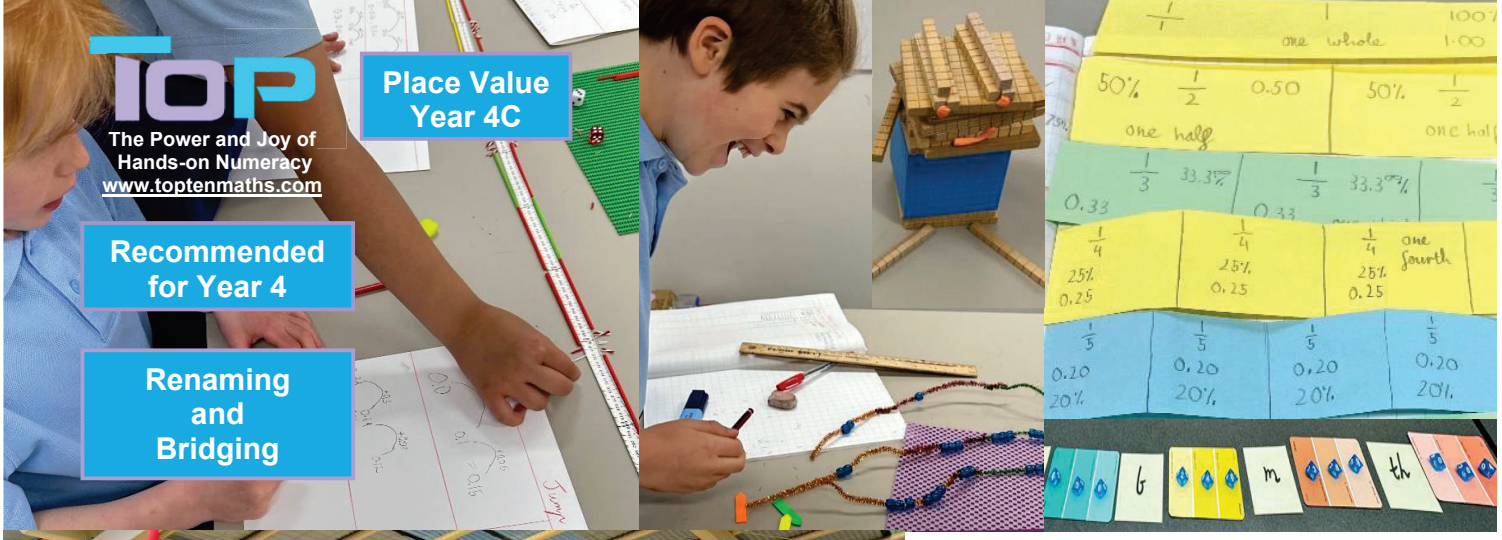

Real-Life Numeracy Years 3-6

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 Unit for Year 4 – 4C
Renaming and Bridging
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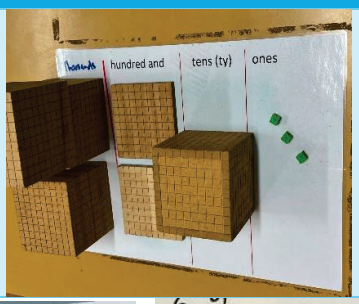
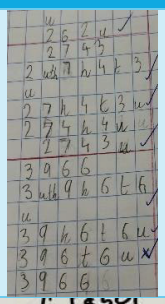
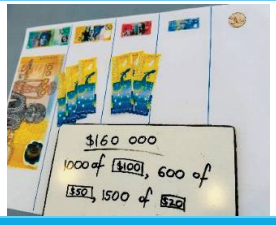
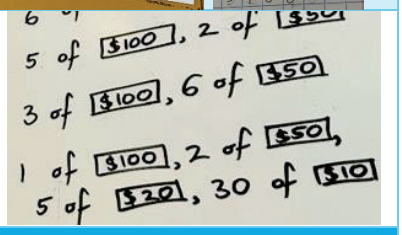
Lesson 1 X-Ray Eyes Renaming Pages 12-53 **Year 4-6 level extensions**	  
Lesson 2 Banker Pages 54-83	  
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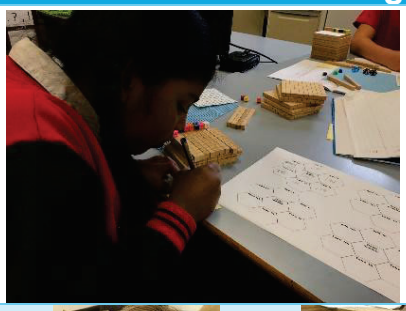
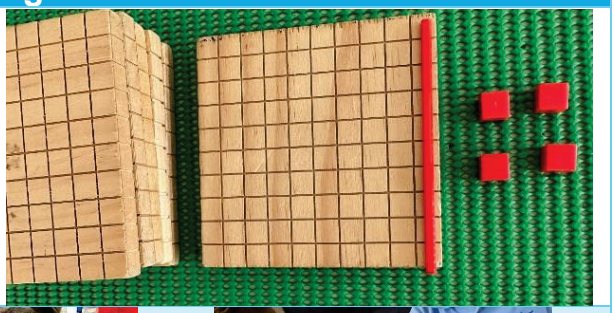
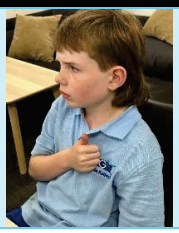
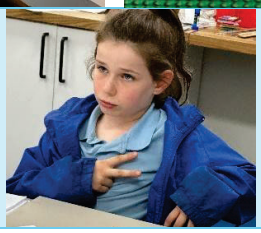
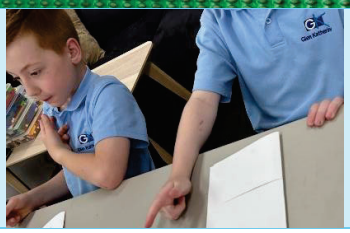
Lesson 3 Place Value Softball Pages 84-108	 
Number Talks Pages 109-114	  

Place Value Unit for Year 4

Curriculum Links for the following lessons

This unit is recommended for Year 4 students.

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**

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 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.**

New WA Curriculum – Number and Algebra – Patterns and Relationships – Year 4: Create and represent increasing multiplicative patterns, using concrete materials and numbers, and describe rules to represent the pattern.

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**

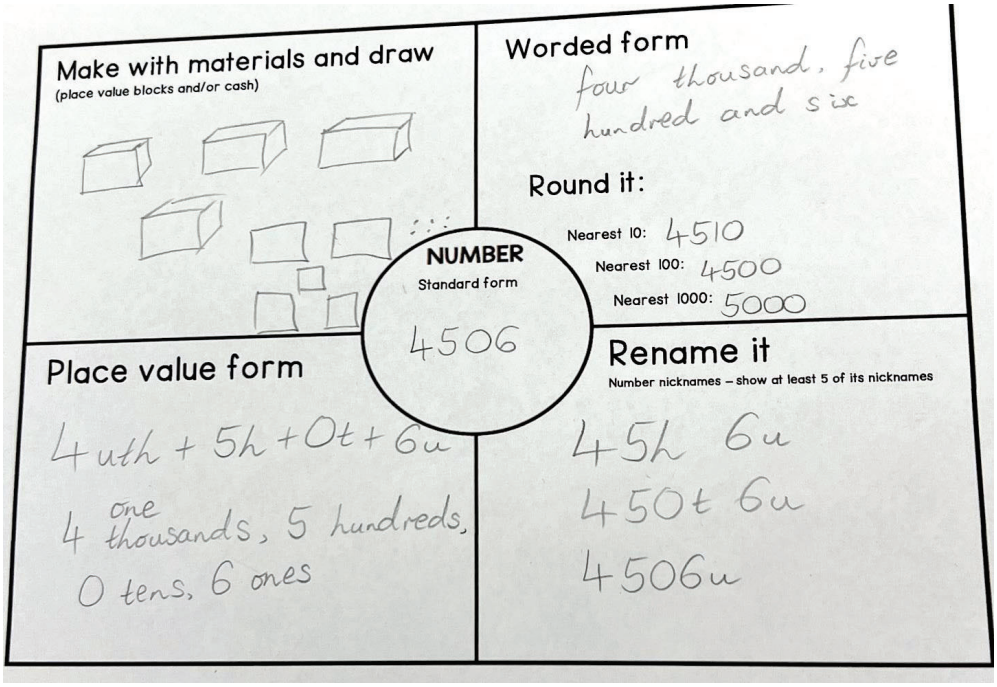
Whole numbers: Recognise and represent numbers that are 10, 100 or 1000 times as large

- **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.
Work sample:



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

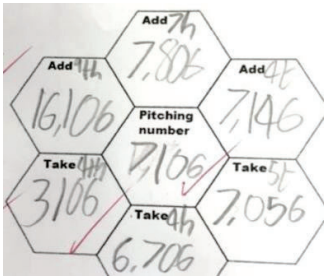
Rush through place value during Term 1 at your peril – its ghost will haunt you for the rest of the numeracy year. You start split strategy – students cannot partition mentally. You start jump strategy – students cannot jump in multiples of a place value, nor bridge or rename. You start multiplication, 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 – Renaming

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.

