommend avoiding multiple-choice/click-the-answer tests, as numeracy as a discipline grows students' reasoning and thinking skills, ability to explain and show strategies, as well as deep conceptual understanding. Answers alone are not the ultimate goal, or a worthy aspiration in the absence of student reasoning.

Please also select lessons that best suit students' interests and your own creativity and passion. Units are designed to share the wisdom of practice, while respecting and safeguarding the professional role of the teacher as the ultimate best judge of what students need.

Adjust how many lessons you deliver based on student progress throughout the unit, which can be tracked using the formative assessment folder.

Place Value for Year 4 – 4A Constructing and Recording Hyperlinked Table of Contents

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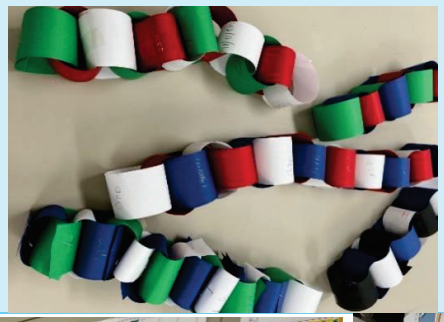

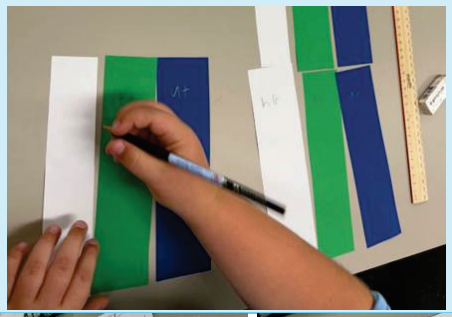

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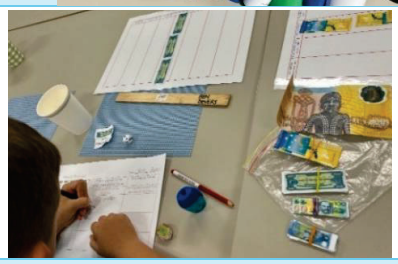

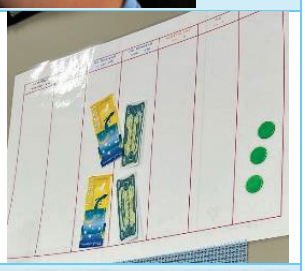

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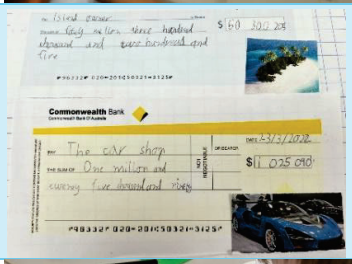

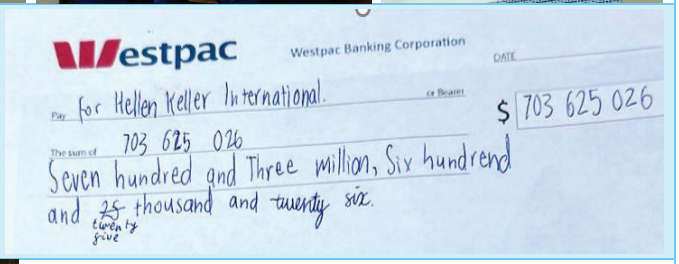

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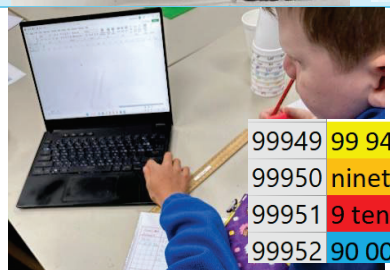


99949	99 949
99950	ninety-nine thousand, nine hundred and forty nine
99951	9 ten thousands, 9 one thousands, 9 hundreds, 4 tens, 9 ones
99952	90 000 + 9000 + 900 + 40 + 9

Place Value Unit for Year 4

Curriculum Links for the following lessons

This unit is recommended for Year 4 students.

Laying the place value foundations for content descriptors relating to place-value based strategies for operating on numbers: **Australian Curriculum V9 AC9M4N06 and Victorian Curriculum Version 2.0 (VC2M4N06)**

Number – Level 4: Develop efficient mental and written strategies and use appropriate digital tools for solving problems involving addition and subtraction, and multiplication and division where there is no remainder

- using and choosing efficient calculation strategies for addition and subtraction problems involving larger numbers, for example, **place value partitioning**, inverse relationship, compatible numbers, jump strategies, **bridging tens, splitting one or more numbers,** extensions to basic facts, algorithms and digital tools where appropriate
- using physical or virtual materials to demonstrate **doubling and halving strategies** for solving multiplication problems; for example, for 5 × 18, using the fact that double 5 is 10 and half of 18 is 9; or using 10 × 18 = 180, then halving 180 to get 90; or applying the associative property of multiplication, where 5 × 18 becomes 5 × 2 × 9, then 5 × 2 × 9 = 10 × 9 = 90 so that 5 × 18 = 90
- using **place value partitioning,** basic facts and an area or region model to represent and solve multiplication problems; for example, for 16 × 4, thinking 10 × 4 and 6 × 4, then 40 + 24 = 64, or a double double strategy where double 16 is 32, double this is 64, so 16 × 4 is 64

Australian Curriculum V9 AC9M4N05 and Victorian Curriculum Version 2.0 (VC2M4N05)

Number – Level 4: Solve problems involving multiplying or dividing natural numbers by multiples and powers of 10 without a calculator, using the multiplicative relationship between the place value of digits

- using physical or virtual materials to demonstrate the multiplicative relationship between the places
- using materials such as place value charts, numeral expanders or sliders to recognise and explain why multiplying by 10 moves the digits one place to the left and dividing by 10 moves digits one place to the right
- using a calculator or other digital tools to recognise and develop an understanding of the effect of multiplying or dividing numbers by tens, hundreds and thousands, recording sequences in a place value chart, in a table or spreadsheet, generalising the patterns noticed and applying them to solve multiplicative problems without a calculator

Australian Curriculum V9 AC9M4N07 and Victorian Curriculum Version 2.0 (VC2M4N07)

Number – Level 4: Choose and use estimation and rounding to check and explain the reasonableness of calculations, including the results of financial transactions

- using proficiency with basic facts to estimate the result of a calculation and say what amounts the answer will be between; for example, 5 packets of biscuits at $2.60 each will cost between $10 and $15 as 5 × $2 = $10 and 5 × $3 = $15
- using rounded amounts to complete an estimated budget for a shopping trip or an excursion, explaining why overestimating the amounts is appropriate
- recognising the effect of rounding in addition and multiplication calculations; rounding both numbers up, both numbers down, and one number up and one number down, and explaining which is the best approximation and why

New WA Curriculum – Number and Algebra – Understanding Number – Year 4: Read, write and order numbers to at least six digits.

New WA Curriculum – Number and Algebra – Understanding Number – Year 4: Represent numbers up to five digits using place value and non-standard partitions with equations. Recognise the multiplicative (10 times as many) place value relationship between adjacent places from right to left.

NSW Syllabus – Stage 2 – Representing numbers using place value A

Whole numbers: Read, represent and order numbers to thousands

- Group physical or virtual objects to show the structure of tens, hundreds and a thousand
- Regroup numbers flexibly, recognising one thousand as 10 hundreds and one hundred as 10 tens or 100 ones
- Compare and describe the relative size of numbers by positioning numbers on a number line (Reasons about quantity)
- Count forwards and backwards by tens and hundreds on and off the decade
- Represent numbers up to and including thousands using physical or virtual manipulatives, words, numerals, diagrams and digital displays
- Read and order numbers of up to at least 4 digits
- Identify the number before and after a number with an internal zero digit

Whole numbers: Apply place value to partition and regroup numbers up to 4 digits

- Record numbers using standard place value form
- Partition numbers of up to 4 digits in non-standard forms (Reasons about quantity)

NSW Syllabus – Stage 2 – Representing numbers using place value B

Whole numbers: Order numbers in the thousands

- Arrange numbers in the thousands in ascending and descending order
- Recognise and describe how rearranging digits changes the size of a number (Reasons about relations)
- Identify the nearest thousand, 10 thousand or 100 thousand to numbers

Whole numbers: Apply place value to partition, regroup and rename numbers up to 6 digits

- Name thousands using the place value grouping of ones, tens and hundreds of thousands
- Use place value to expand the number notation
- Partition numbers of up to 6 digits in non-standard forms

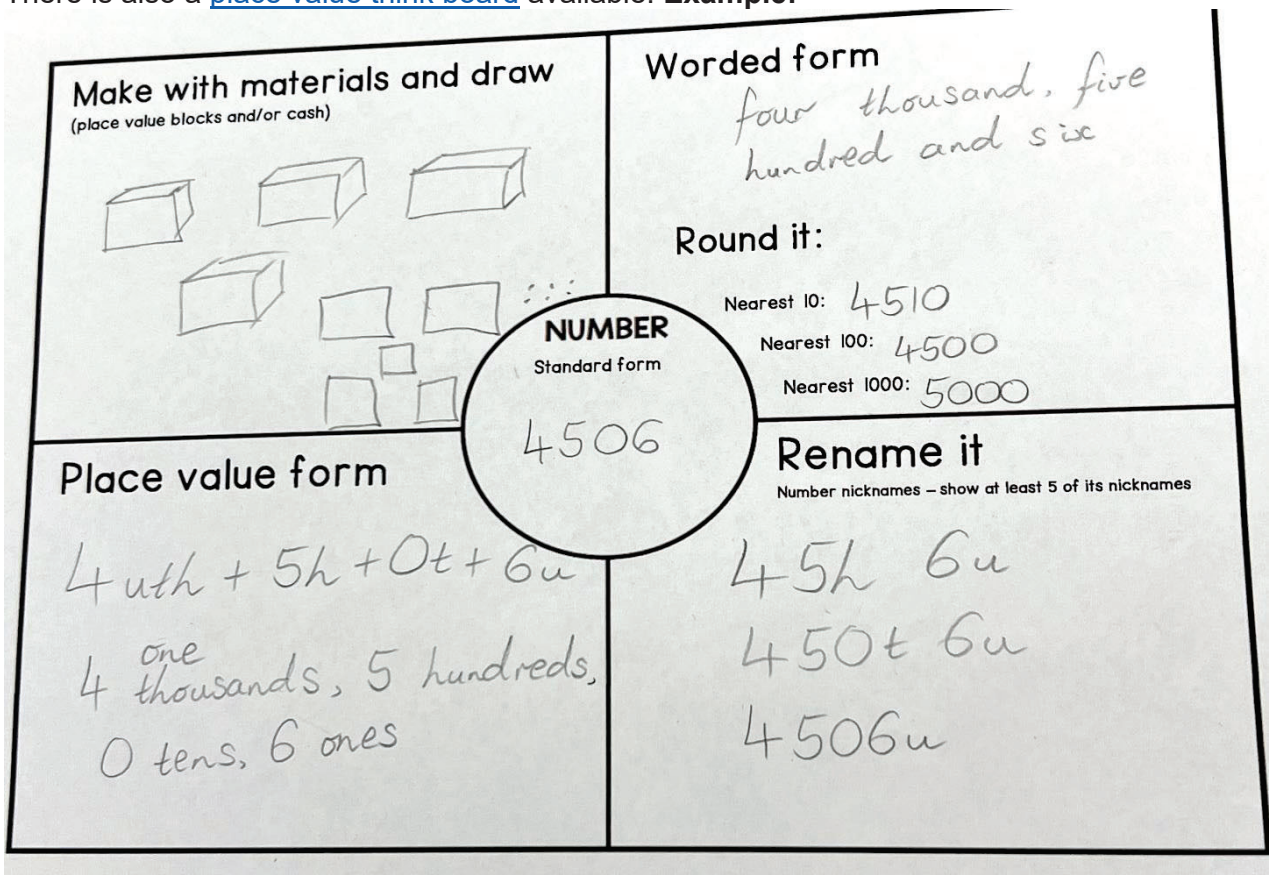
Whole numbers: Recognise and represent numbers that are 10, 100 or 1000 times as large

- Recognise the number of tens, hundreds or thousands in a number
- Describe how making a number 10, 100 or 1000 times as large changes the place value of digits

Formative Assessment

A formative assessment cross-check is available in this unit's folder with progressive learning goals and specific success criteria for this unit. This includes a grid template or a section template for notes, whichever the teacher prefers to use.

There is also a place value think board available. **Example:**



The ghost of place value past shall haunt you all year...

Rush through place value during Term 1 at your peril – its ghost will haunt you for the rest of the numeracy year. You start split strategy – students cannot partition mentally. You start jump strategy – students cannot jump in multiples of a place value, nor bridge or rename. You start multiplication, students cannot estimate because they cannot round, so produce unreasonable answers. You try division – they cannot partition or rename. It is worth the seven weeks.

Teaching Tips

Big idea and Sequencing

One of the big ideas for the early years that students have experienced so far in their place value journey is “10 of these is 1 of those” and “100 of these is 1 of those.” This extends in year 3 and 4 to become, “1000 of these is 1 of those,” or 10 thousands is 1 ten thousand,” and 10 000 ones = 1 ten thousand, and 100 hundreds = 1 ten thousand, and 1000 tens = 1 ten thousand. The base-ten nature of place value must be highlighted to students regularly.

10 hundredths = 1 tenth
10 tenths = one whole, or 10 x 10 cents = $1
10 ones = 1 ten
10 tens = 1 hundred, or 100 ones = 1 hundred
10 hundreds = 1 thousand, or 1000 ones = 1 thousand , or 100 tens = 1 thousand
10 000 ones = 1 ten thousand, 100 hundreds or **10 thousands = 1 ten thousand**

Developmental sequence: There is a recognised sequence for teaching any new phase of place value. It is as follows:

1. Introduce the new unit: 10 of these = 1 of those, or 100 of these = 1 of those, or 1000 of these = 1 of those. In year 4, this extends to 10 000 ones = 1 ten thousand.

2. Address language problems (tens; teens; saying *‘and’* after hundreds; repetition of the h-t-o/u pattern in second phase place value; saying the name of the place value family at each interval of 3 digits “four hundred and fifty-three *thousand* five hundred and two).

3. Make, model and name regular examples (54 643, 35 783).

4. Irregular examples (teens 17 514, internal zeroes 60 703).

5. Round to nearest ten, hundred, thousand and ten thousand.

6. Rename flexibly (53 408 as 53 one thousands 40 tens 8 ones, or 4 ten thousands 13 one thousands 408 ones, or 534 hundreds 8 ones).

7. Add/subtract place values (+3 tens, -8 hundreds). Recognise combinations that make tens of thousands numbers, such as 50 000 or 100 000 (complements of 100 000).

The unit follows this sequence, by first introducing and consolidating larger place values. The focus is on recording using place value form, standard form and worded forms.

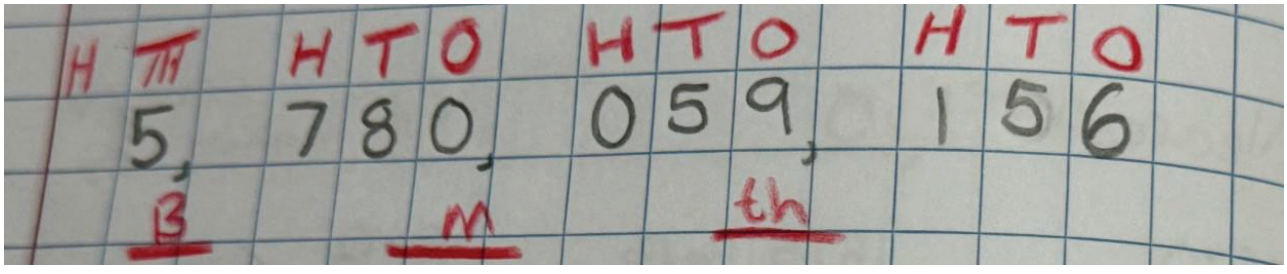
Then the unit progresses to rounding, renaming, bridging/adding/subtracting place values, and partitioning these larger numbers to assist with the four operations.

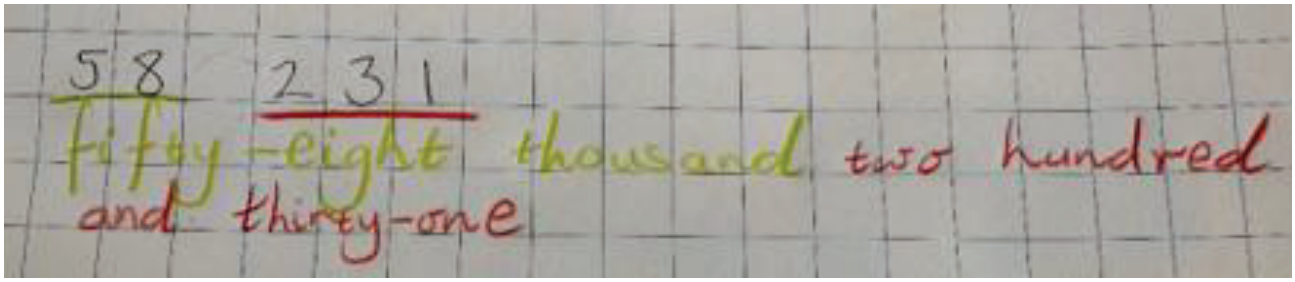
Paint Samples Place Values – If you can read 3-digit numbers, you can already read massive numbers!

Critical tip for reading and writing larger numbers in words

Place value paint samples

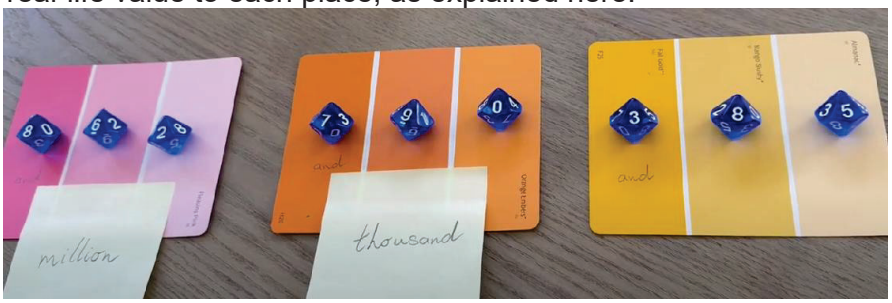
https://youtu.be/eadZHFYVshU?si=KrqaXaSosP9osqcD





Real-life connections

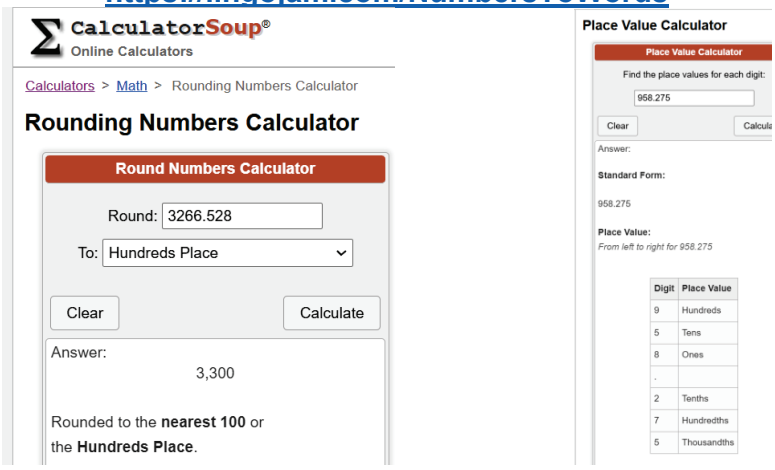
The strategy for saying and writing larger numbers in words can become even more meaningful by assigning a real-life value to each place, as explained here:



https://www.youtube.com/watch?v=Uk554fOB7XU

Immediate feedback mechanisms

https://lingojam.com/NumbersToWords



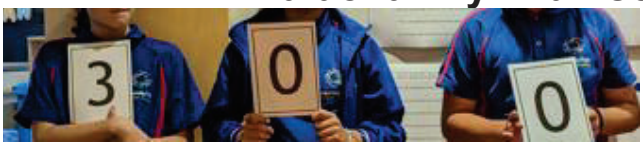
https://www.calculatorsoup.com/calculators/math/roundingnumbers.php

https://www.calculatorsoup.com/calculators/math/place-value-calculator.php

Place Value Families of Students (Groups of 3)
'Become the Number'

With great thanks to Mernda Park PS

Read each set of 3 numbers, then all three students say the place value family in unison:

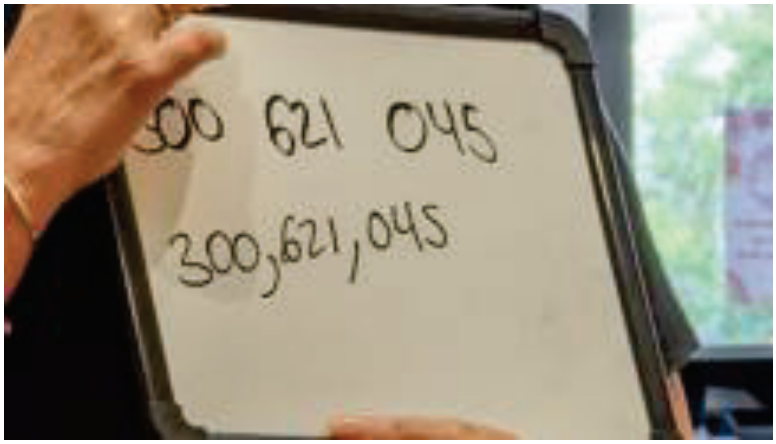


"300 MILLION!"

"621 THOUSAND!"

"AND" 

45 (No family is said for the final place value, as we don't say 'ones' when reading a number – it is assumed the final place is ones).

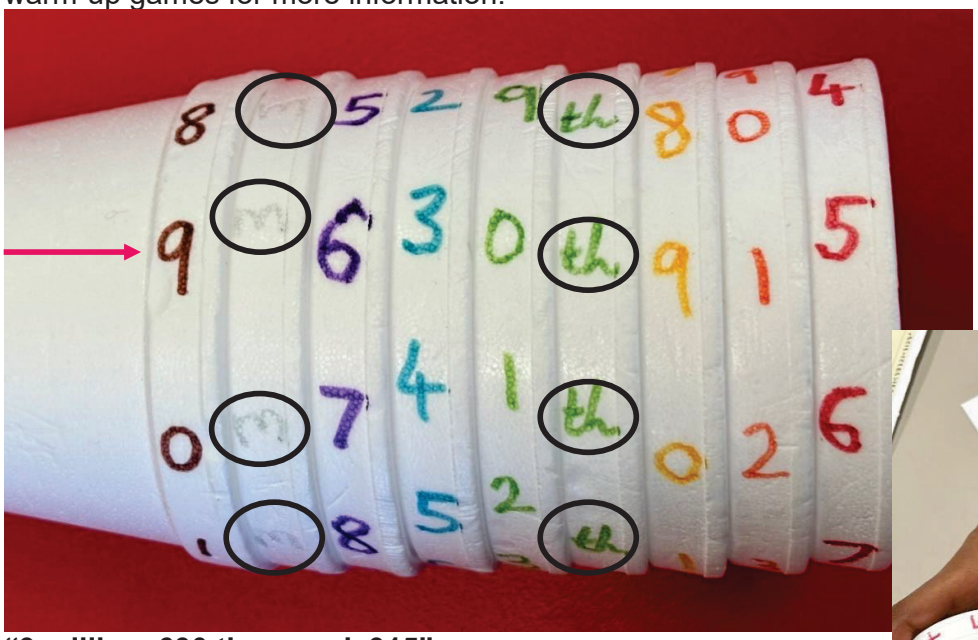


Spaces and commas were modelled, as both are seen in real-life contexts.

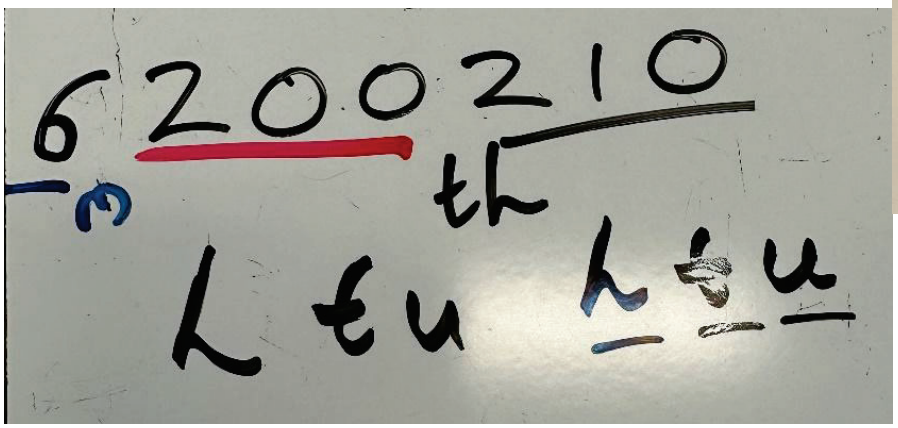
Even though the official Australian convention is to use spaces, commas are regularly encountered in real-life contexts, so it is best practice to model both.

Place Value Cups

An excellent resource to support reading large place values – see the *Year 6A Place Value Unit* warm-up games for more information.

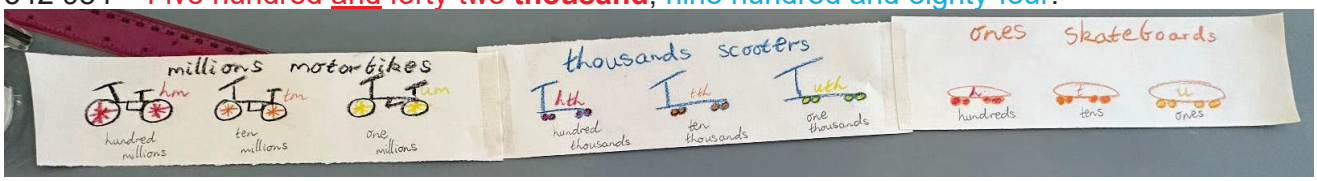


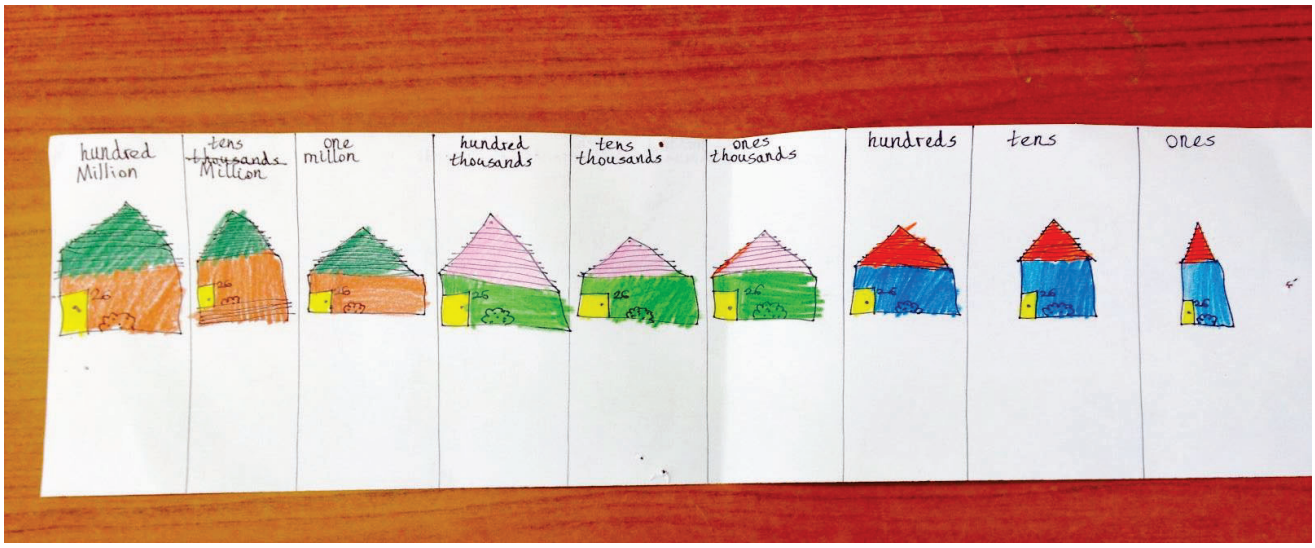
"9 million, 630 thousand, 915"
Once you know how to read 3-digit numbers, you can read so much more!



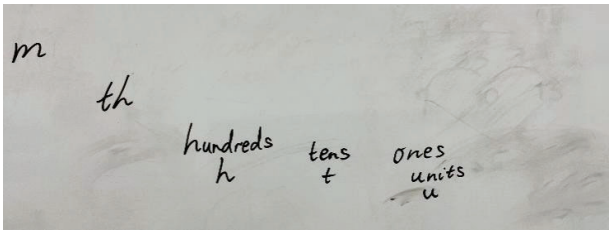
Underline three places at a time starting from the right.

Second phase place value: As students progress to working with thousands and tens of thousands, it is critical to introduce the place value pattern that recurs throughout our base-ten system (hundreds, tens and ones). Students who have not had this pattern highlighted to them, and reinforced, often have the misconception that the place value system works as: "Ones, tens, hundreds, thousands, millions, billions." Representations that highlight the 'three in each place value family' understanding, and the repetition of the hundreds, tens, ones pattern within each, combat this misconception. This then becomes a very efficient strategy for students to accurately say, read and write very large numbers in worded form, by focusing on three places at a time, saying the number as if it were just a hundreds number, then saying the place value: 542 984 = Five hundred and forty-two **thousand**, nine hundred and eighty-four.

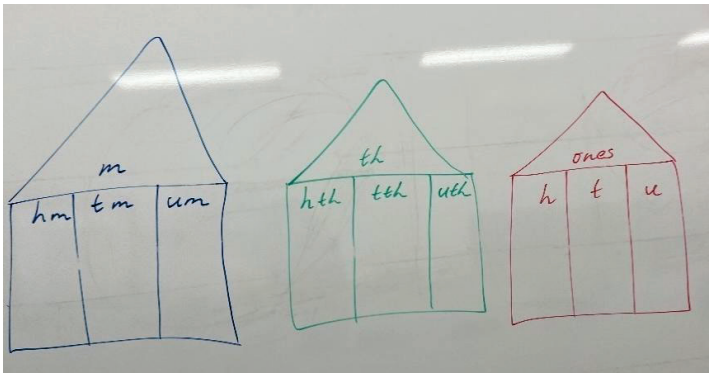




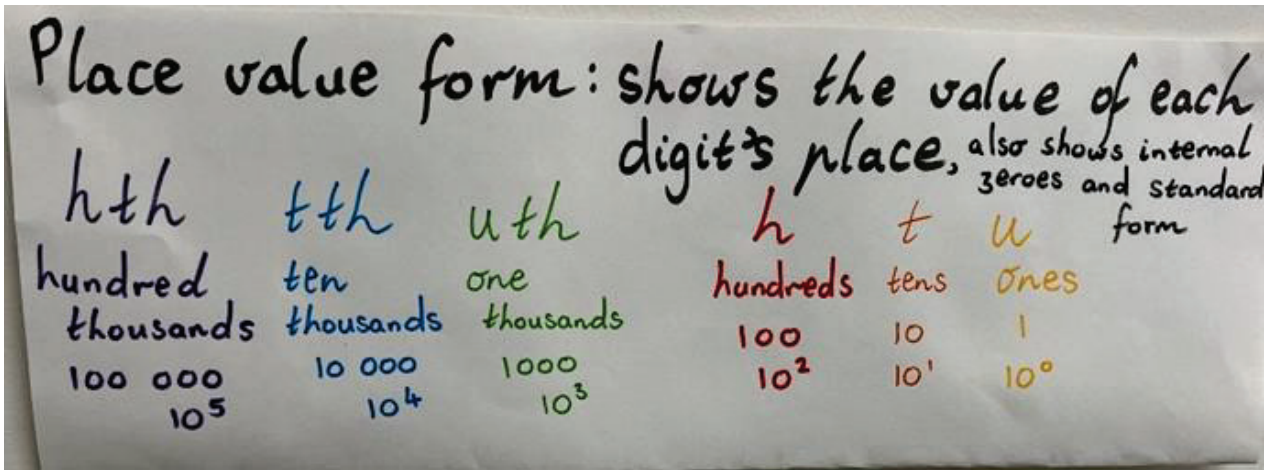
Students' common misconception – That place values work as ones, tens, hundreds, thousands, millions



Place value patterns – ones, tens, hundreds exist in all place values in sets of 3, so it is, in fact, ones, tens, hundreds; ones, tens, hundreds of thousands; ones, …



Anchor chart examples



Changing the language of 'MAB' to place value blocks

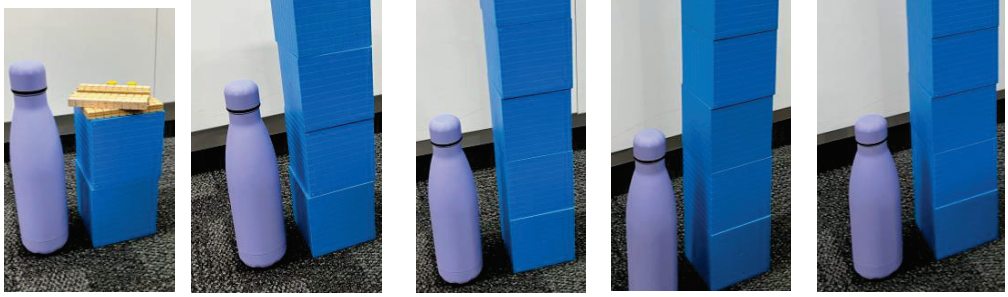
While the commercial name for the most commonly used materials throughout this unit is 'MAB,' it is critical to instead call these 'place value blocks' for our purposes in the classroom, to reflect why and how we are using the materials. MAB is abstract language that does not form part of long-term maths vocabulary, compared to 'place value.'

Comparing numbers

Once materials are in use, students generally learn how to compare and order numbers reasonably quickly. This often does not represent a significantly challenging gap to address – it tends to fall into place naturally alongside tasks that relate to constructing, recording, rounding and renaming numbers. However, if difficulties present, these strategies may be of benefit.

Cash connection: As in, “Would you like 5 thousand 4 hundred and thirty-two dollars, *or* 4 thousand 5 hundred and twenty-three dollars?”

Using place value blocks to compare: Students build place values as towers, seeing that the values change the size of the number considerably, depending on which digit is in which place value position. It is not sufficient to use playing cards alone – use the blocks, like so:



2 162 4321 5433 7015 9424

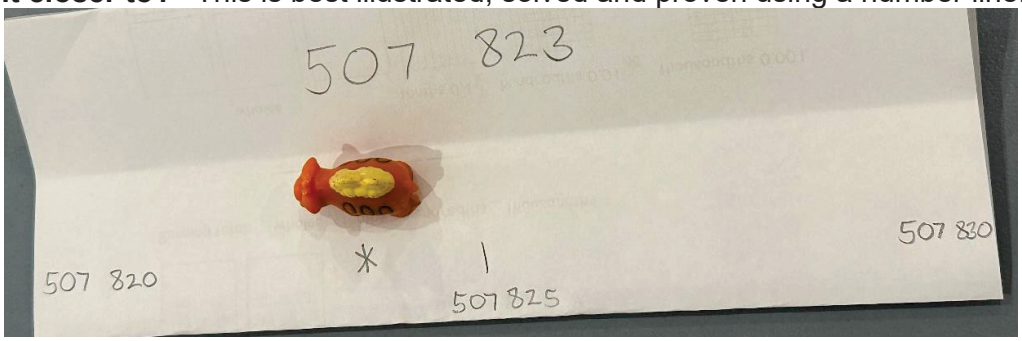
The blocks can visually show how a different digit in that place value position drastically alters the size of the number (playing card tasks without blocks do not achieve this).

Using number lines to compare: It is also valuable to challenge students to place numbers along a number line (use the same set of digits, change which place values the cards occupy, and mark each number along a number line to show their order).

As our place value system is ‘left-leading’ and base-10, this means that any place to the left is worth 10 times more than one place further to the right and, thus, ‘Left rules, right drools by a factor of 10 or by x10’ – but students must understand why, rather than applying this ‘rule’ without concrete or visual understanding.

Rounding

Avoid ‘rounding rollercoasters’ or ‘rounding mountains’ and instead repeat this critical question: **“What is it closer to?”** This is best illustrated, solved and proven using a number line.