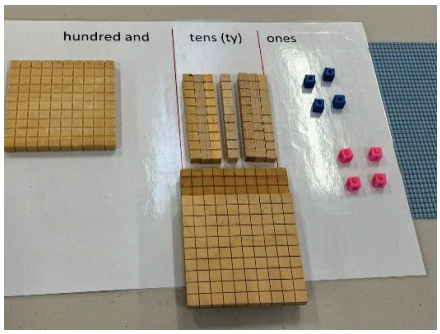
Renaming is about **building flexibility with number sense** that can be used to great effect for mental strategies that are to follow throughout the year for every operation.

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).



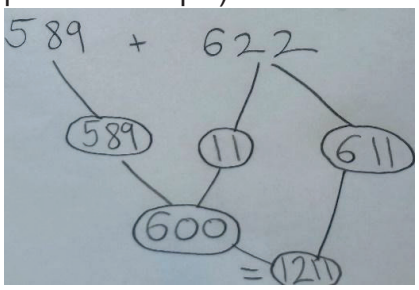
Renaming is similar to giving a number its **Aussie nicknames**. Like many Aussies, numbers have lots of nicknames!

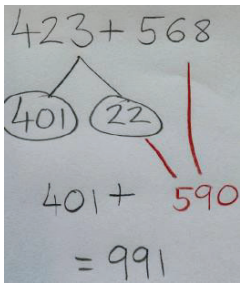
In the early years, students were trained to use superhero eyes (subitising). Now their eyes are upgraded to 'x-ray eyes' that can slice larger place value blocks into their base-ten parts. The best way to do this is to set up a number in its regular sense on a place value chart, then physically push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

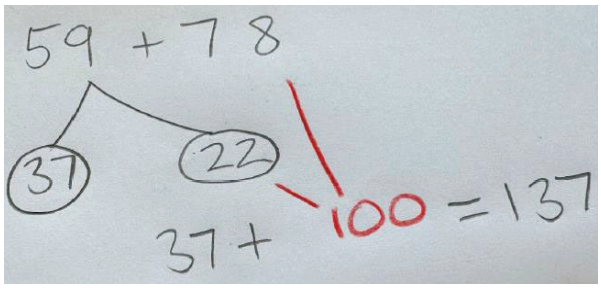


Flexible (non-standard) partitioning

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 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):

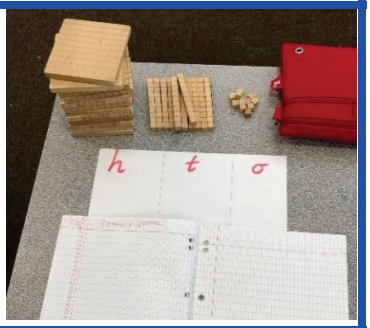
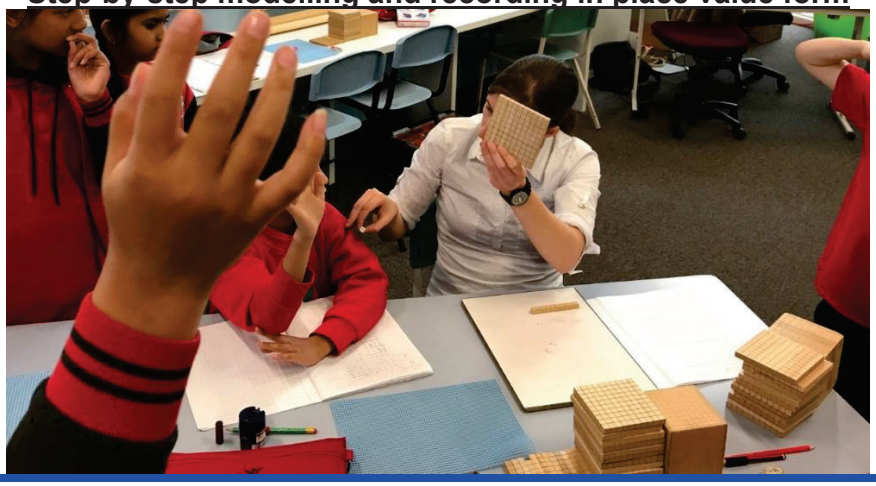






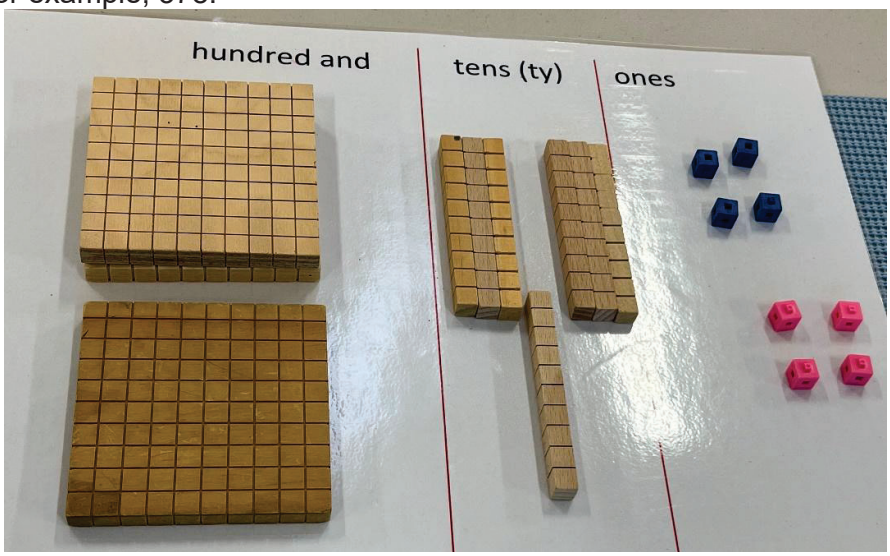
Accordingly, for operating on numbers efficiently and mentally, renaming can prove to be an extremely valuable tool.