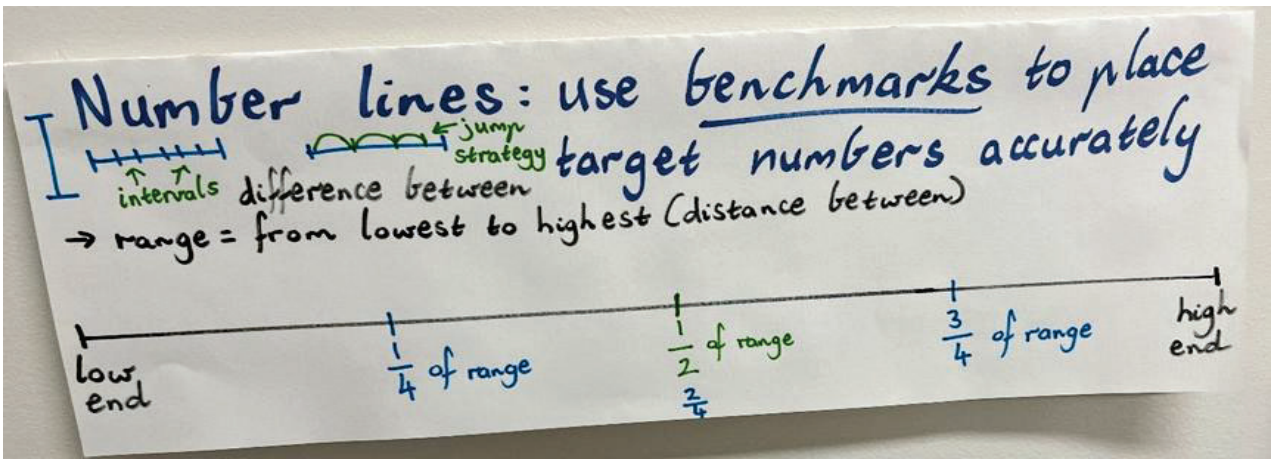
Rote rules relating to underlining the place next door, and so on, often falter in students’ memories when they are conceptually challenged, and also do not create genuine number sense in terms of number line awareness. These fragile procedures frequently fall to pieces when students are asked to round inside a place value (rounding a tens of thousands number to the nearest ten), or estimate while operating, as the rules are too fragile to be applied meaningfully and with a number sense that is critical for real-life numeracy.

Research quoted in Clarke et al (2008): **According to this large-scale study, summarised here, if we do not teach or emphasise rounding and estimation throughout the year of numeracy, we are setting up students to fail in more than 60 percent of real-life scenarios.**

> Surveys completed by two hundred adults over a twenty-four-hour period found that more than 60 percent of all calculations carried out in daily life only required an estimate (Northcote and McIntosh 1999). We believe that the curriculum emphasis should reflect this finding. This is one reason why teaching fraction algorithms for the four operations does not prepare students for real-life encounters with fractions, where mental estimation is the key skill.

The discussion point then becomes the ‘5,’ as it lies in the centre of the number line, so does not appear to be visually closer to either side. There is a reason 5 rounds up – what do you think? (Take some thinking time before reading on…).

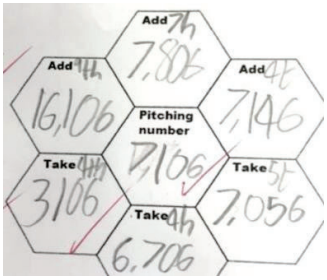
The reason that 5 rounds up is not simply by rule/convention – there is a mathematical basis for it. How many digits are there? There are 10 digits, including zero. So if we count on one hand – 5 digits go down, and 5 go up. That is an even or fair share for situations in life when we round down, and others when we round up.



Renaming, when used to its highest effect, is not concerned with preparing students for the vertical algorithms at all – that is a slightly positive after-effect.

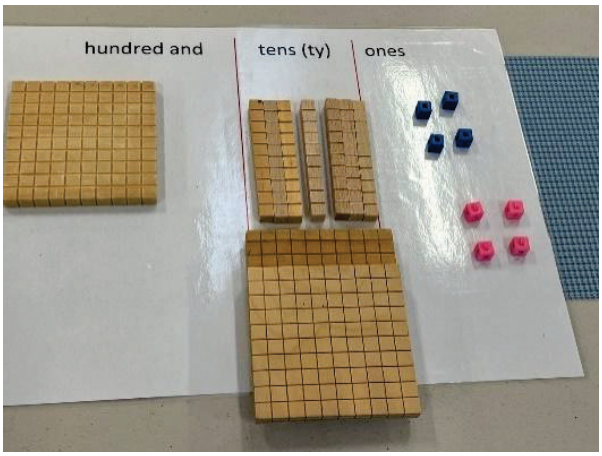
Renaming is about **building flexibility with number sense** that can be used to great effect for mental strategies that are to follow throughout the year for every operation.

For example, if a student needs to work out 7106 – 400, a student who can rename would be aware that within 7106 there are 71 hundreds. 71 hundreds – 4 hundreds = 67 hundreds, making the answer 6706 (since the tens and ones do not change when taking away a multiple of 100).



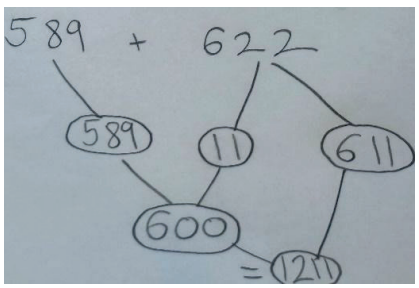
Renaming is similar to giving a number its **Aussie nickname**. Like many Aussies, numbers have lots of nicknames!

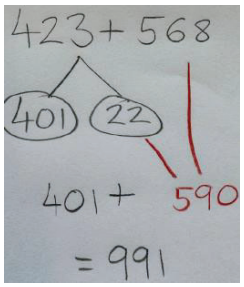
In the early years, students were trained to use superhero eyes (subitising). Now their eyes are upgraded to 'x-ray eyes' that can slice larger place value blocks into their base-ten parts. The best way to do this is to set up a number in its regular sense on a place value chart, then physically push blocks to the right, renaming (with x-ray eyes) those values in that place value.

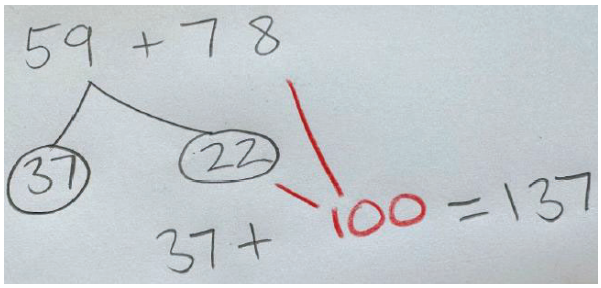


Flexible (non-standard) partitioning

It is also important to show students that they can partition in a non-standard/flexible format as well. For example, for these addition problems, it would potentially be quite an efficient strategy for some students to engage in the following examples of flexible (non-standard) partitioning, renaming one part (partitioning/breaking it another way, that is not a pure place value split):







Accordingly, for operating on numbers efficiently and mentally, renaming can be an extremely valuable tool.

Materials Organisation – PowerPoint summary and video link showing schools' organisational methods

Place value blocks organisation: To reduce pack-up and set-up times, it is critical to organise an efficient strategy for the distribution of place value blocks to each pair of students. In our experience, these are a few strategies that work best:

Transparent containers with at least 1 thousand cube, 12 hundreds, 12 tens and 12 ones, or open trays with more than sufficient supplies:

Left-hand image: Students at Herberton State School are allocated a container with a place value block set (1 thousand, 12 hundreds, 12 tens, 12 ones), as well as all the essentials for that week's lessons (templates for the week, dice, cash notes, and so on).
Right-hand image: Chirnside Park PS uses a barbeque tray style method.

Tupperware from Woolworths/Coles:

Fits precisely 20 tens, as well as 20 ones and all dice.

Thousand block and 12 hundreds.

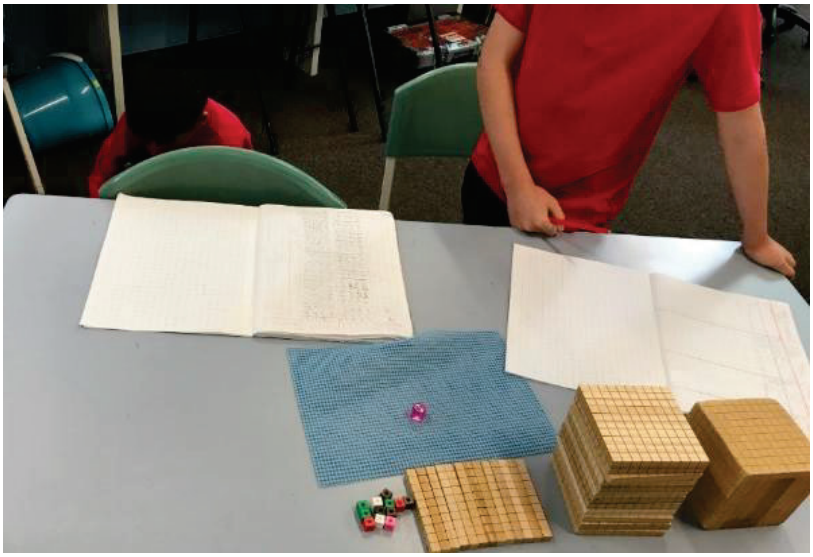
Grab-and-go partner container sets for Year 3/4 (20 hundreds, 20 tens, 20 ones, and as many thousands as possible in partner sets).

Cotton bags with 1 thousand, 12 hundreds, 12 tens and 12 ones. More thousand blocks available in the corners of the room.

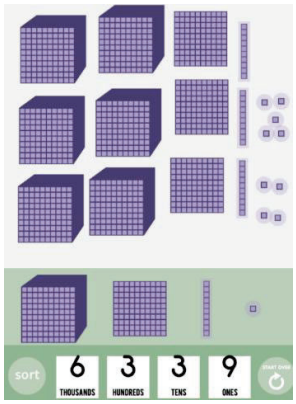
Top Ten member schools' exceptional organisation systems, with place value blocks set up, ready to collect and pack up in 1-minute: **video link**.

As the materials take up a significant amount of space on desks, it is also important to 'clear the desks' prior to each lesson, removing pencil cases, novels, water bottles and any other items, as shown here.

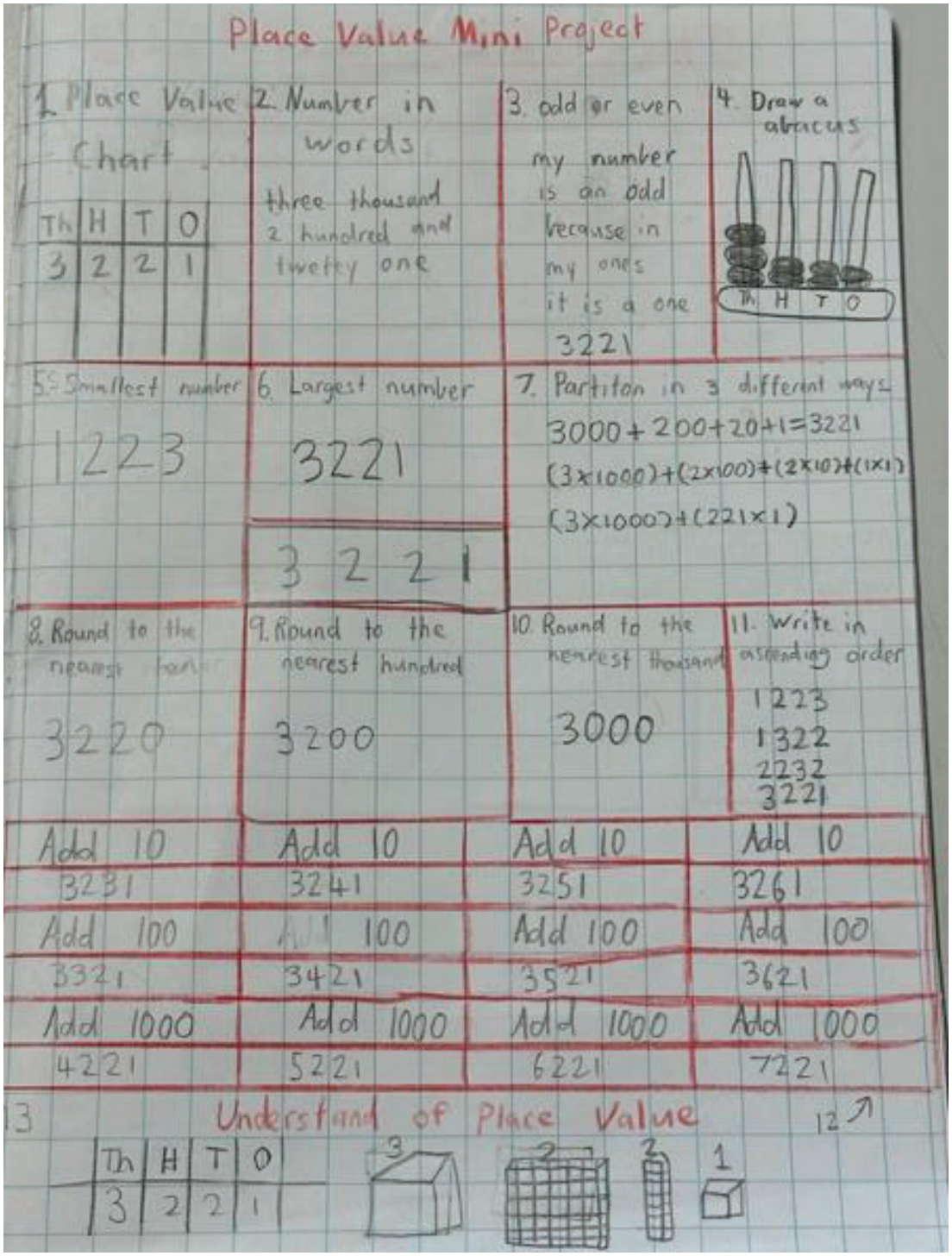
It is imperative to access sufficient place value blocks for students to create representations of 4-digit numbers and see the sheer size difference between the thousands, hundreds, tens and ones, as well as the difference between, for example, 2404 and 4204.



However, the reality is that some classrooms are under-resourced. For those classrooms, there is an ICT alternative, which is much less valuable than physical representations and hands-on learning experiences, but is preferable to a worksheet: https://www.abcya.com/games/base_ten

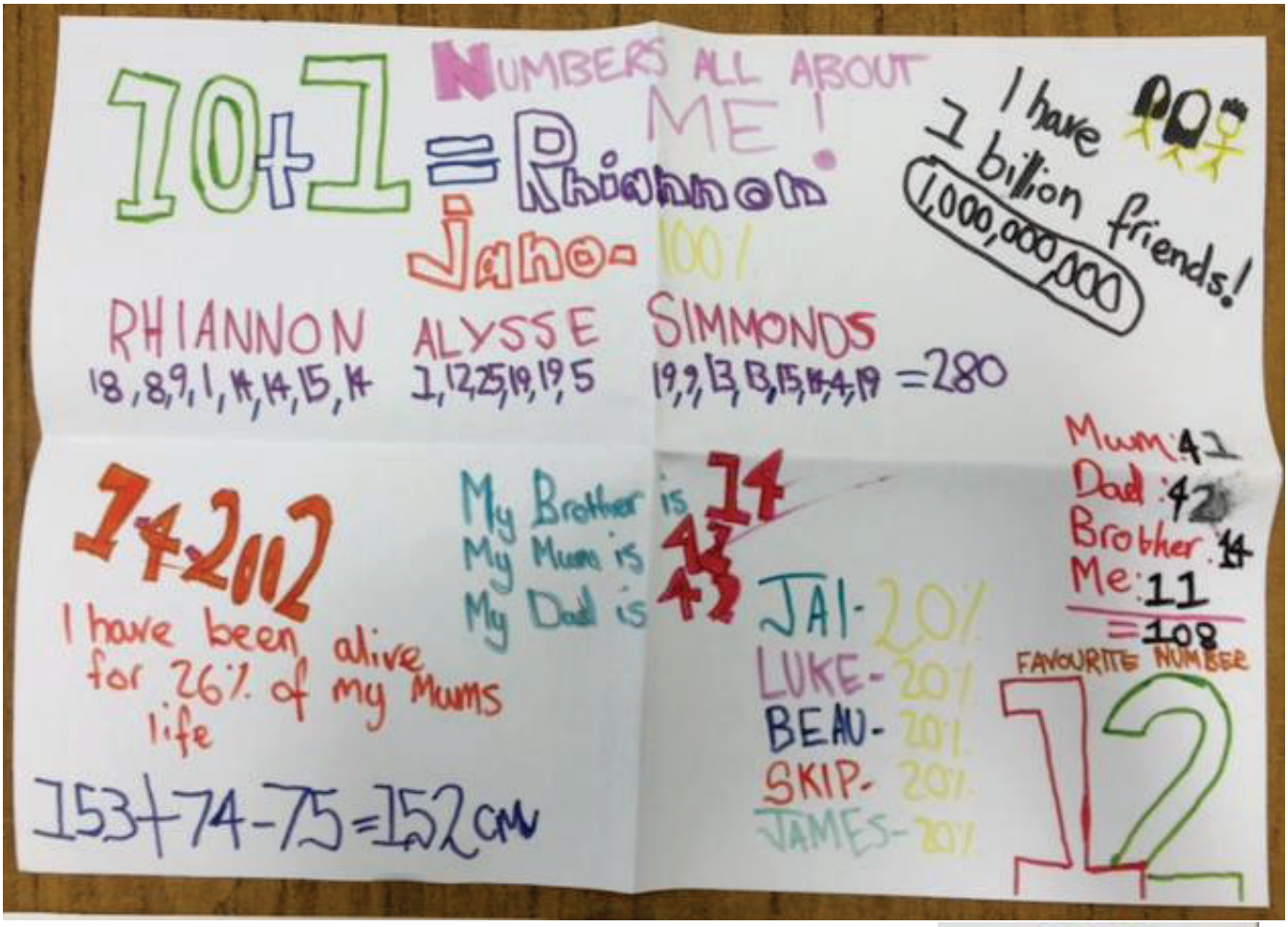


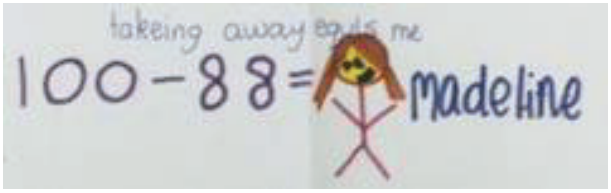
Student Maths Glossary and Reflection Journals – Unit launch glossary and activating prior knowledge brainstorms co-constructed with the teacher

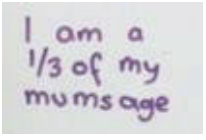


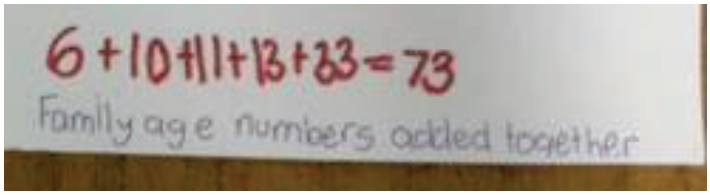
Unit Launch and Start of the Year 'Get to know you'

A 'numbers about me' get to know you activity – ideal for the start of the year!



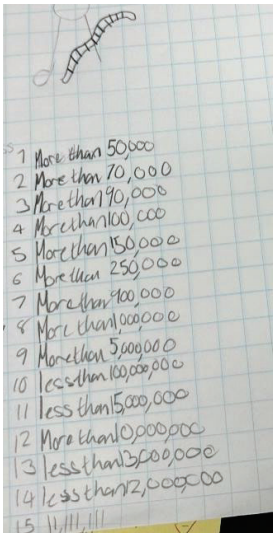
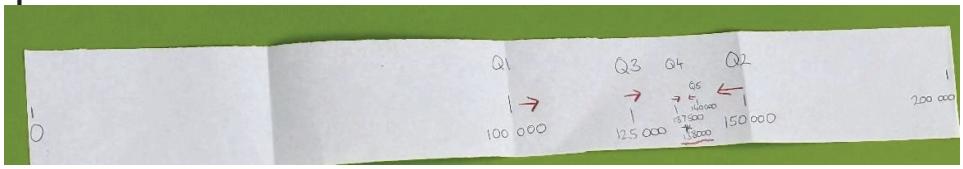




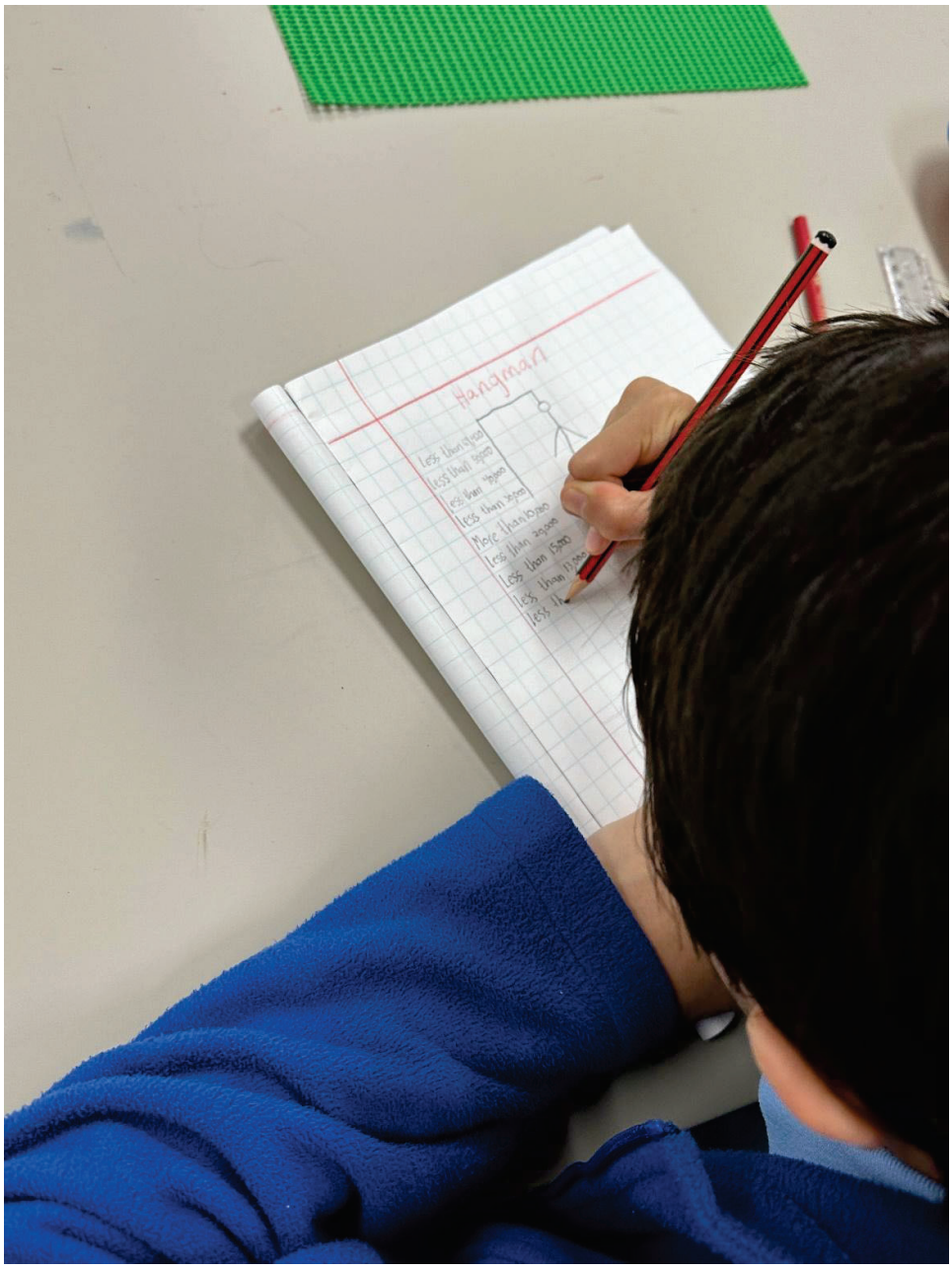


Show me some of the most challenging equations you can brainstorm about numbers that relate to you – 'impress me.'

Warm-up Games

Warm-ups	Second phase place value
Back-to-Back Calculator Challenge **Focus: Internal zeroes, standard and worded form.**	Play in pairs back-to-back with each student holding a calculator. 1. Student A types in a number and reads it out loud in proper/formal worded form (one million twenty thousand and seven) to student B. 2. Student B aims to type the same number into the calculator. 3. When ready, turn around and reveal. 4. Immediate feedback option to check if both students may be incorrect, or if students disagree but do not know who is correct: https://lingojam.com/NumbersToWords **Support:** Lower numbers. Place value chart in front of them to assist. **Extension 1:** Include plenty of internal zeroes. **Extension 2:** Include decimals. **Extension 3:** Scientific or exponential notation clues ("5 multiplied by 10 to the power of 9").
Guess My Number in ____ Questions **Focus: Using strategic mathematical questions and thinking to solve a place value problem involving the tens of thousands.** **Artistic variations:** **Stickwoman shark escape** **Stickman cannon shot** **Stickwoman dog chase** **Stickman skateboard stack**	Students play different versions of number 'hangman,' using strategic questions to save their stickman or stickwoman from impending doom.  **Alternative version:** If you do not wish to use 'hangman' as the context, it could be any drawing (in the below example, one student attempted to draw a caterpillar before the other student guessed their number, with the pre-agreed limit of 15 questions/lines for the caterpillar to be complete). This makes the game more engaging, particularly for artistically-inclined students. Students do not always have to draw a hangman. Students could instead draw a shark approaching a swimming stickwoman, or a stickman being loaded into a cannon at the circus. So long as the drawing has 15 lines (so that it allows student A to ask 15 questions). Students have artistic freedom (within the realms of what is appropriate for the classroom). **Students could also record using a number line (with their partner informing them of the initial range of the line), like so, with 'Q1' standing for 'Question 1' and arrows indicating the result of the question:** 

Hangman version: Student A's goal is to draw a hangman (they must draw at least 15 different elements on the page), before student B guesses their number. For fairness, student A must record their number on a post-it note.



Restricted number version: Students pull 5 cards, keeping 3 hidden and revealing 2 place values by turning both of these cards face-up. Student B looks at the upside down cards, but keeps these concealed from student A.

	Student A should keep a brief mathematical-style list of the answers they have given (as shown above), which also helps keep track of the deadline of 15 questions. **Prohibited questions (these questions are banned, because they are not rich in mathematical thinking):** • Is the digit in the ____ place more/less than 5? • Is the digit in the ___ place odd/even? (Students can ask if the entire number is odd/even, but not about particular place value columns, as the conceptual focus is on whole number, not limited column-style thinking). **Permitted question types:** • Is the total less/more than ___? Requires students to think about what the entire number could be, rather than just a single digit. • If the number were rounded to the nearest ____(ten, hundred, thousand, ten thousand), would it round to ____ or ____, or neither? • Is the number odd/even? (As this only allows the student to narrow down the ones place and highlights the significance of the ones in determining odd/even). **Emphasise for student B to use a variety of the questions above, and display a succinct summary of this list on the board as a supportive prompt.** When student B is ready to guess, they must use place value language (not just guess the digit): “Are there 5 tens of thousands? Are there 9 hundreds? Is our number fifty-thousand, two hundred and thirty-six? I think our number has 6 tens of thousands, 0 one thousands, 2 hundreds, 5 tens and 7 ones. Am I correct?” **Support:** For students who are struggling, allow 20 or 25 questions, or reduce the number of place values in play to 3 or 4. **Extension:** Play a decimals version using 6 cards with at least 3 decimal places, or the wholes and 5 decimal places. Name each decimal place value (tenths, hundredths, thousandths, ten thousandths, hundred thousandths, millionths).

Place Value Pyramid

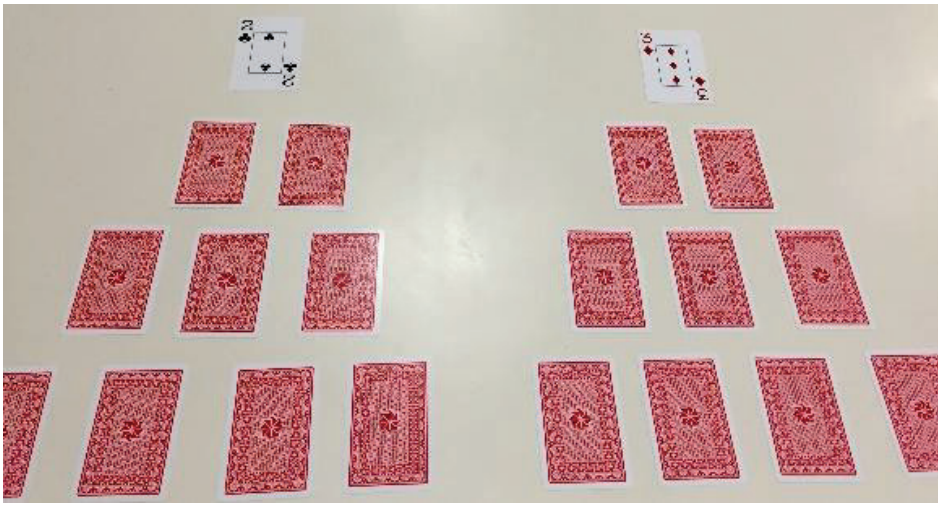
Focus: Comparing and ordering numbers

Students create a pyramid with cards facing down. They flip the ones over (the top row).

The player with the larger number wins both cards, for example, player with the 3, collects the 3 and the 2 card.

Then, they flip the tens over. The player with the larger number gets all four cards in that row (both tens numbers), and so on.

At the end, students create the largest number they can using any 6 of their collected cards. The player with the largest final number wins.



Extension: Work out the difference between your and your partner's number each round, and your final number.

Place Value Year 4A Lesson 2

Place Value Wonders of the World

Learning intention: Make 5-digit numbers, recording in standard and worded forms, and partitioning into place values (18 437 as 1 of the ten thousands, 8 of the one thousands, 4 of the hundreds, 3 of the tens and 7 of the ones). Record in place value form (tth uth h t u). Maths vocabulary: tally, rename, place value form, standard form, worded form

Numeracy picture book link: If… https://www.youtube.com/watch?v=TnHTIeiWzHg

YouTube hook: Learn about the wonders of the world: https://www.youtube.com/watch?v=7Dbuc6vIRnE or https://www.youtube.com/watch?v=JJV7y7A8ng8&ab_channel=IAmYourTargetDemographic and (at the conclusion of the lesson or as a hook for the second repeat

Lesson summary: Students use place value blocks to create a replica of one of the wonders of the world (work in groups of 3-4 to create all 7 wonders as a class). Students then gallery walk with a map of the world in hand (pre-marked with locations of the wonders of the world during the hook), roaming to the creations made by their classmates. At each gallery, students record numbers in their place value form, as well as standard and worded forms. 5-minute time limit to construct, then gallery walk for the rest of the session.

Materials:

- Place value wonders of the world recording template.
- Map of the world during hook or warm-down – printable version here.
- As many place value blocks as possible, particularly thousands cubes.
- **Classroom management tip:** Require that all 'wonders of the world' exhibits use more than 10 one thousand cubes.
- *For support with worded form:*
- Numbers to words spelling assistance charts – cursive font or stick and ball font.

The Great Wall of China

5-minute construction time-limit, followed by a gallery walk to record all other galleries in the room

session) https://www.youtube.com/watch?v=86FyWTKzxpI **As wonders of the world are mentioned in these videos, pause and use Google Maps to locate them. Challenge students to mark them onto their map of the world, to build geographic awareness.** First mark the location of your school's city/town and any other key landmarks (large nearby cities, common holiday destinations) with students.

Best set-up: During the hook, mark the locations of the wonders of the world on the world map, using Google Maps to locate these as a class.

Construct a whole-class 'wonder of the world' example in 5 minutes, practising the recording template together. Then give students 5 minutes of build time using a YouTube countdown.

Depending on how many place value blocks are available:

- If there are limited supplies, students build their own creation every 5 minutes, then record, demolish and build again for another 4 minutes OR
- If supplies are plentiful, students build once, then roam to each gallery around the room with their recording template.

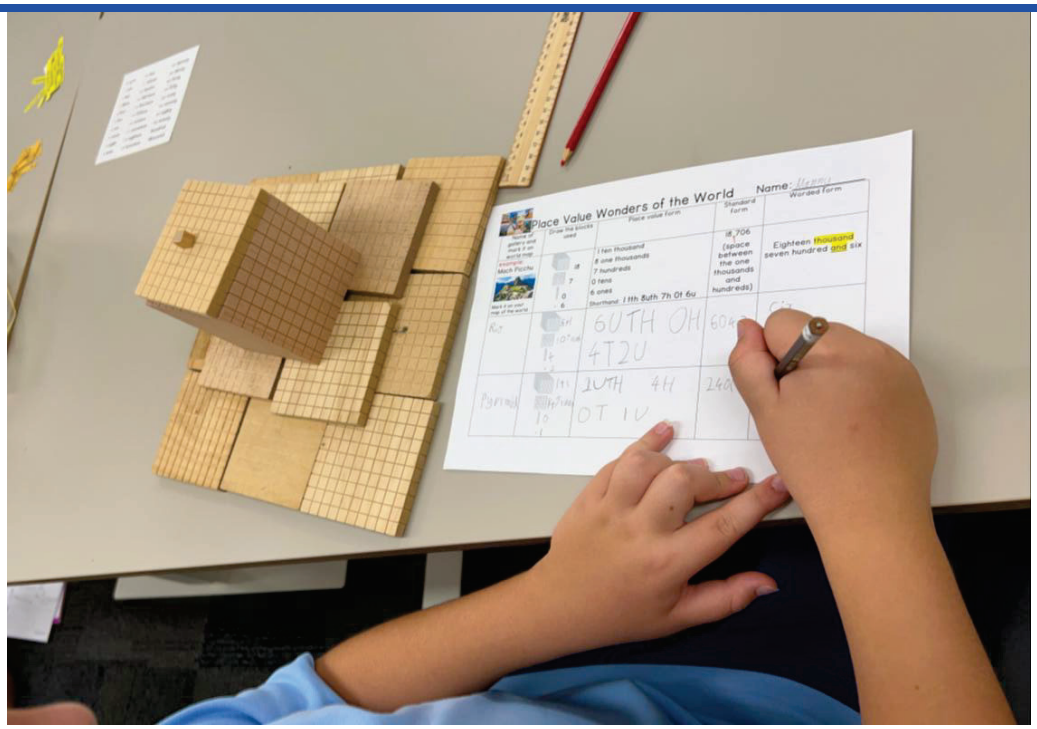
Display Google images of the wonders of the world while students build: link.

Set a strict 5-minute time limit for construction time using a YouTube countdown:
https://www.youtube.com/watch?v=_W0bSen8Qjg

Link to students' interests – arts-loving students: If you have been thinking of becoming an artist, or you just love art, this is the maths lesson for you! Today, we are creating pop-up art installations (wonders of the world pop-ups)!

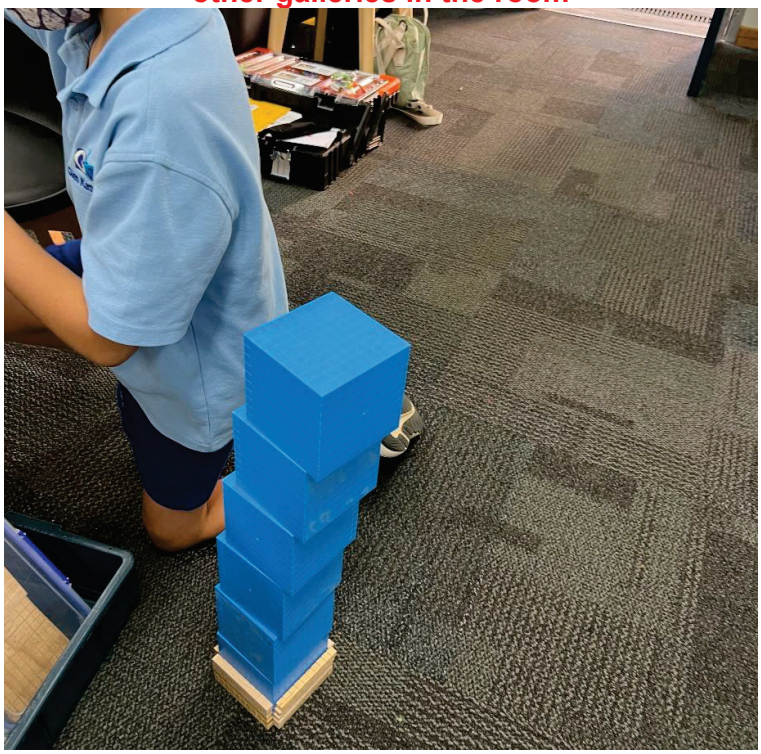
Link to students' interests – video games: Wonders of the Minecraft world https://www.youtube.com/watch?v=AUJ8UmtaUOc&ab_channel=WatchMojo.com

As a repeat session, students could create one of these Minecraft wonders, or could create an exhibit of their favourite