Note: **This lesson is similar to *X-Ray Eyes Renaming* from the *Year 3C Unit Plan*, but with additional extension options for Year 4s to use when ready.**

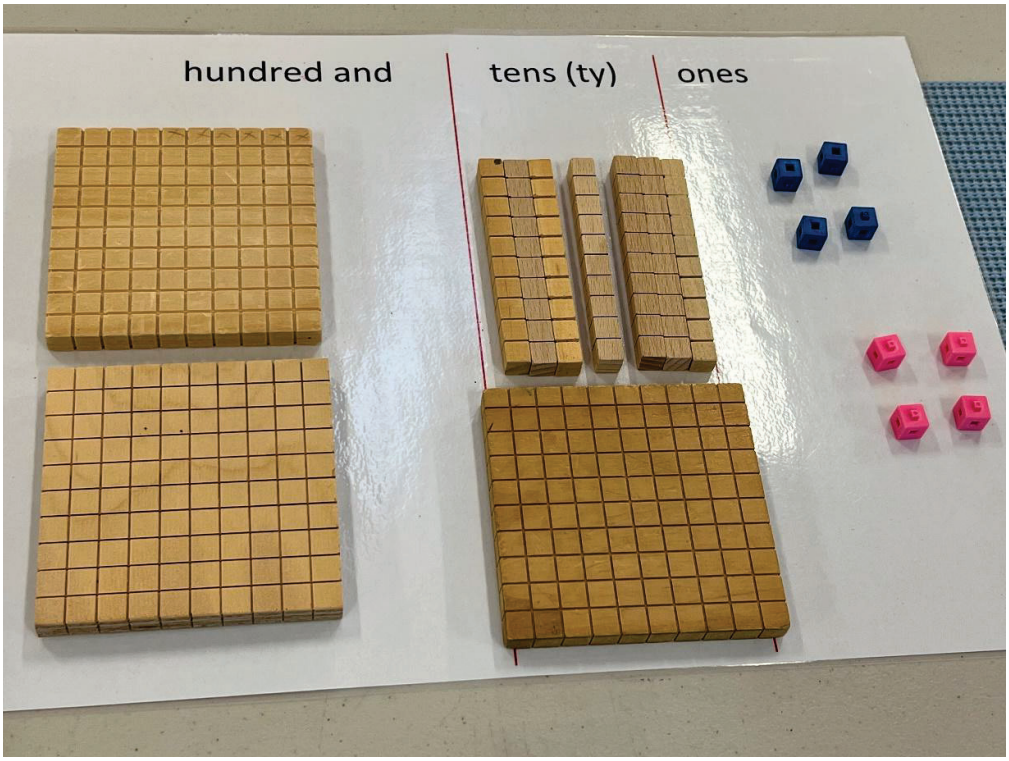
Place Value Year 4C Lesson 1	**Renaming Revision and Going Further: X-Ray Eyes** **Learning intention: Rename 3-digit and 4-digit numbers to work out all the ways these can be made using different place values (give a number its nicknames). Use place value form to record.** **Maths vocabulary: rename, x-ray eyes, place value form**
Real-life link: Link 'renaming' numbers to giving a number a nickname. Chat about any appropriate nicknames that students have in the class. Just like when you get a nickname, you don't change, but people just call you by an extra name. Investigate Aussie slang: http://www.koalanet.com.au/australian-slang.html and https://www.mondly.com/blog/2020/05/14/87-australian-slang-terms-speak-aussie/. Australians are the best at giving things nicknames, so now let's	**Lesson summary: Students rename 3-digit and 4-digit numbers using place value blocks and x-ray eyes (not exchanging/trading/borrowing, but by slicing the blocks up with their eyes in the place value positions). *Critical tip:* Change the whole-school language from carrying/borrowing/trading to renaming for all operations, and lay the foundations for this during these place value sessions.** **Materials:** • Place value blocks – at least 3 one thousands blocks (more if possible), 9 hundreds, 9 tens, 9 ones. • H-T-O chart • Extension version: Wholes-tenths-hundredths chart **Best set-up:** Fishbowl model, then regular like-ability maths buddies.  **Modelling and questioning:** Everyone put on your **x-ray eyes**! Remember 'superhero eyes' from prep/kinder. Well, these are even more powerful! Your x-ray eyes see through the blocks, seeing what they are worth depending on which place value you have put them into in your chart. For example, how many tens are in this one hundred? How many hundreds are in this one thousand cube? Model a hundreds number, then a thousands number example as a class. **Step-by-step modelling and recording in place value form** 

rename numbers by giving them nicknames! It is still the same number; we are just giving it some extra names – nicknames!

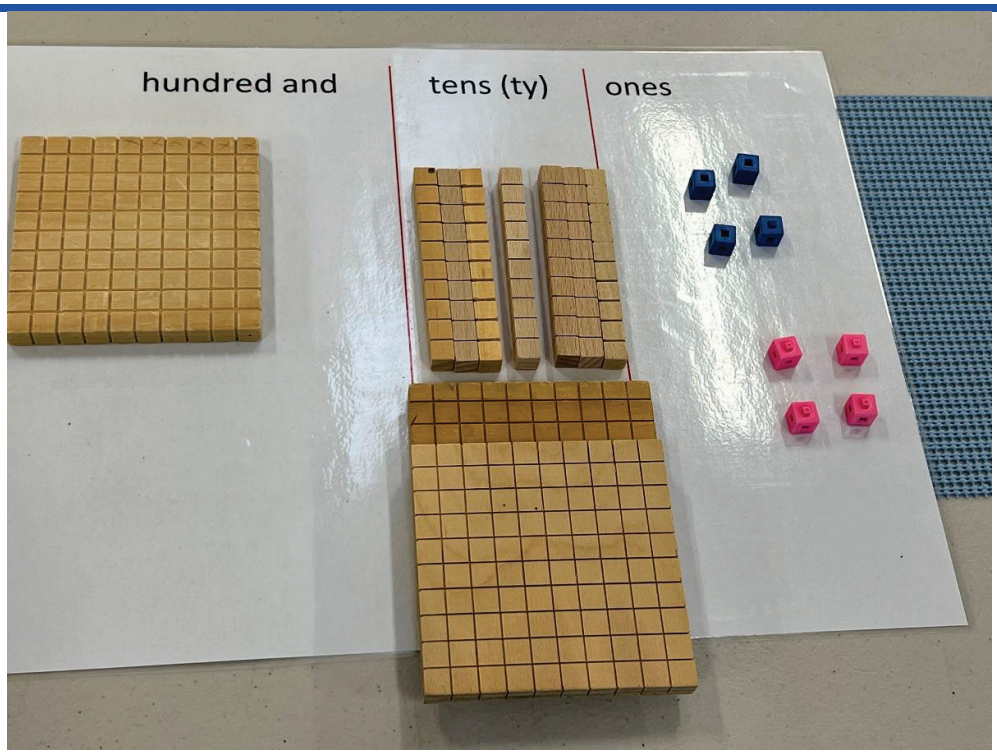
Rename hundreds numbers (as soon as students show readiness for this during lesson 1), then thousands numbers during repeat session 2. For example, 378:



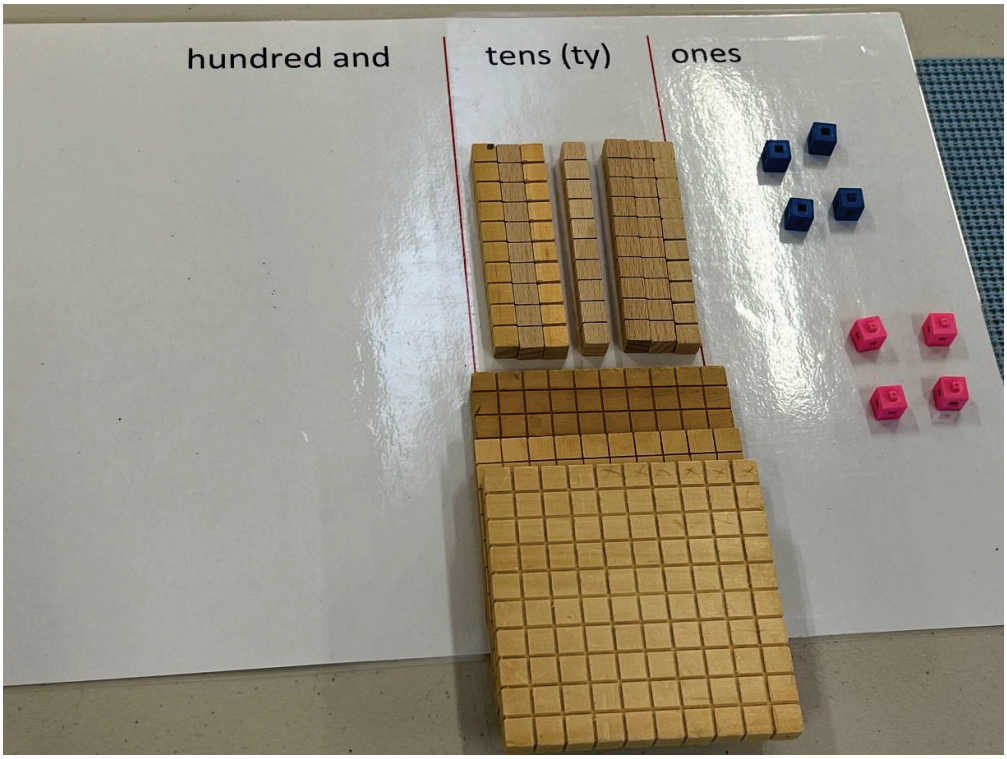
Its regular, proper or standard name is 378, or its place value form is 3 hundreds, 7 tens, 8 ones. Just like your proper name is 'Alexandra Julia Garcia.' But, just like you, it has nicknames…



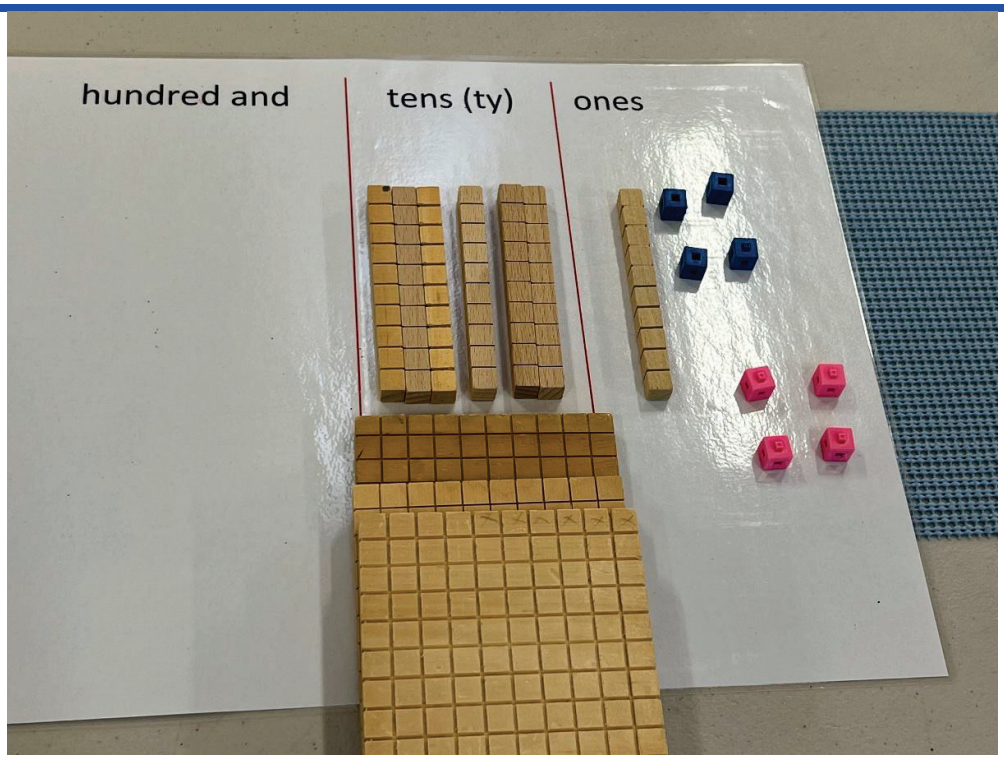
2 hundreds 17 tens 8 ones



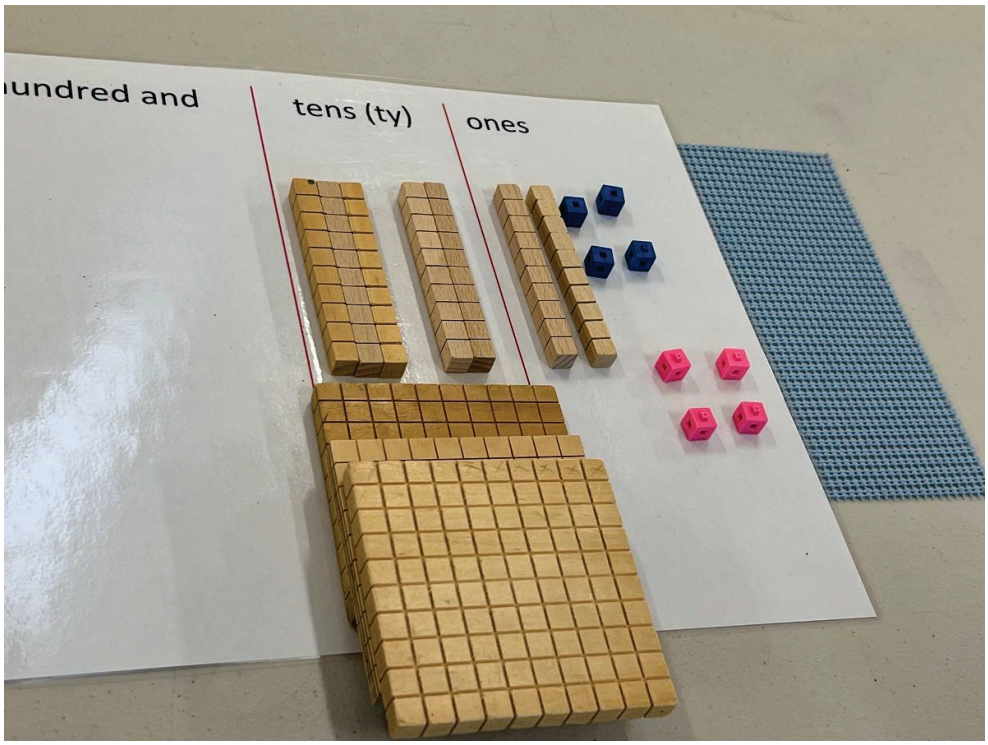
1 hundred 27 tens 8 ones



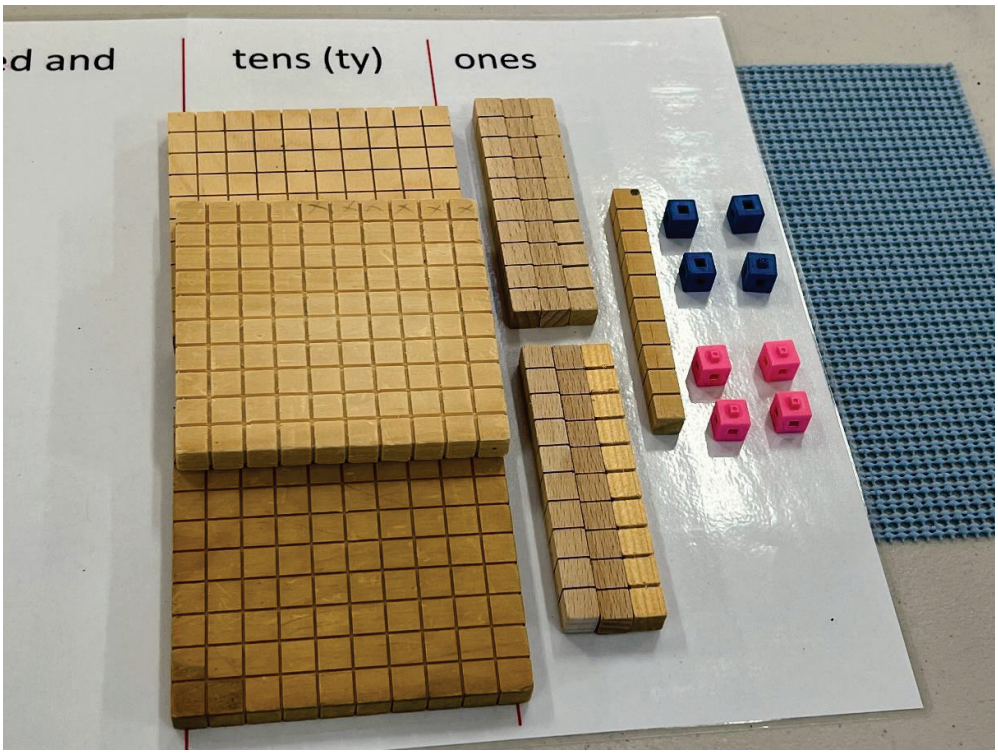
37 tens 8 ones



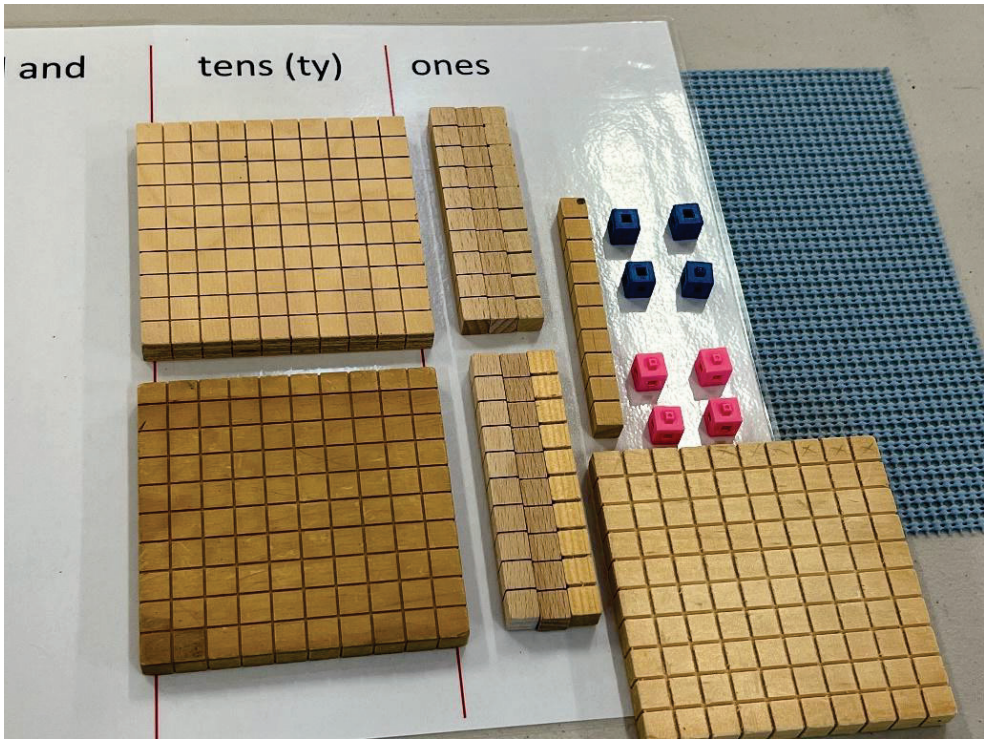
36 tens 18 ones



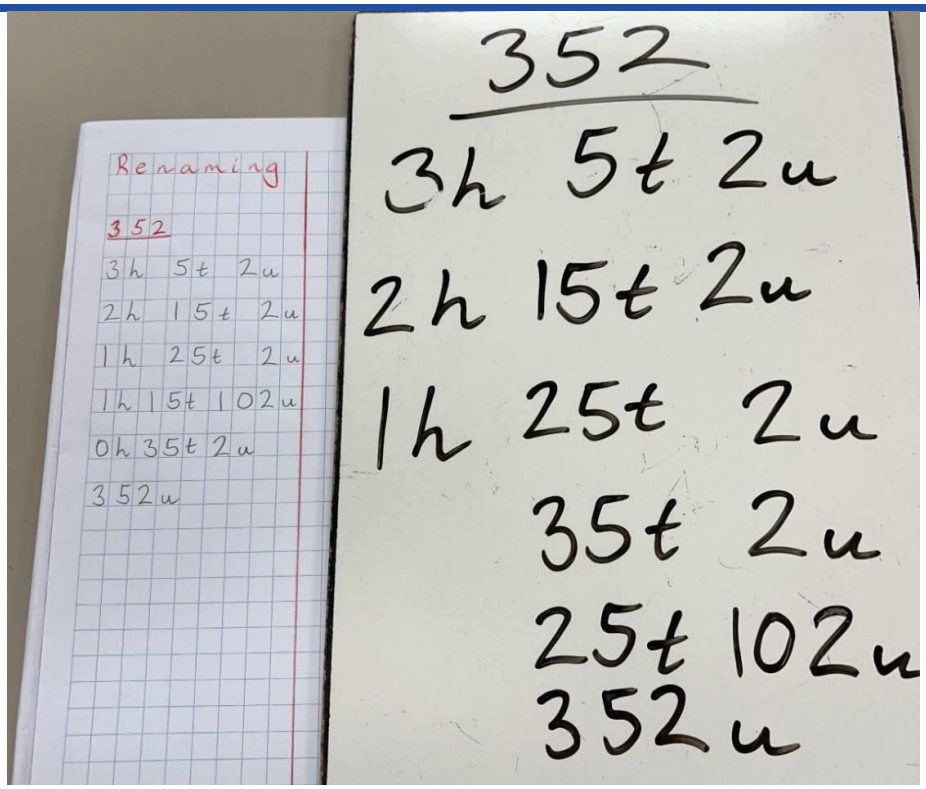
35 tens 28 ones



30 tens 78 ones

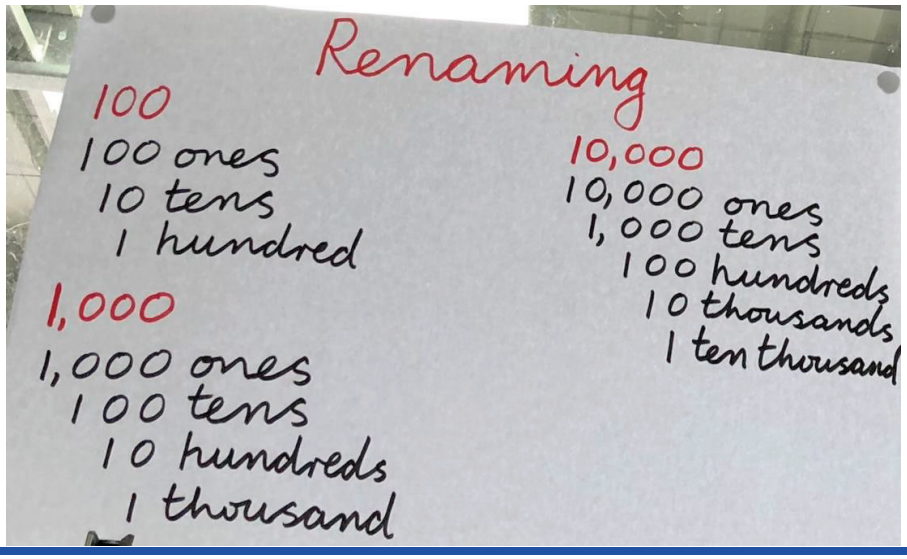


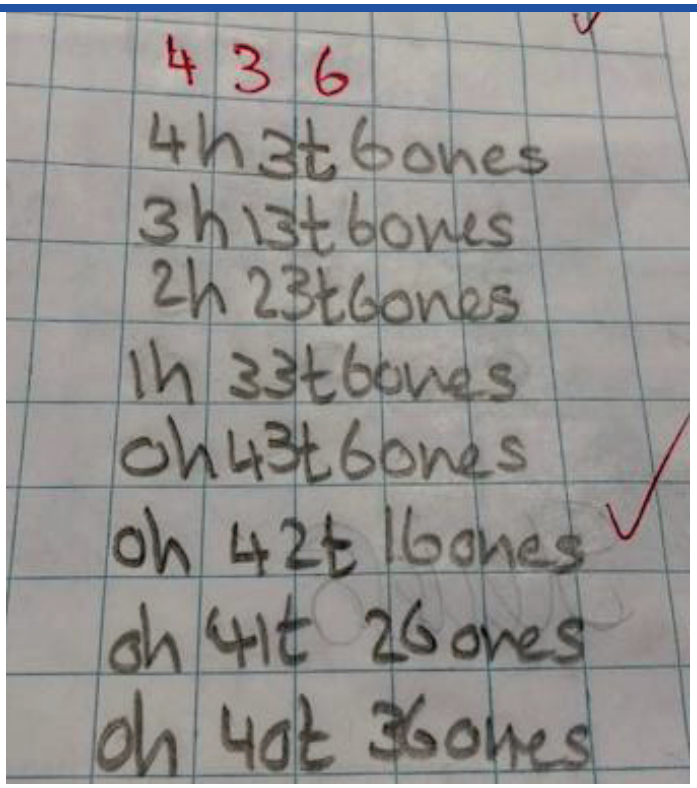
20 tens 178 ones

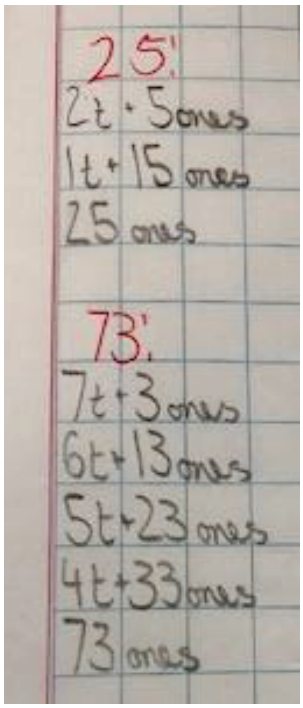