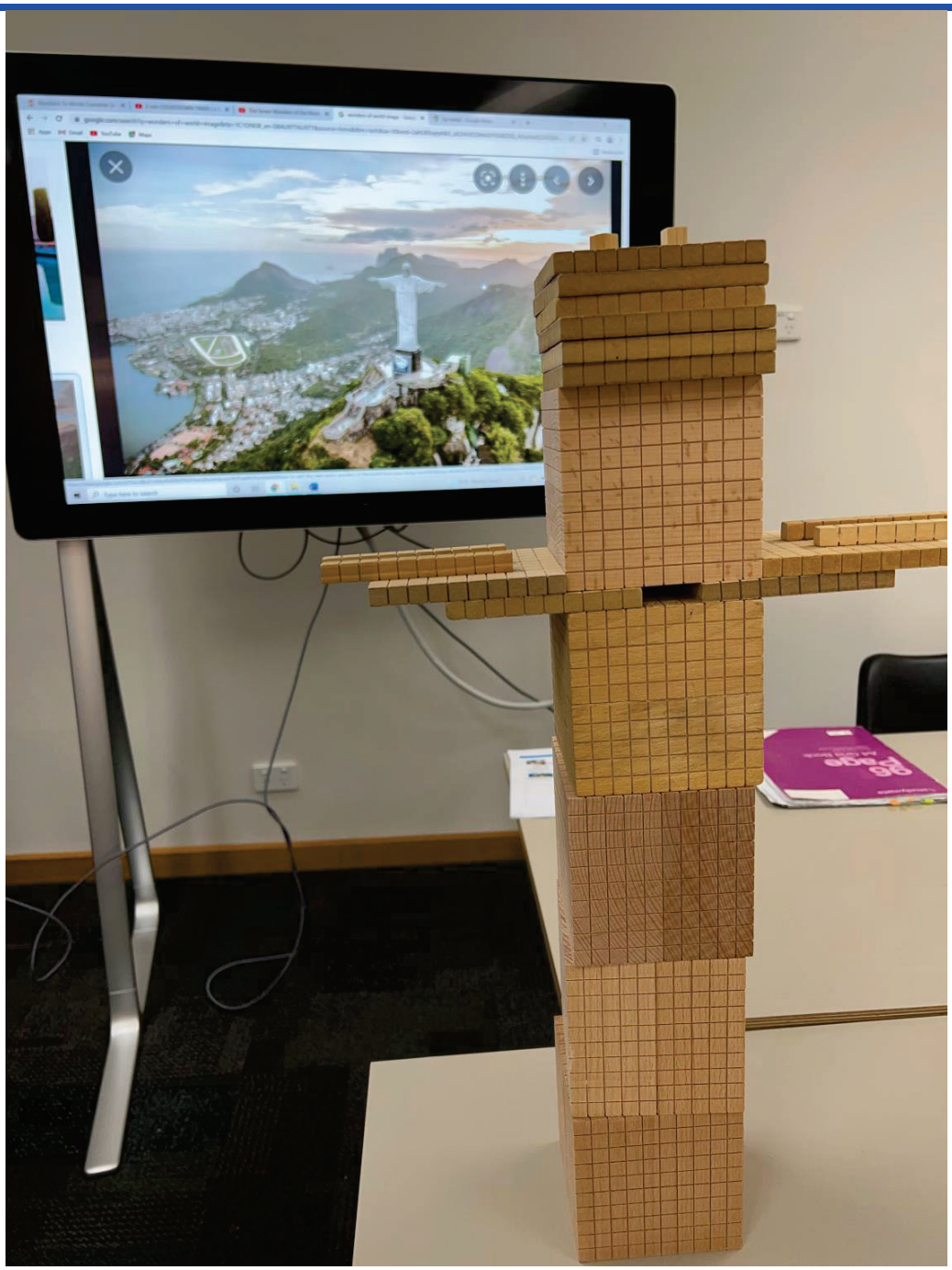
The Pyramids of Egypt

5-minute construction time-limit, followed by a gallery walk to record all other galleries in the room



Leaning Tower of Pisa

place in the world.



Whole-class modelled example – Christ the Redeemer in Rio

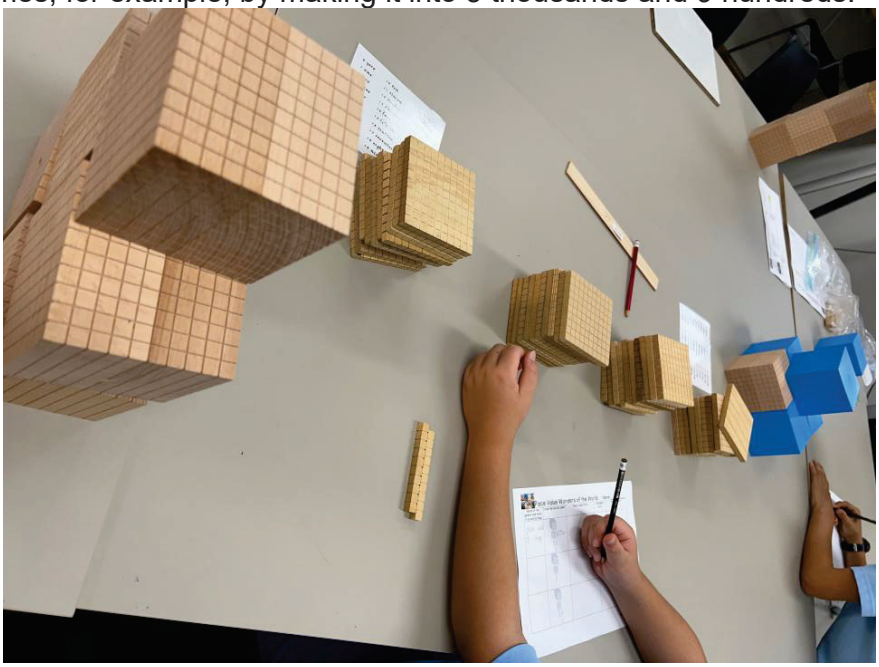
5-minute construction time-limit, followed by a gallery walk to record all other galleries in the room

Critical tip for the first day: For the first session, avoid any renaming – tell students they can only use up to 9 of each place value (apart from the thousands cubes, which can be used in abundance to create larger numbers).

The Great Wall of China – Whole-class example as reflection

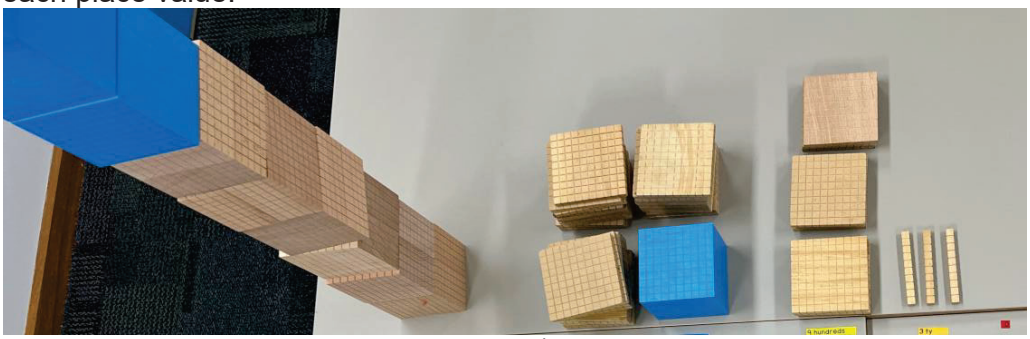
Superhero eyes tip: Emphasise for students to use their 'superhero' (subitising) eyes to work out how many of each block were used, and to think multiplicatively by seeing groups of 3, 4 or 5. Challenge students to come up with strategies to make the task of working out the total less overwhelming and avoid counting by ones (break it into sections with a partner, use tally marks).

Deconstruct it tip: Alternatively, students can deconstruct their wonder of the world (if building their own at 2-minute intervals, instead of doing the gallery walks). This greatly assists in working out what 39 hundreds becomes, for example, by making it into 3 thousands and 9 hundreds.



Shown above, students deconstructed, making collections of 5 thousands, with the 39 hundreds renamed into piles of 3 thousands and 9 hundreds.

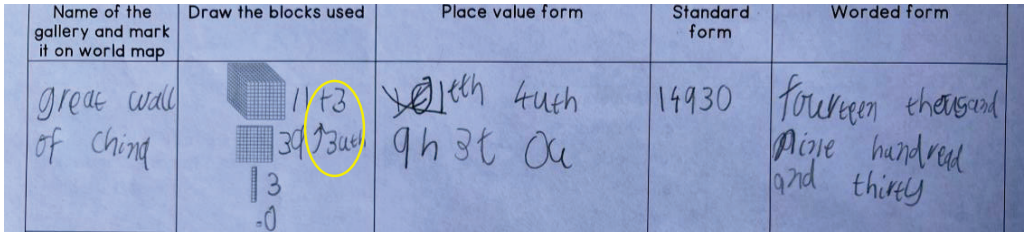
This was then organised like so, with place value form cards placed below each place value:



"1 ten thousand, 4 one thousands (1 thousand cube and 30 hundreds in piles of 10), 9 hundreds (3 piles of 3) and 3 tens, 0 ones." The way it is organised makes it as easy as possible to see (subitise) the total value, rather than count it. The tower of 10 000 is particularly important, as even many extension students see 10 000 as 10 of the one thousands, rather than visualising this as 1 of the ten thousands.

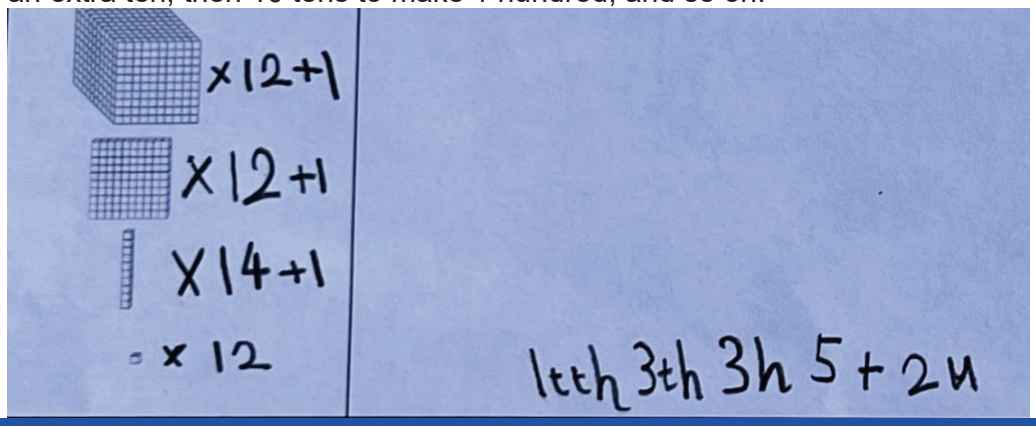
Immediate feedback tool:

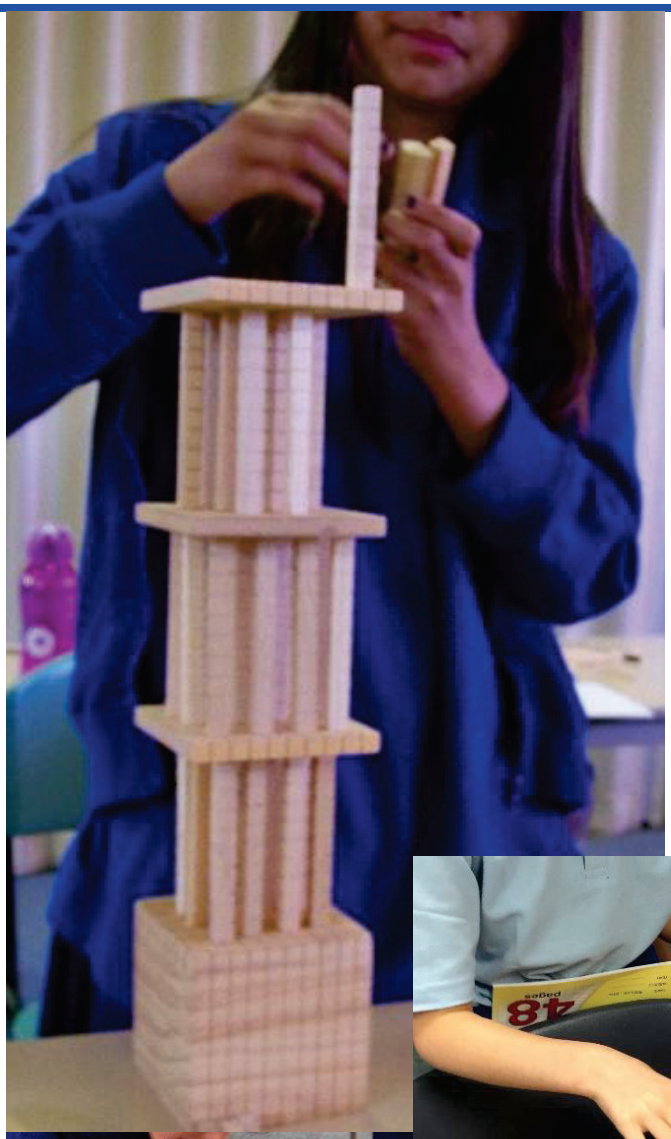
https://www.calculatorsoup.com/calculators/math/place-value-calculator.php



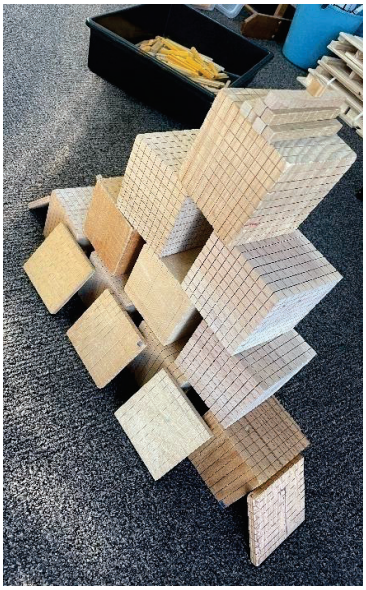
Here the student showed in their recording that they had 11 one thousand cubes, but also another 3 one thousands, from the 39 hundreds that were used. This then renamed to 1 ten thousand, 4 one thousands, 9 hundreds, 3 tens and 0 ones for the student's place value form recording.

Another example of renaming, where the student renamed 10 ones to make an extra ten, then 10 tens to make 1 hundred, and so on:

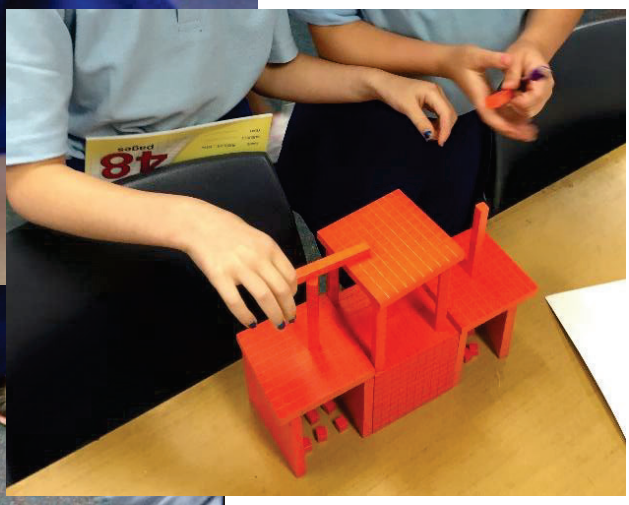




Beginnings of the Christ the Redeemer statue

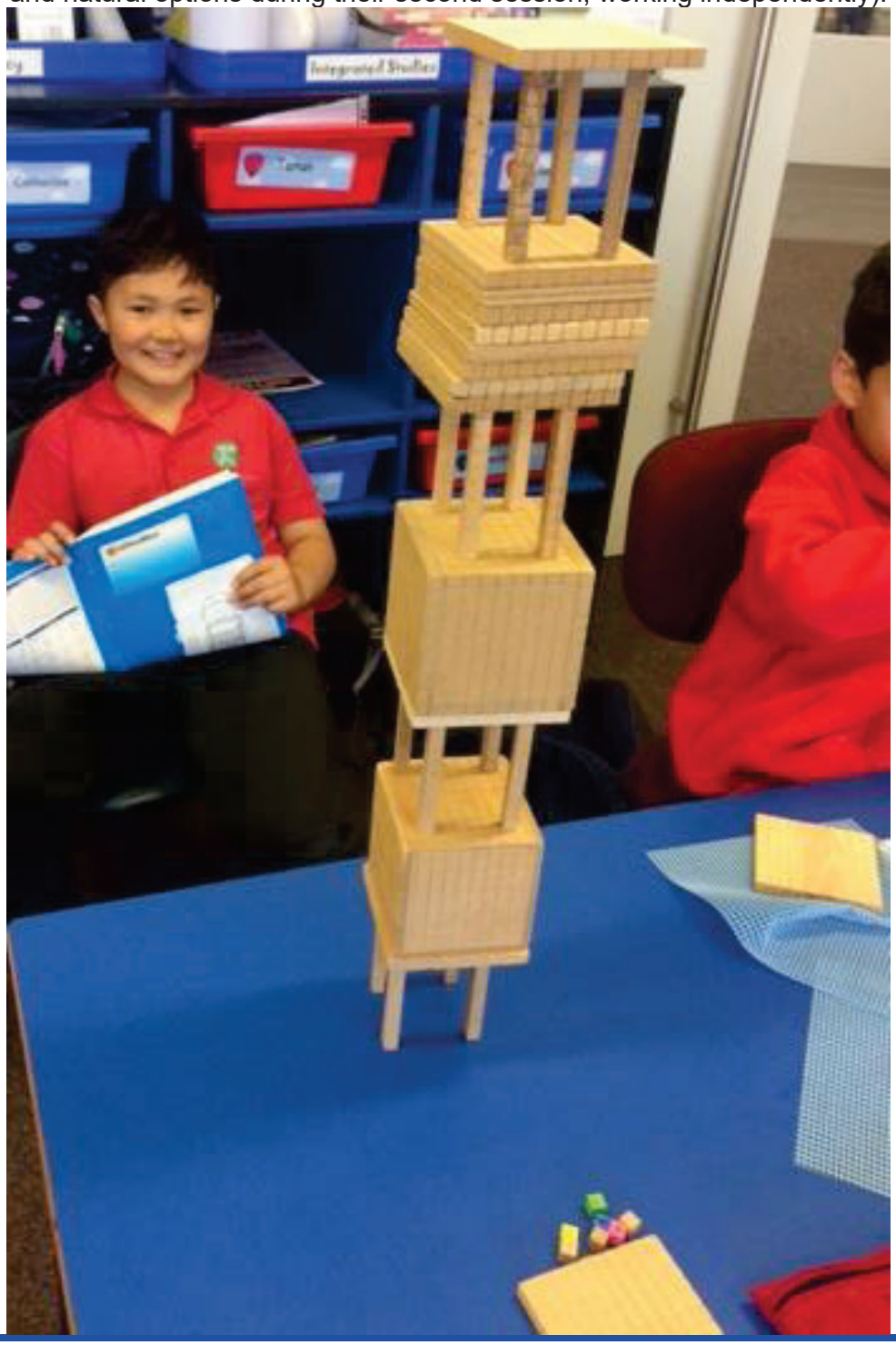


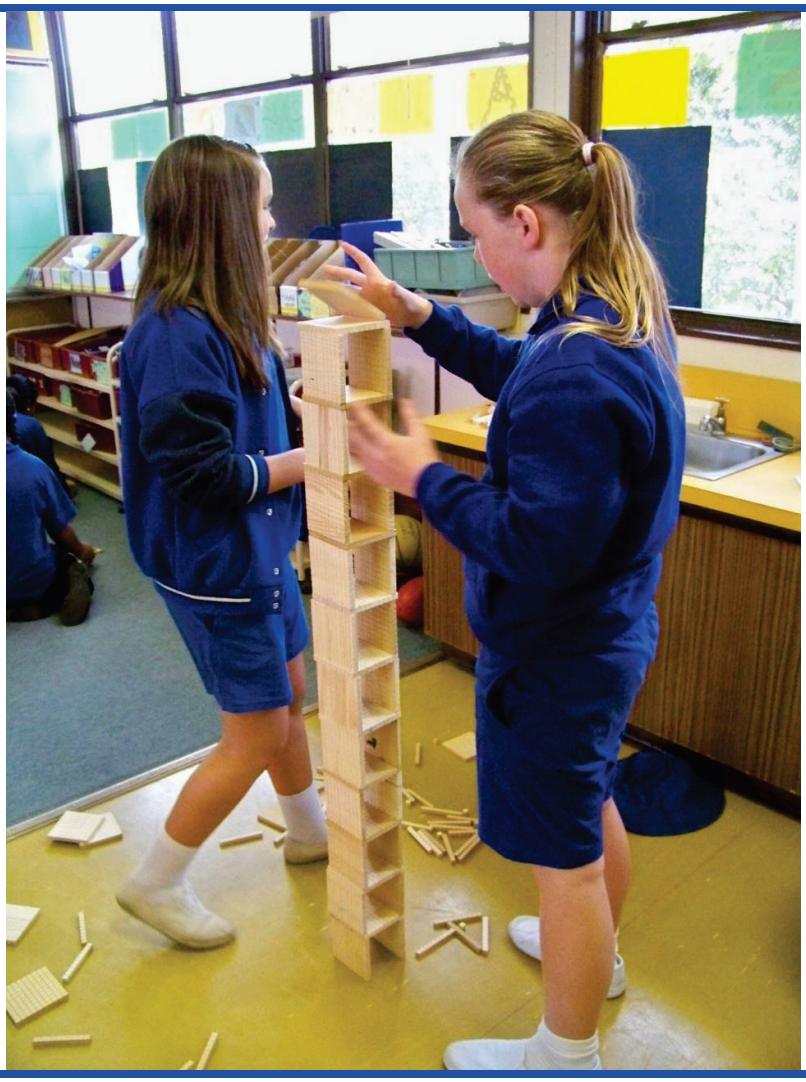
Pyramids of Egypt



Beginnings of Taj Mahals

Lesson in action:
The Leaning Tower of Pisa with student recording its value
(*Note:* Students were given free choice to choose from more architectural and natural options during their second session, working independently).