Teacher modelled example – Top Ten always recommends modelling using both a prepared grid book and a whiteboard in the moment, then showing students a photograph of the grid book on the screen as a worked example of excellent mathematical recording for each lesson. Complete many examples for each number, as this helps students see the **place value pattern** that exists when renaming numbers.

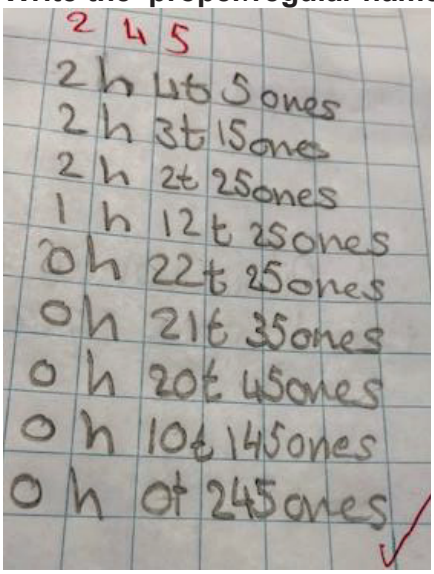
Class anchor chart below

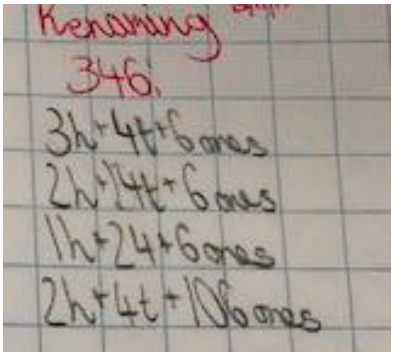




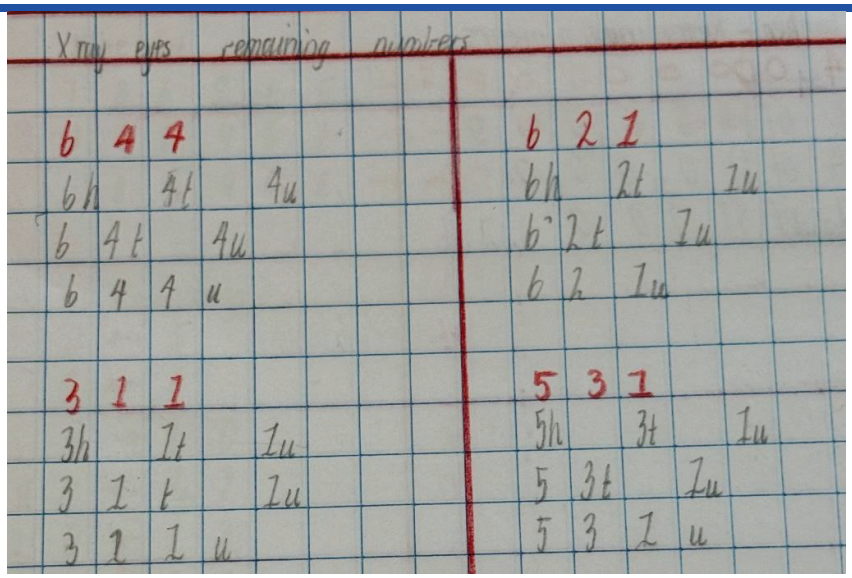


Write the 'proper/regular name' of the number in red as a subheading.

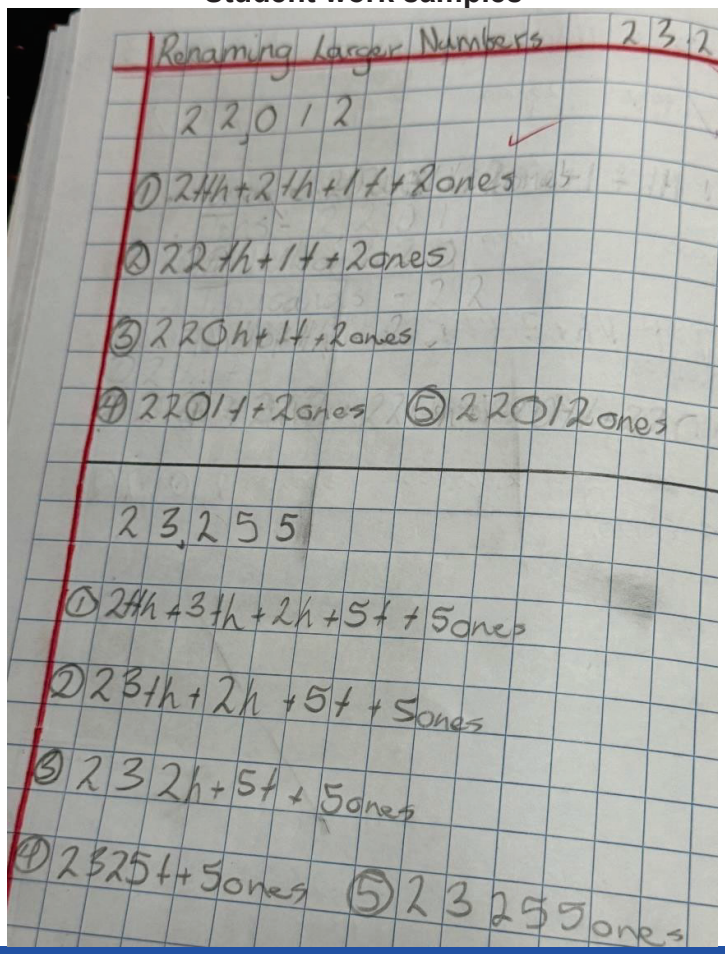


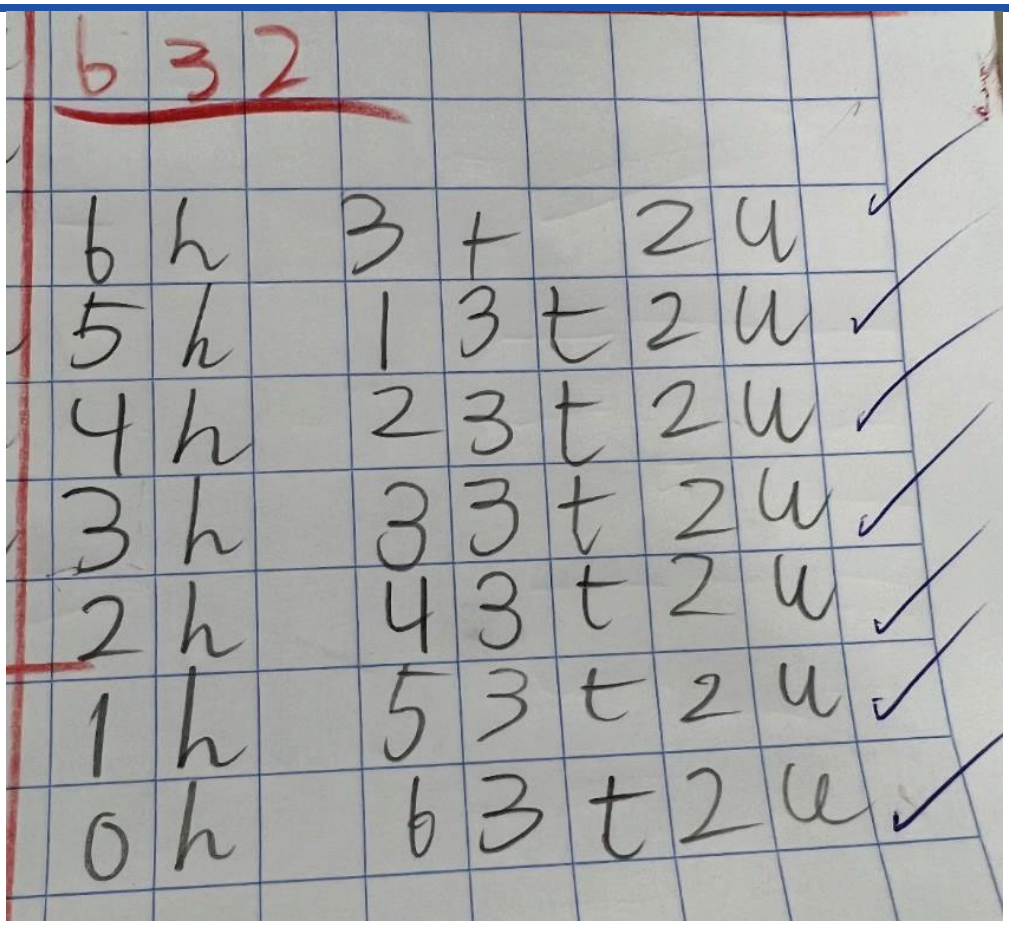


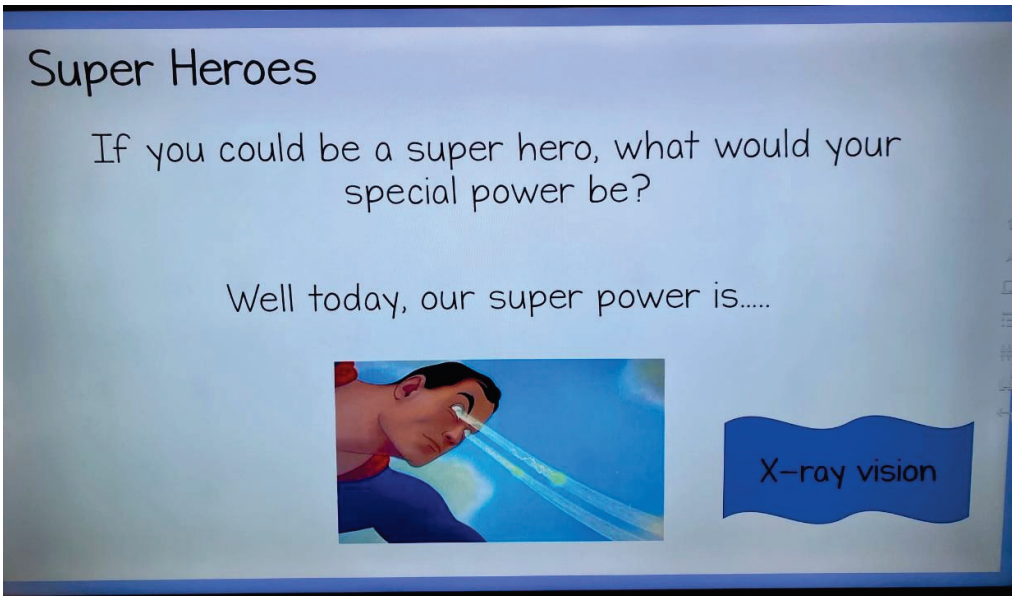
Note: The above student work sample was from before Top Ten started using 'u' for ones as the shorthand notation. It is preferable to use 'u,' instead of 'ones', as the 'o' has some potential to be confused for '0' even when (like in this lesson) students were advised to write the full word for ones to combat this.