Modelling: For the modelling, create your own wonder of the world with a few student volunteers around a whole-class circle. Spend 2-3 minutes on the creation. Once it is looking reasonable, pause to work out its value, giving students some thinking time. Introduce the **strategy of tallying each place value on a post-it note**, like so:

Renaming: If any place has more than 9, **rename** it so ten of the previous place value make 1 of the next place = '15 one thousands' renames into '1 of the ten thousands and 5 of the one thousands.' As a whole-class demonstration, stack 10 one thousand blocks on top of one another to create a representation of 10 thousands = 1 ten thousand. How many one thousands are in 10 000? How many hundreds? How many tens? How many ones?

Place value form: When finished, chorus the place value language/form as a class for the example creation: "1 of the ten thousands, 5 of the one thousands, 8 of the hundreds, 7 of the tens, 2 of the ones."

Modelling the recording and creating examples of internal zeroes: Also complete the recording template for your modelled teacher example, with students recording as their first example as well. Pass this around or display it on the interactive whiteboard zoomed in, so students can see precisely what their recording should look like for each creation.

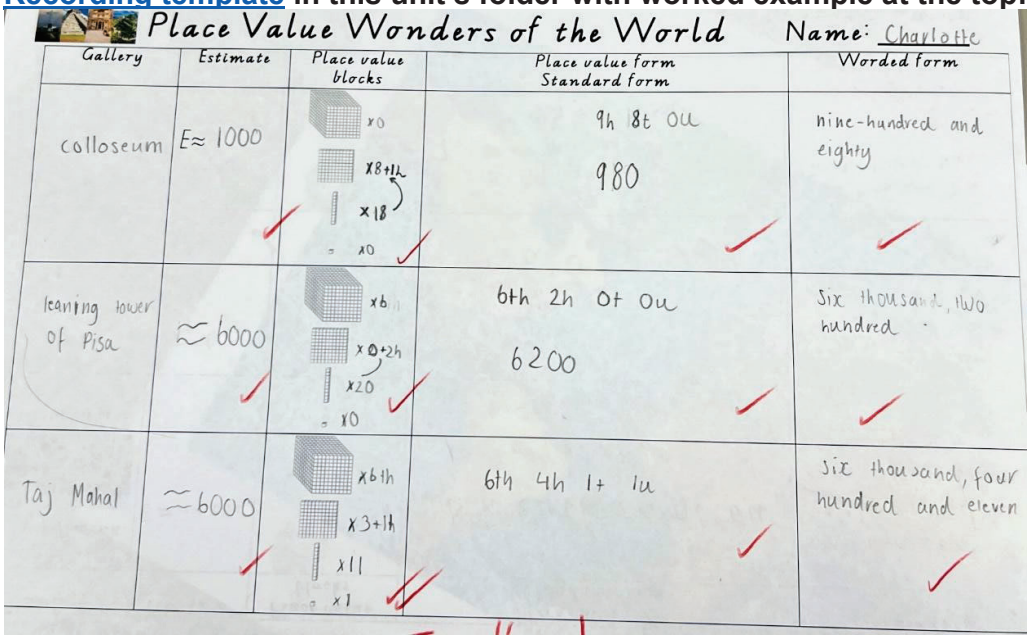
Next, each pair or group of 3 students creates a wonder of the world. Offer each to the class and designate the group that will be creating it, so that there is a great variety of 'exhibits' or 'pop-up art installations' in the room: "Who would like to create the Taj Mahal?" To ensure there are examples with internal zeroes in the room, the teacher may make it so that some groups cannot use one type of block/place value. For example, "Great Wall of China group – you cannot use any ones blocks; Pyramids of Giza group – no tens blocks; Machu Picchu – no hundreds blocks."

Classroom management tip: Allocate a set amount of time for the artistic creation element of the lesson, such as 2, 3 or 5 minute YouTube countdown (https://www.youtube.com/watch?v=_W0bSen8Qjg&ab_channel=AdamEschborn).

Gallery walk and recording: After the 5-minute creation time, students roam the room, visiting each 'wonder of the world' to record:

- **Place value form:** 24 506 as "2 ten thousands, 4 one thousands, 5 hundreds, 0 tens, 6 ones," or for shorthand in writing: 2tt 4uth 5h 0t 6u. As explained in the teaching tips section, this is far preferred by numeracy coaches over expanded form, which does not scaffold students towards conceptualising each place value as a unit in itself.
- **Standard form (digits):** 24 506
- **Worded form:** Provide printouts of the numbers to words spelling assistance charts (cursive font version or stick and ball version). Remember to emphasise for students to use 'and' after the hundreds, as well as to record a hyphen to connect the tens and ones: "twenty four thousand, five hundred **and** six."
- Mark its location on the world map.

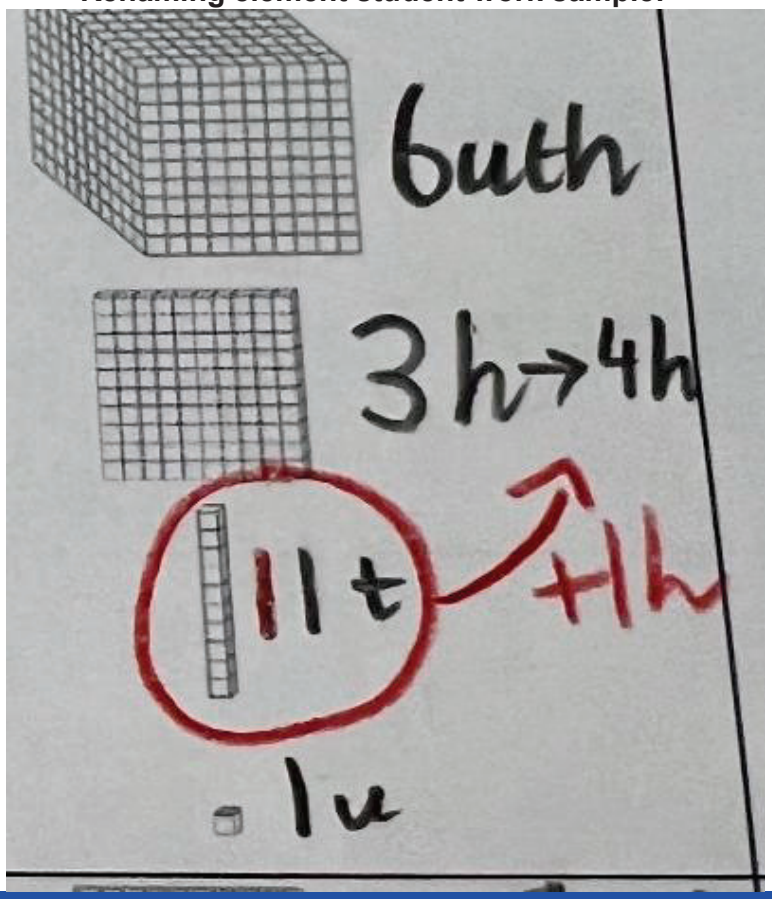
Recording template in this unit's folder with worked example at the top:

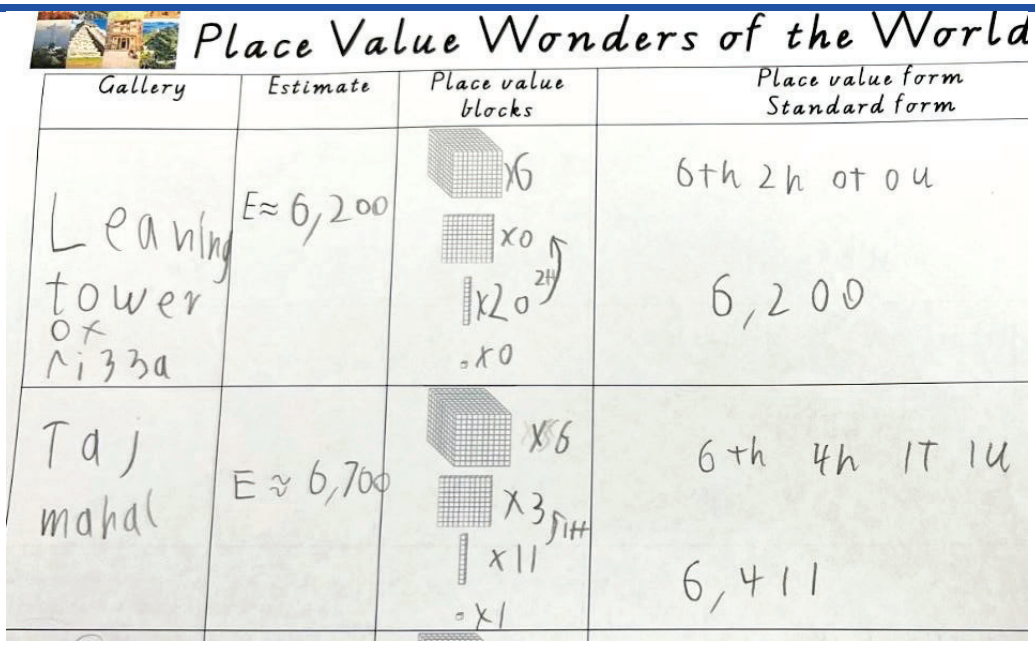


Place Value Wonders of the World Name: Charlotte

Gallery	Estimate	Place value blocks	Place value form Standard form	Worded form
colloseum	E≈ 1000	x0 x8+1h x18 = x0	9h 8t 0u 980	nine-hundred and eighty
leaning tower of Pisa	≈6000	x6 x0+2h x20 = x0	6th 2h 0t 0u 6200	Six thousand, two hundred
Taj Mahal	≈6000	x6th x3+1h x11 = x1	6th 4h 1t 1u	six thousand, four hundred and eleven

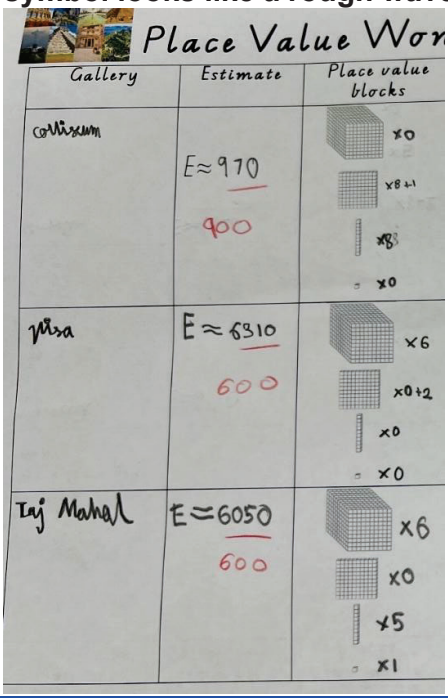
Renaming element student work sample:



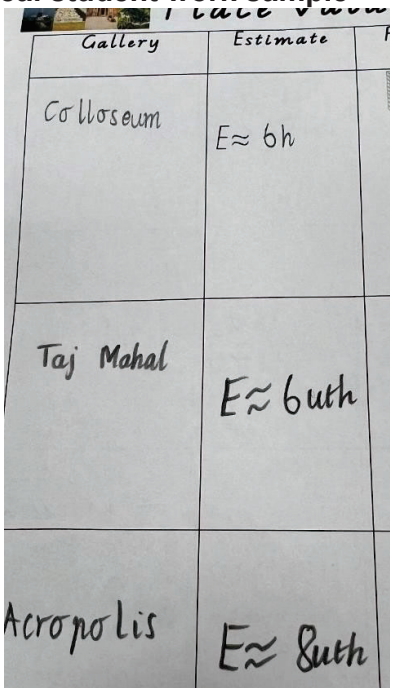


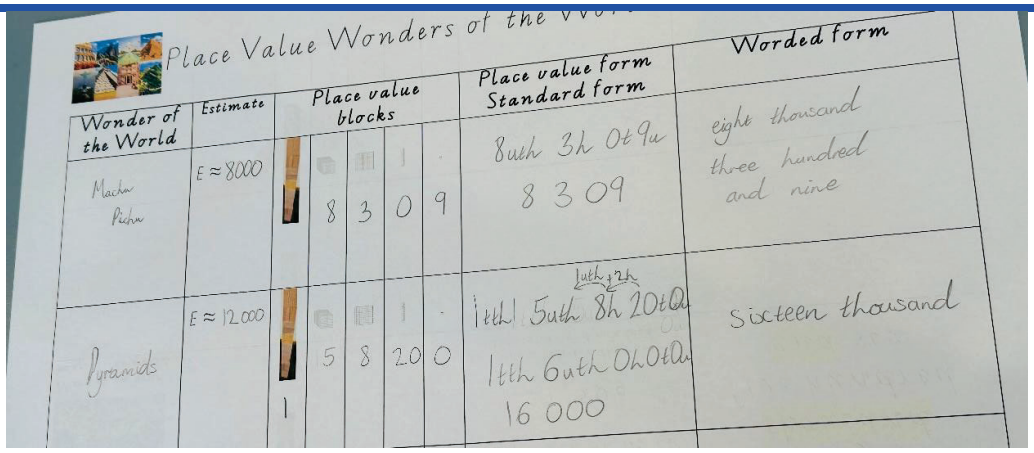
More renaming student work samples

Estimation element – feedback to students whose estimates are too precise – nearest thousand or hundred only (no tens), as estimates are meant to be rough, just as the approximate symbol looks like a rough wave:



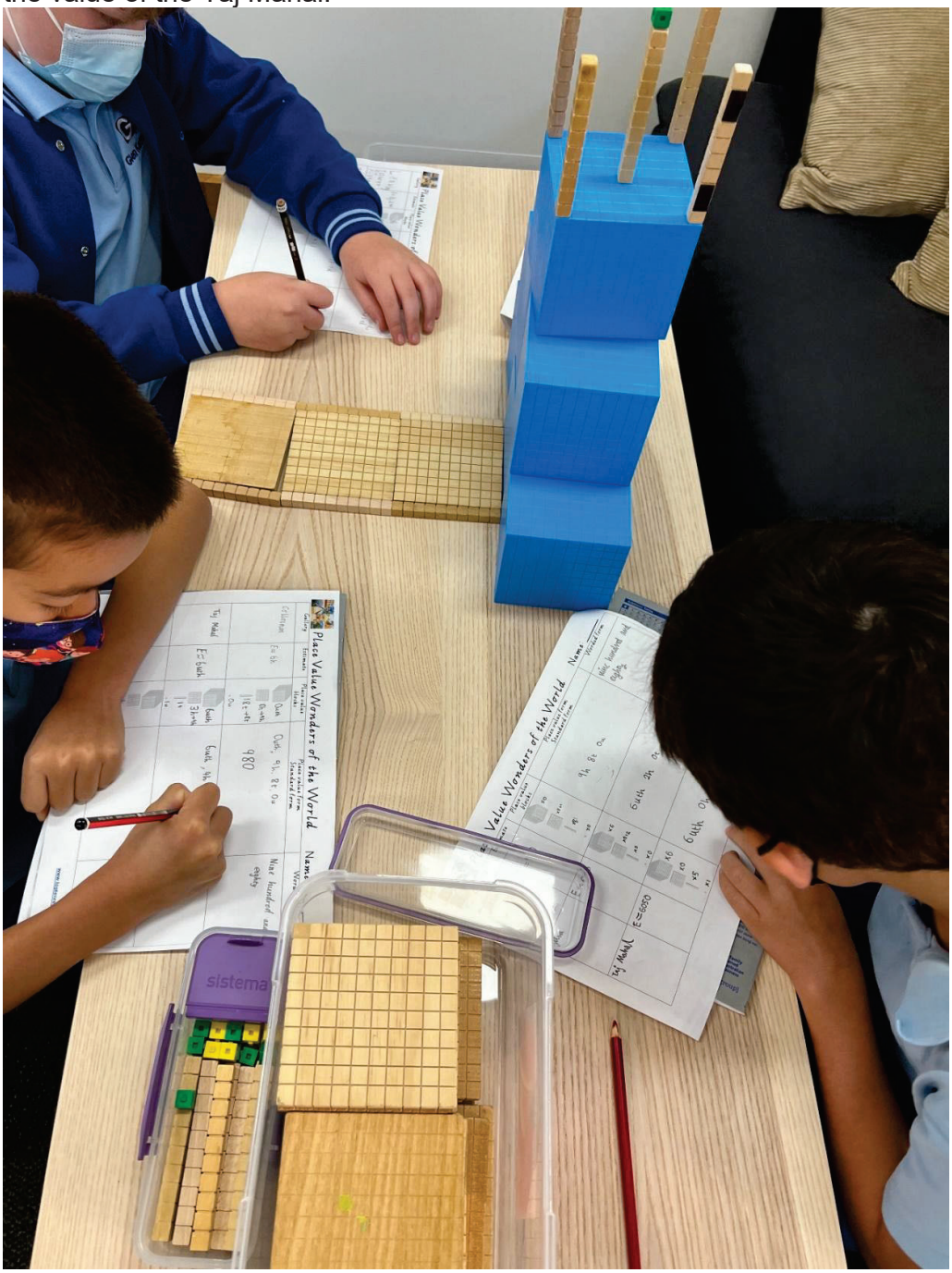
Ideal student work sample



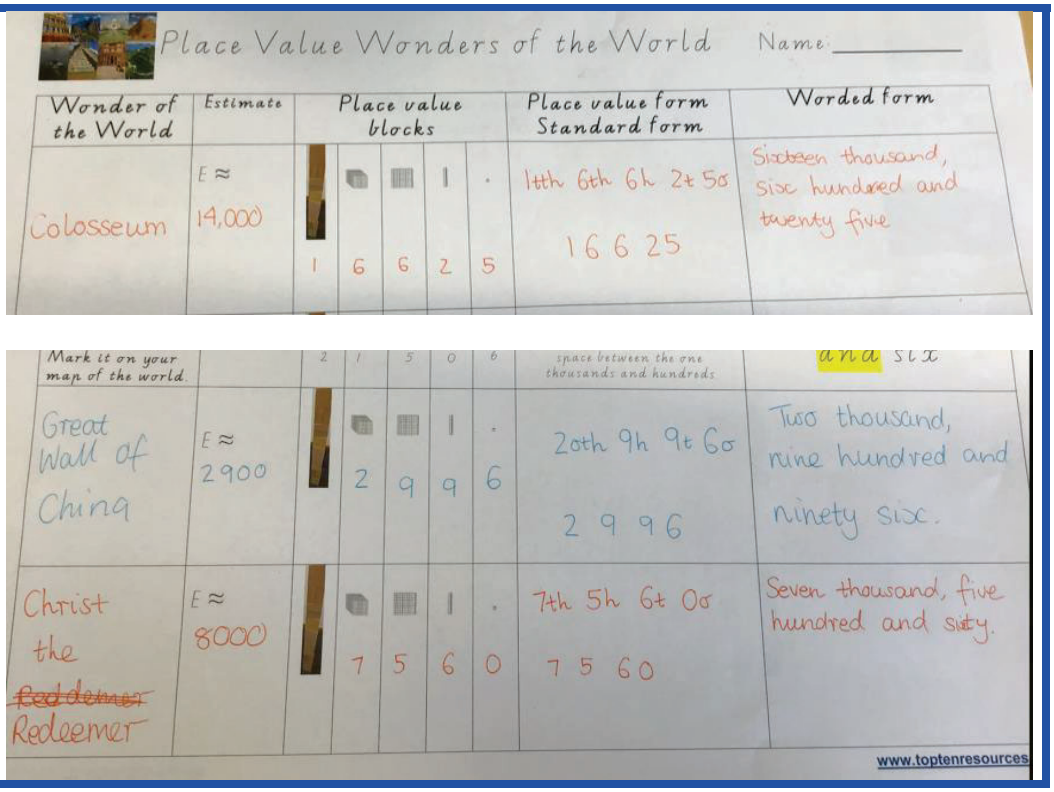


Gallery-walk part of the lesson recording in action – Students recording the value of the Coloseum.

Gallery-walk part of the lesson recording in action – Students recording the value of the Taj Mahal.



Gallery-walk part of the lesson recording in action – Students recording the value of the Taj Mahal.

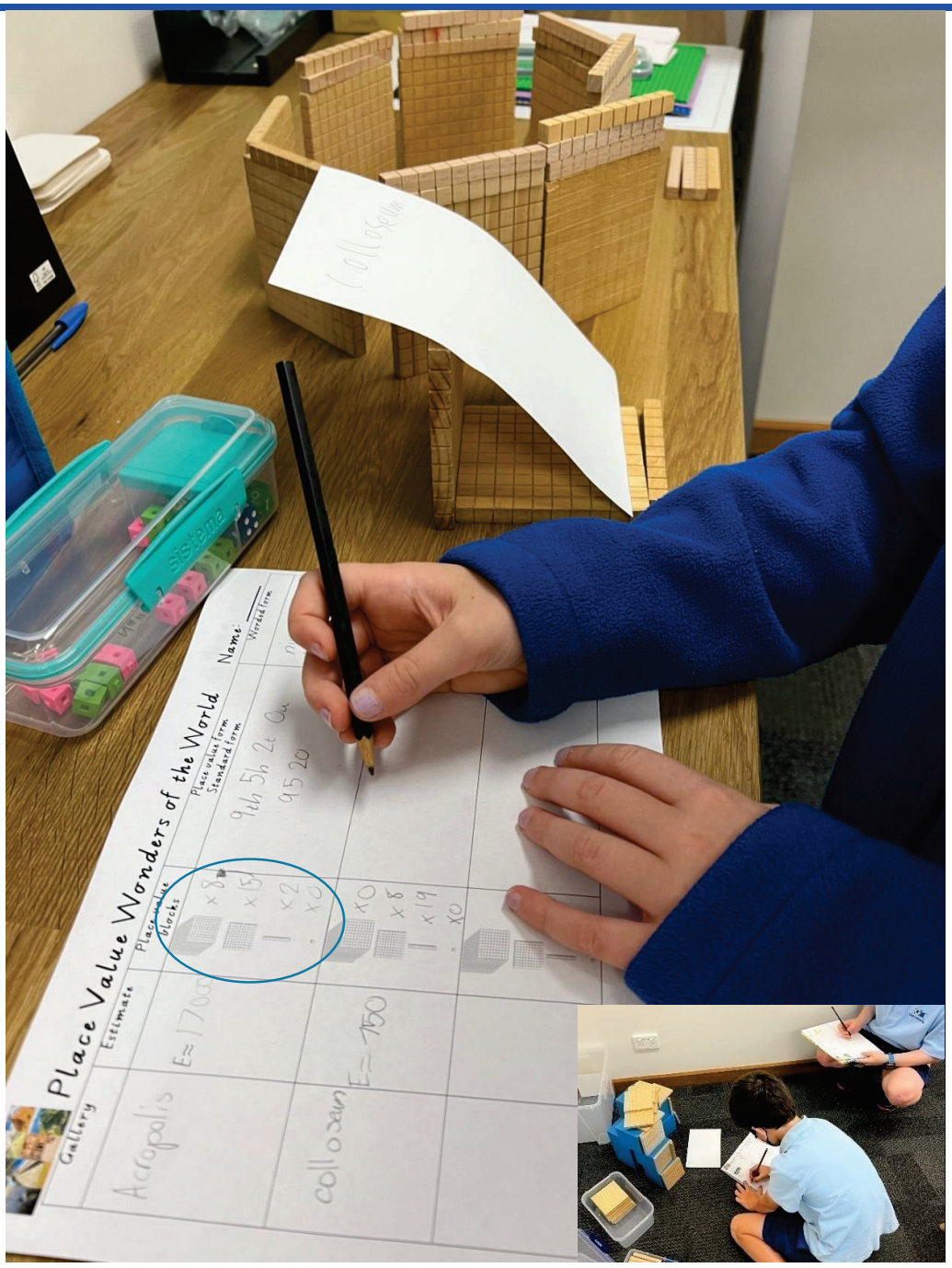


Place Value Wonders of the World Name: _____

Wonder of the World	Estimate	Place value blocks	Place value form Standard form	Worded form
Colosseum	E ≈ 14,000	1 6 6 2 5	1th 6th 6h 2t 5o 16625	Sixteen thousand, six hundred and twenty five

Mark it on your map of the world.		2 1 5 0 6	space between the one thousands and hundreds	and six
Great Wall of China	E ≈ 2900	2 9 9 6	2oth 9h 9t 6o 2996	Two thousand, nine hundred and ninety six.
Christ the ~~Reddemer~~ Redeemer	E ≈ 8000	7 5 6 0	7th 5h 6t 0o 7560	Seven thousand, five hundred and sixty.

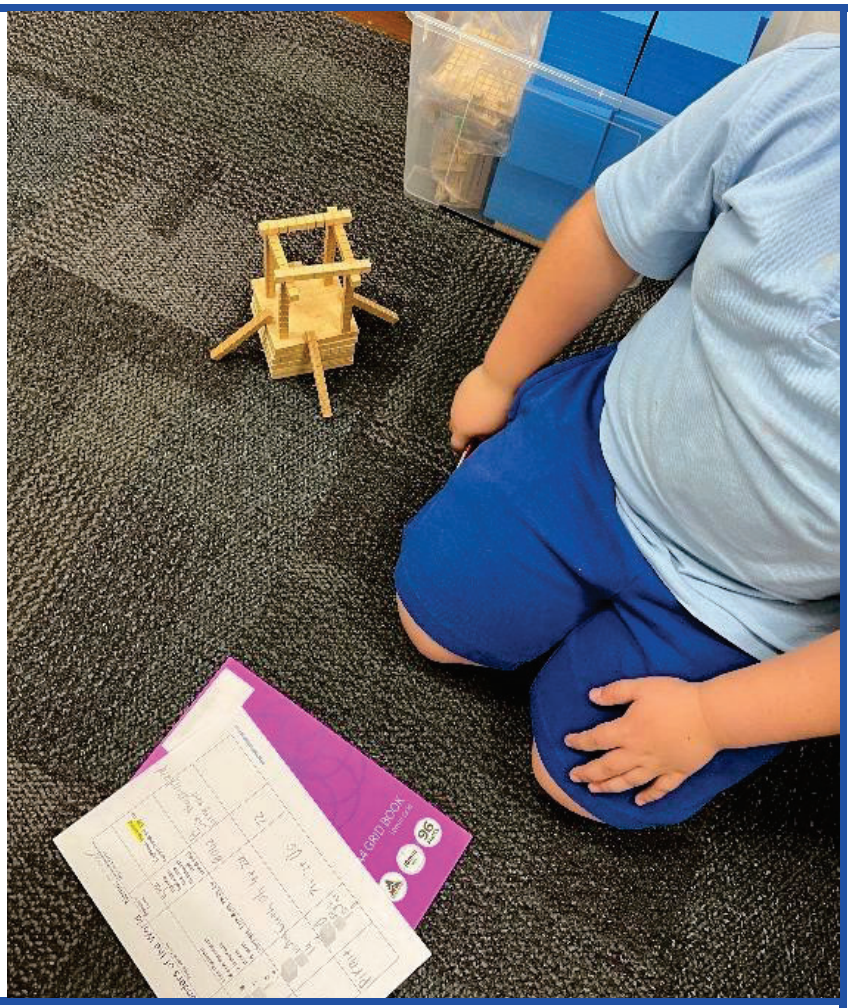
www.toptenresources



Renaming: In this work sample, the student uses an arrow to show that the 15 hundreds renames to 1 thousand and 5 hundreds, adding to the existing 8 thousands.

Support 1: Only use hundreds, tens and ones blocks for their exhibits.

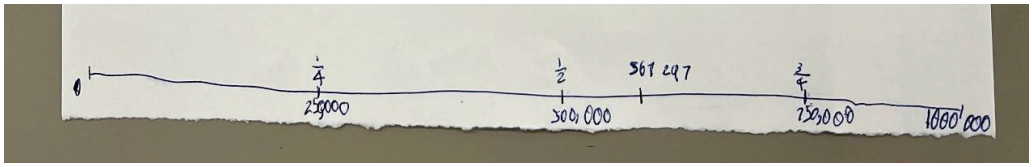
Mini Pyramid

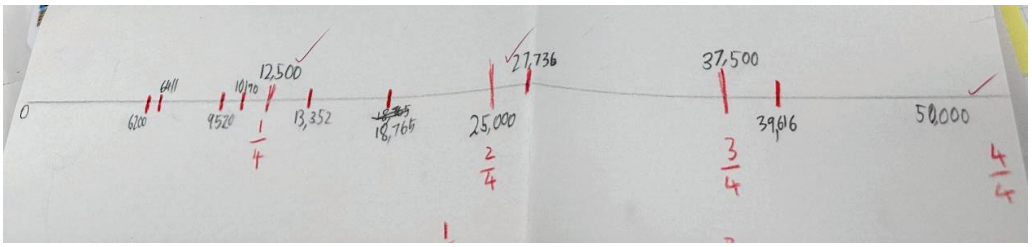


Support 2: For students who are particularly struggling to say and record the worded forms of numbers correctly, there is a website that can be used to assist them as they gallery walk with an iPad: https://lingojam.com/NumbersToWords

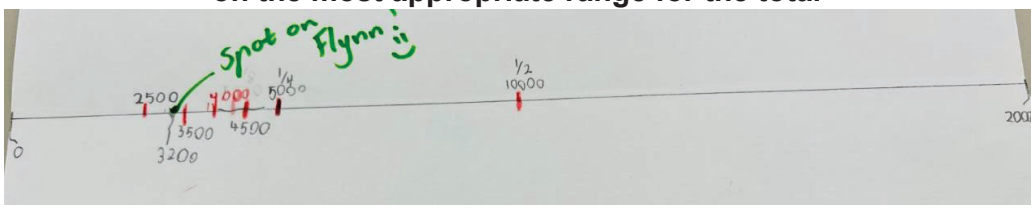
Type in the standard form of the number in digits, and it immediately produces the worded form, including 'and' after the hundreds (which many other programs omit). Students could at first use this to assist them, reading the number from the screen. Later, or during the second session, students could use this as a checker for immediate feedback on their attempt at the worded form of each gallery.

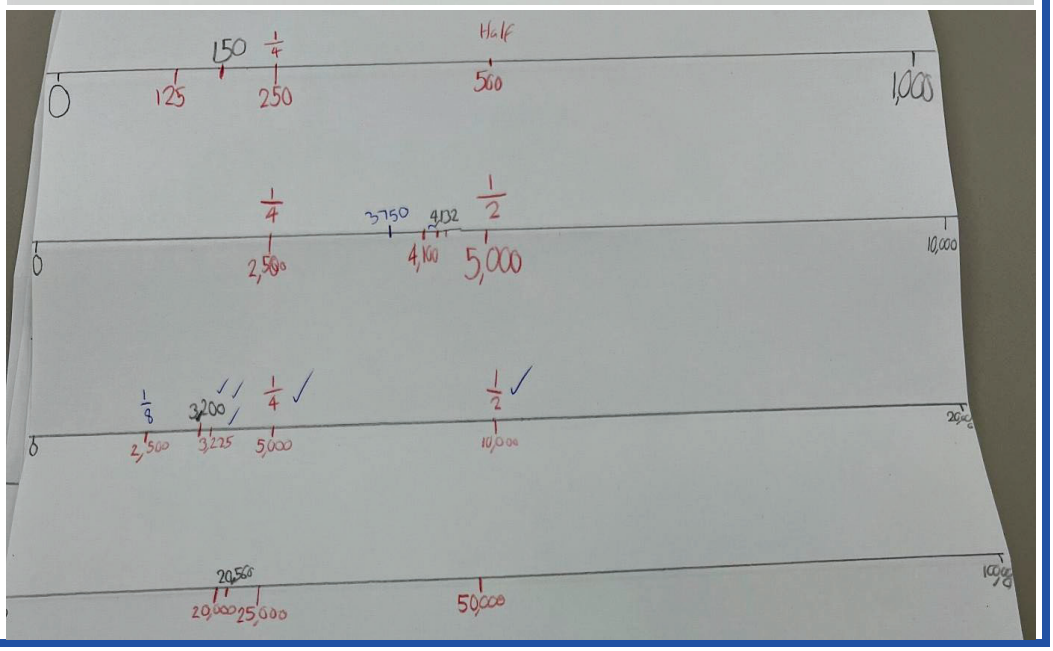
Extension 1: Draw a 0 to 100 000 number line along an A3 strip of paper. Extension students place each gallery's total on the number line as they roam. At first (before starting the gallery walk part of the lesson), students problem-solve to create some strategies to maximise the accuracy of their number placement; for example, placing benchmarks such as 50 000 at ½, 75 000 at ¾ and 25 000 at ¼.

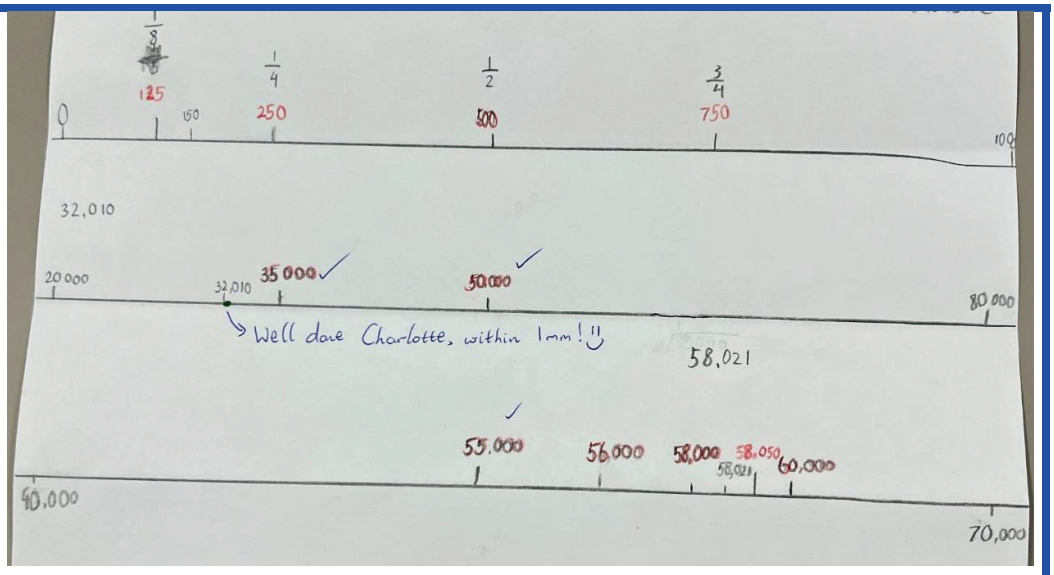




Student work samples where the students choose the range of the number line and varied this for each wonder of the world gallery based on the most appropriate range for the total







Questioning focused on number line benchmarking:

- What fractions would be useful to mark?
- If you know half of 100, what is half of 1000, half of 10 000, and what is half of 100 000? What about ¼ and ¾? For ¼, start with $100 shared between 4 people, then work out ¼ of $1000, and so on.