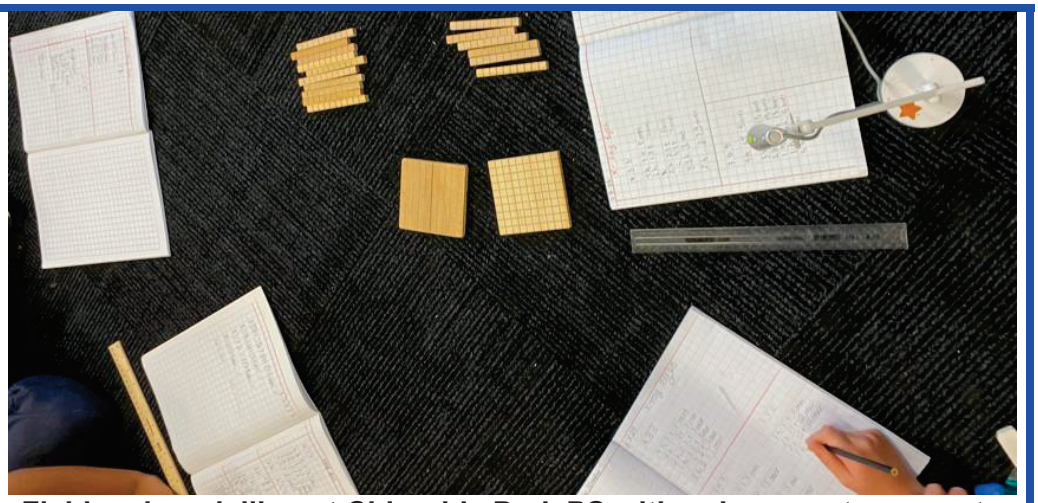
Student work samples



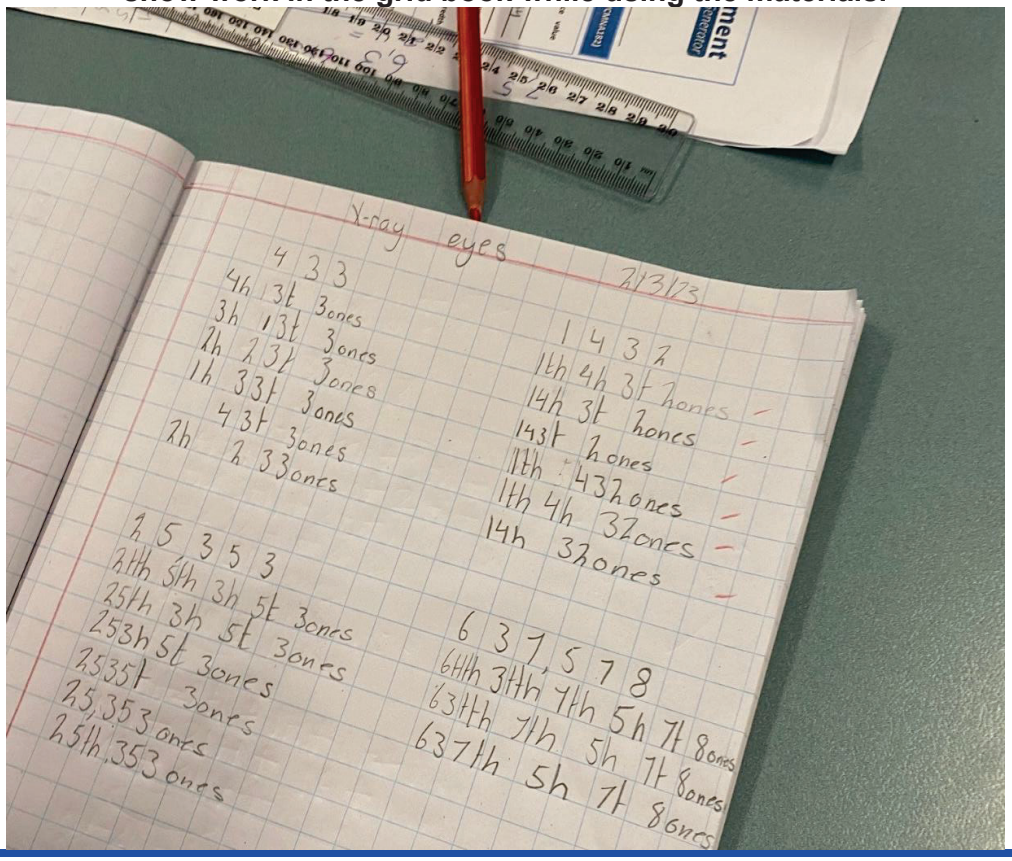