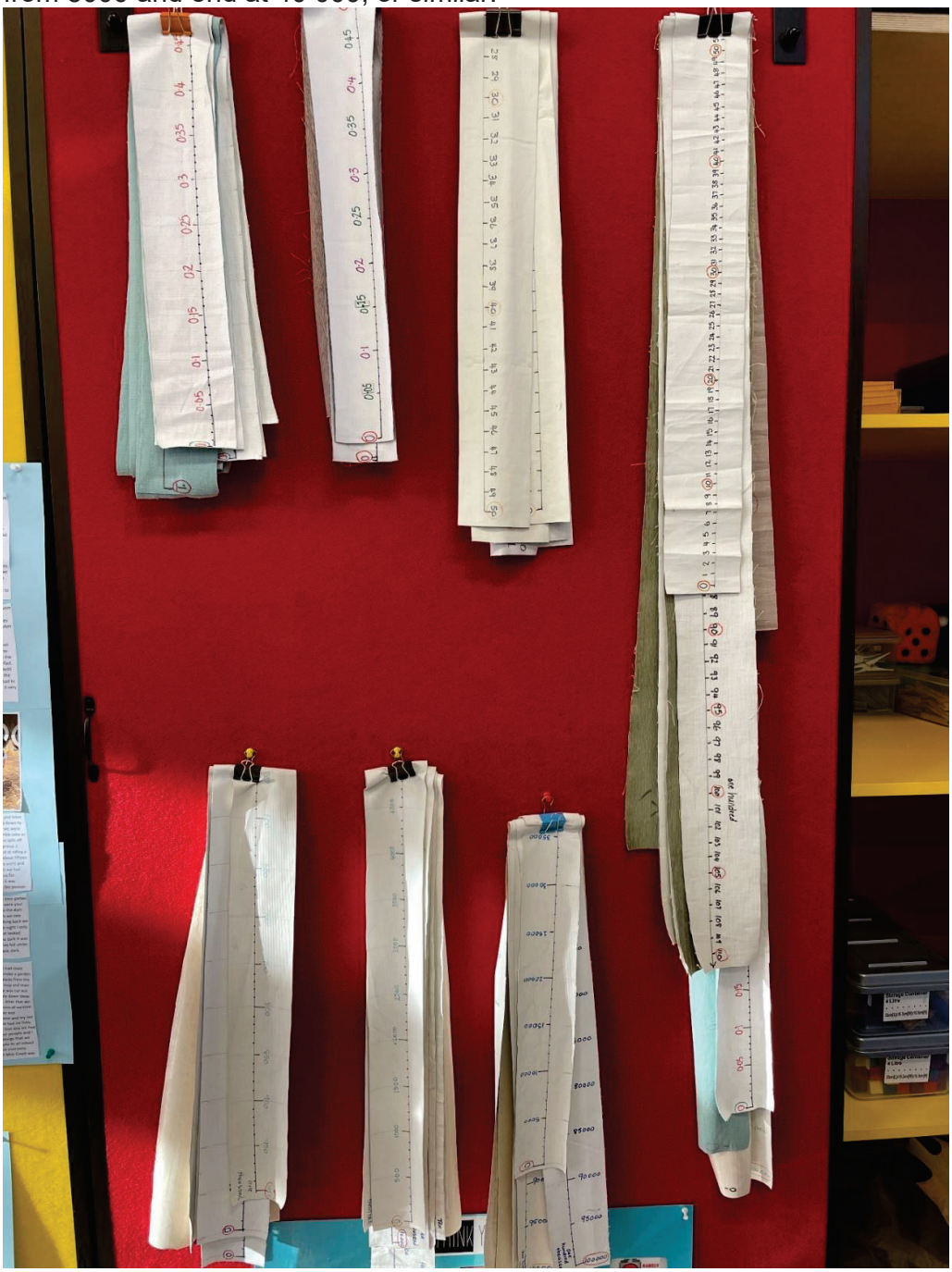
As extension students complete the gallery walk, they can check the accuracy of their placement of the numbers using this strategy:
How could you check the accuracy of your number line placement? How could you work out what each number is worth in terms of its width in centimetres or millimetres along the number line? For example, how many centimetres or millimetres along would the number 1 go, or 10, or 100? Give the student 5 minutes to brainstorm ideas, which can include continuing to break down the fractions (working out 1/8 of the line, then 1/16 and so on, assigning values to these, or working out 1/10 and 1/100 of the line).

Then also suggest this very precise strategy: If you measure the entire width of the page, it is 42cm (the wider side of an A3 page). So, 100 000 divided by 42cm on the calculator = 0.00042cm. Therefore, each interval (single number, or each one) is worth 0.00042cm.

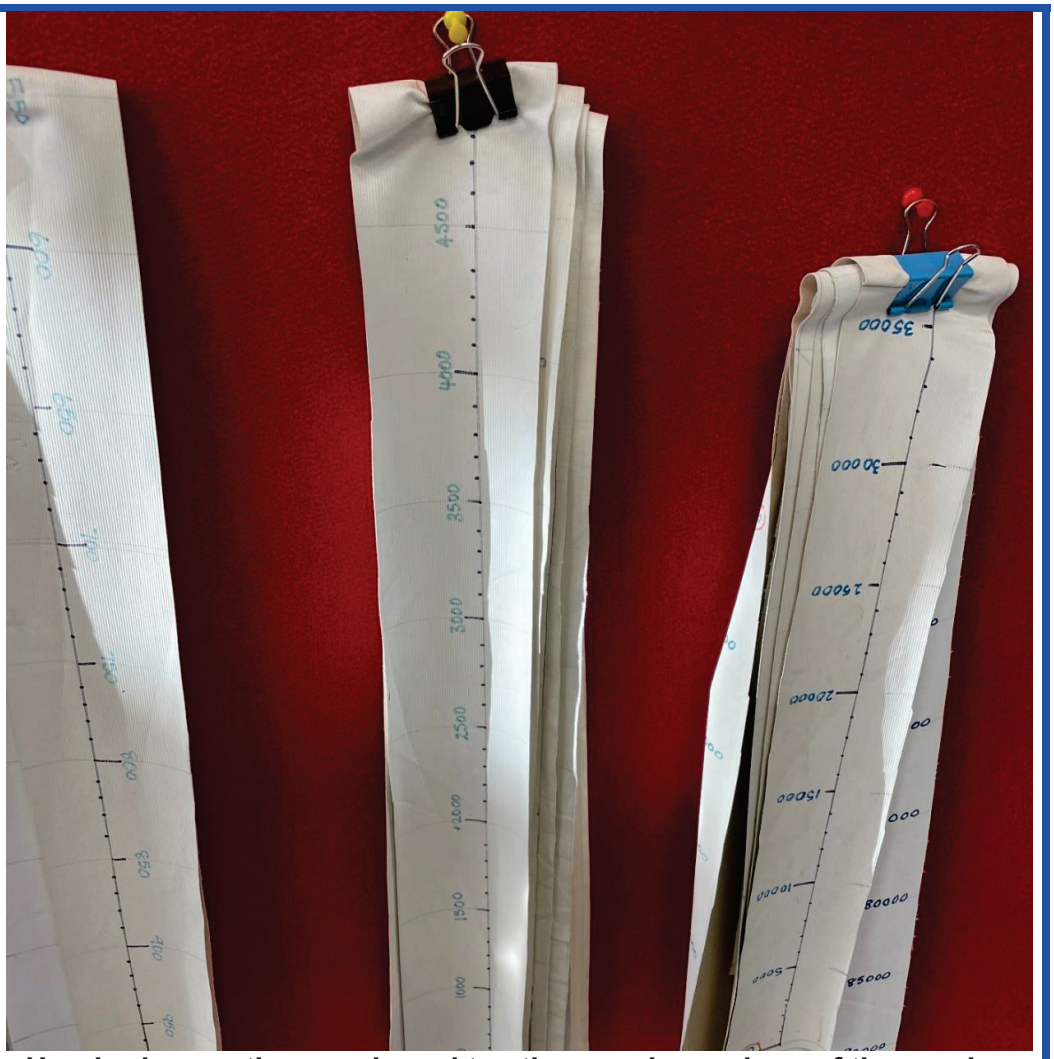
If you were placing 53 405 on the number line, then using the calculator, 0.00042 x 53 405 = 22.26cm. If you placed 53 405 close to the 22cm mark, it was pretty spot on! Use this strategy for immediate feedback on their placement of each number (but only after writing it), recording in green pencil precisely where it should have been. This provides extremely valuable immediate feedback (rather than the teacher only providing feedback at the end of the lesson after collecting their sheet).

Start a new number line for each new wonder of the world, to avoid the task becoming too easy by having lots of numbers placed along the line.

As an extra challenge during a second repeat session, start the number line from 5000 and end at 40 000, or similar.



Number line wall at Ardmona Primary School



Hundreds, one thousands and ten thousands versions of the number lines at Ardmona PS

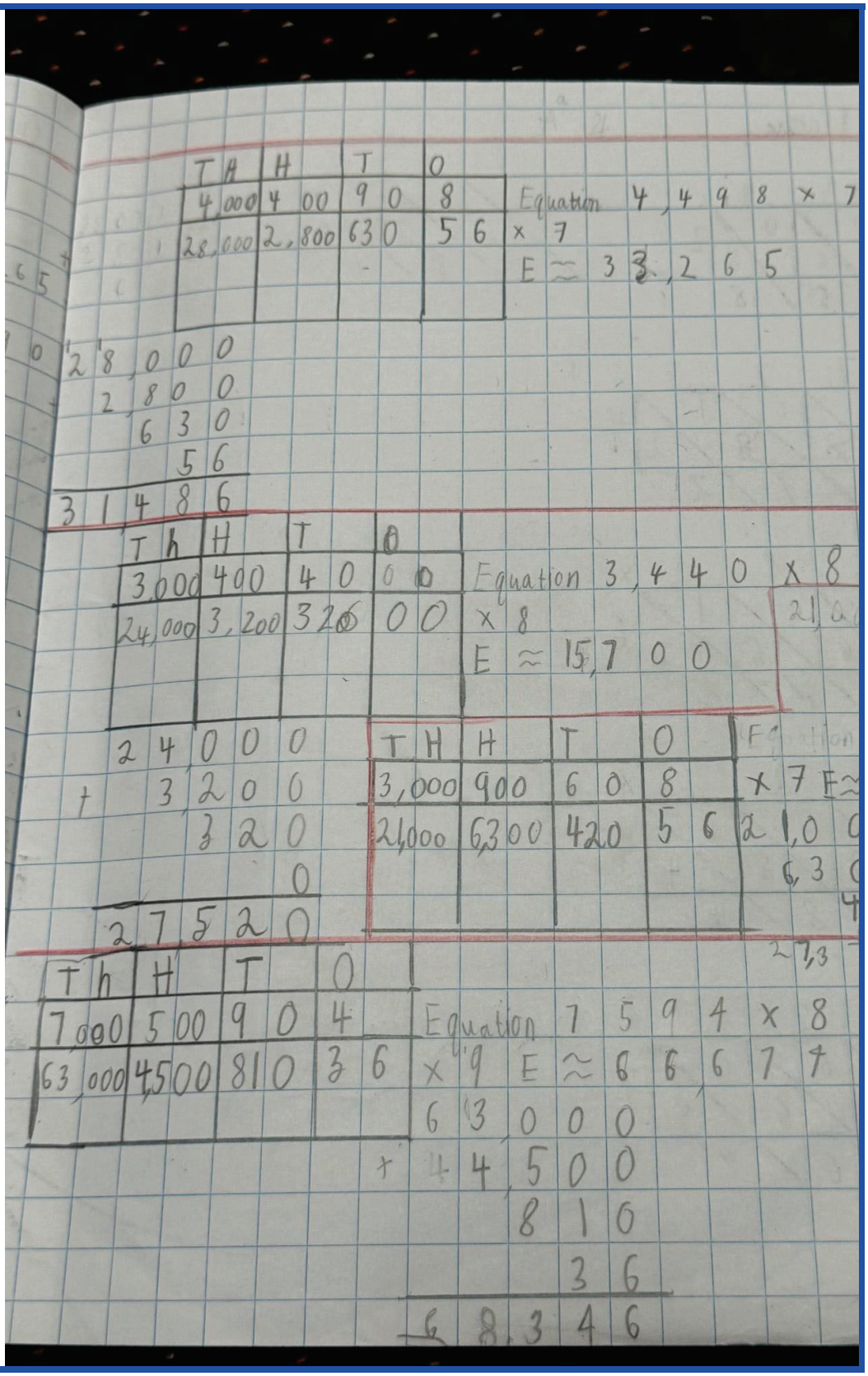
Number lines template

Students can create challenges for each other. For example, student A creates the range (marking the low and high end of the number line), then student B must work out the value that would be at an emoticon or star that student A drew along the line – what would the emoticon be worth based on the range student A created and its position along the line.

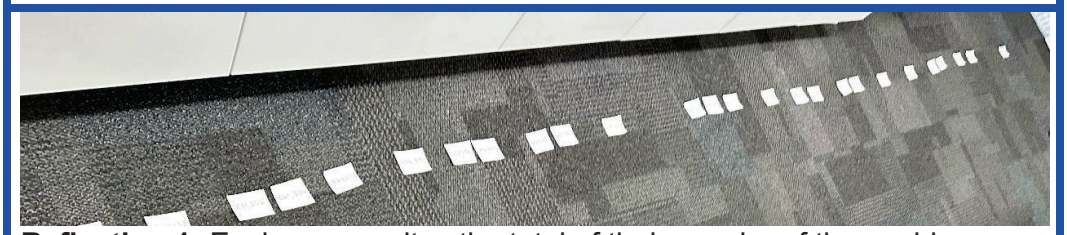
Alternatively, student A marks the location and value of a number, then student B must work out the accurate range to ensure its location is correct.

Decimal versions of the number line wall at Ardmona PS

Extension 2: Roll the 10-sided dice – now you have that many clones of your wonder of the world (multiply it). How many blocks would you need to construct them all?

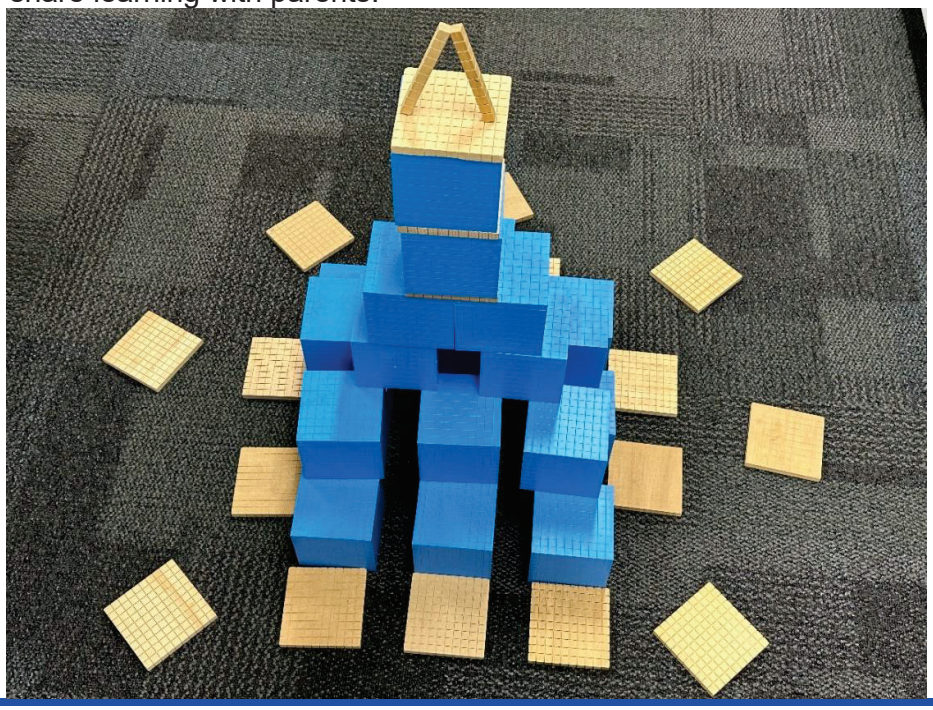


Extension 3: https://www.youtube.com/watch?v=GxhVxezfo30
Gru from the Minions movies steals the Shrink Ray and gives it to you. You use it on your creation. If you shrink it by a factor of ____, what will its new value become?



Reflection 1: Each group writes the total of their wonder of the world on a sliced rectangle of paper or cardboard. Bring these outside (use a sheltered space out of the wind), or carpet along the longest side of the classroom. Create a massive number line from 0 to 100 000, discussing and debating the placement of each number. This simultaneously provides practice at ordering numbers and number line placement. After the number line is complete, students can write a random ten thousands number on a post-it note and hand it to a like-ability partner to solve where it would be placed.

Reflection 2: Make a massive wonder of the world as a whole class using all the thousands blocks in the year level (or school). First, hold a vote to choose a whole-class wonder of the world. After creating it together, challenge students to estimate its value. Then **deconstruct it into place values** – towers of ten thousands, one thousands, hundreds, tens and ones. Each student records its place value form, standard and worded forms. Take a photo to post on your classroom numeracy wall and any platform where you share learning with parents.

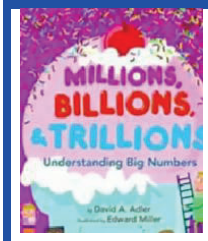


Place Value Year 4A Lesson 3

Pattern of 3 Place Value

Learning intention: Learn the place value pattern that exists for all numbers. Use this pattern to say and write numbers (worded form).

Maths vocabulary: hundreds and tens-ones pattern, worded form



Numeracy picture book link – *Million, Billions and Trillions* by D. Adler. https://www.youtube.com/watch?v=Z_PLHQnM6zs

Connection to popular characters: Place values work in groups of 3 (hundreds, tens, ones). Connect this concept to the most popular trios of all time, such as Harry Potter (Harry, Ron and Hermione), and so on: https://www.ranker.com/lis

Lesson summary: Students participate in a series of investigations to learn to read large numbers by taking advantage of the place value pattern of 3 that exists, including using themselves (standing up the front in groups of 3), paint samples (split into thirds) and paper chains.

Materials:

- Free paper paint samples from Bunnings split into three parts.
- A4 coloured paper sliced into thin strips (provide at least 6 different colours).
- Glue, tape or staplers.
- One piece of A4 paper folded into sixths to create 6 playing cards.

Best set-up: Run the first part (with students standing in groups of 3) as a whole-class, with others recording on mini whiteboards. Then model the paint samples part, but finally do not over-model the paper chain challenge, as that is designed for students to showcase what they have learned about place value patterns during the previous parts of the session.

Place Value Families – students in groups of 3

With great thanks to Mernda Park PS

Read each set of 3 numbers, then all three students say the place value family in unison:

"MILLION!"

"THOUSAND!"

"AND" 

(No family said for the final place value, as we don't say 'ones' when reading a number as it is assumed the final place is ones if nothing is said).