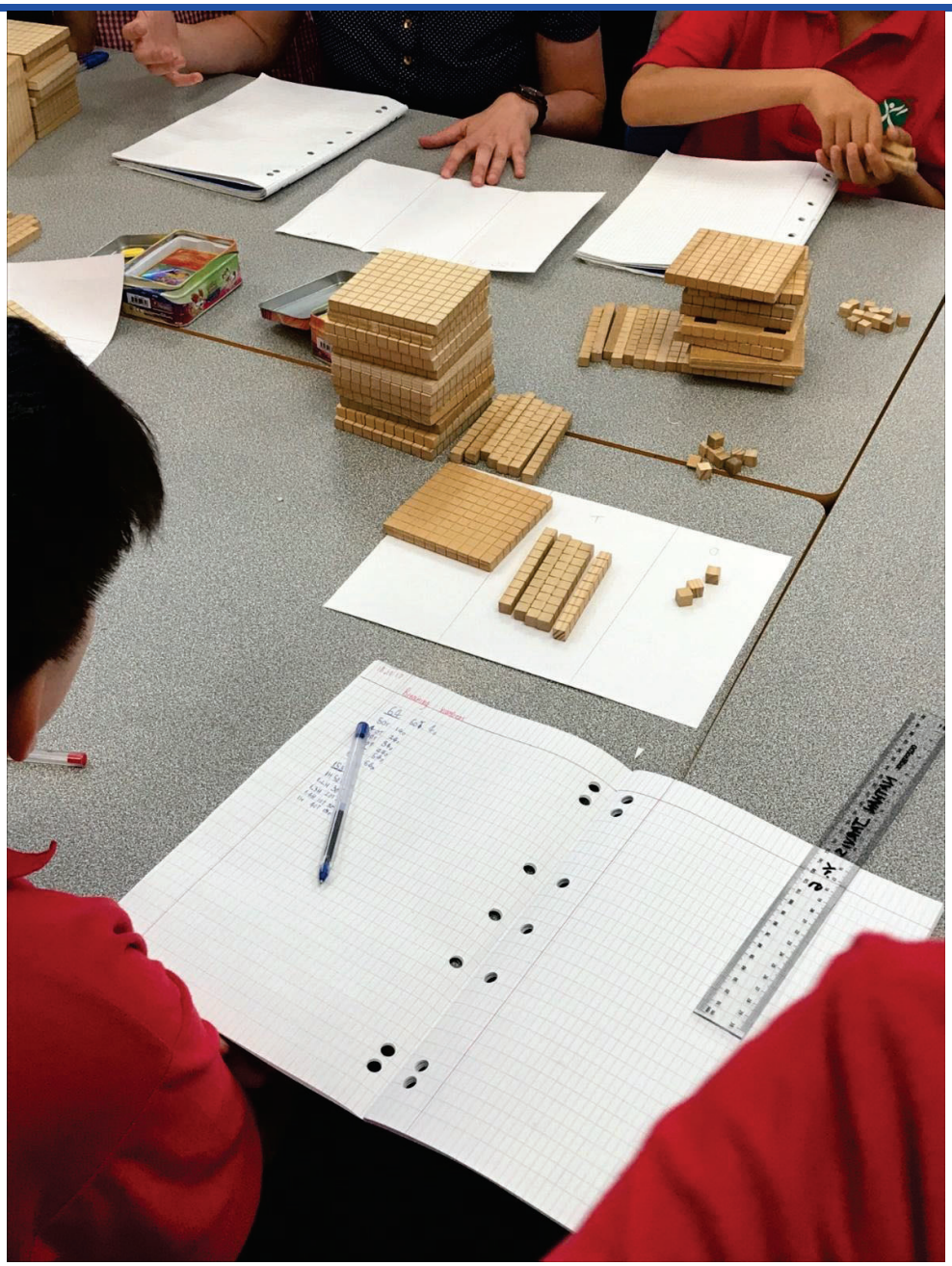


The x-ray eyes hook!

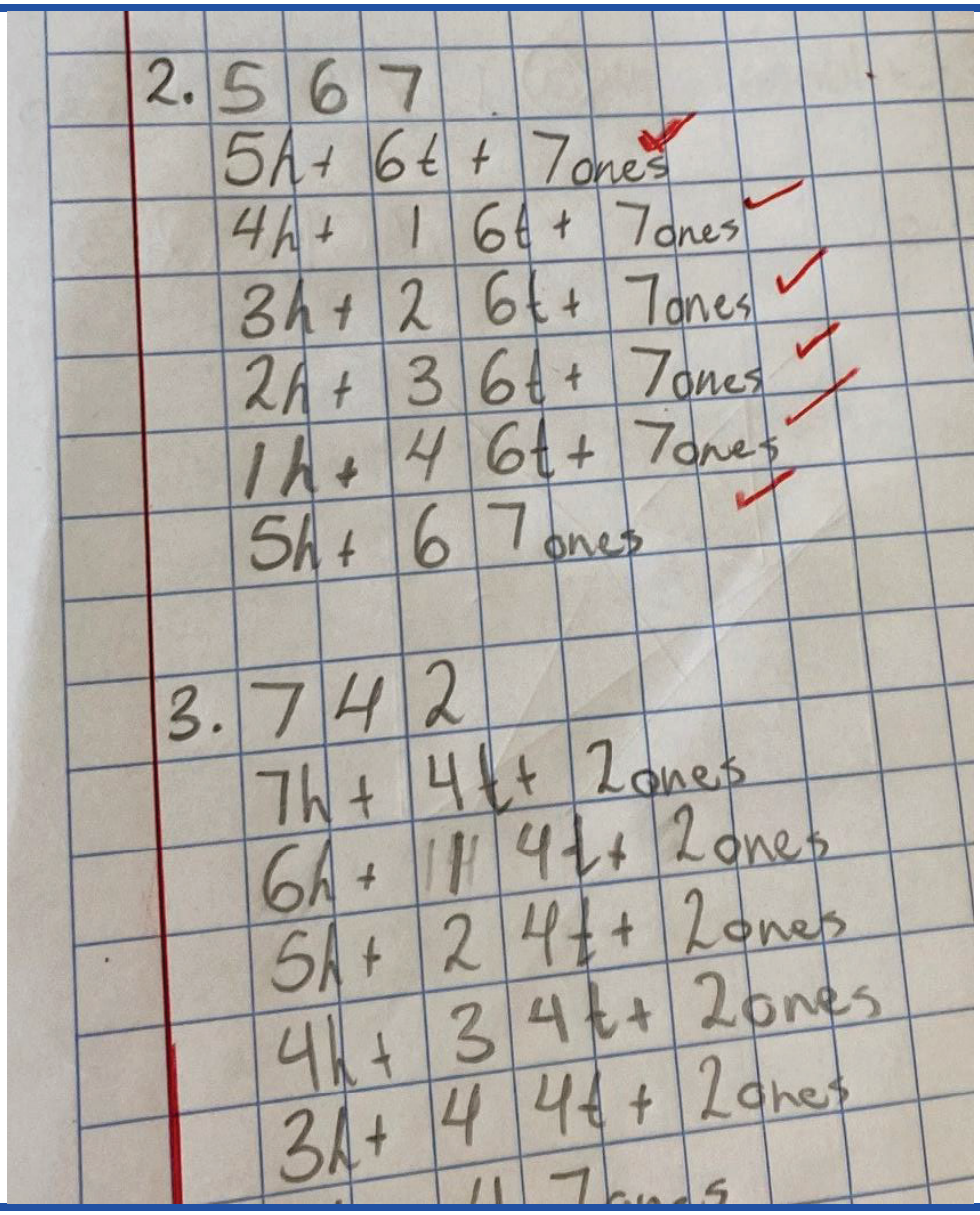


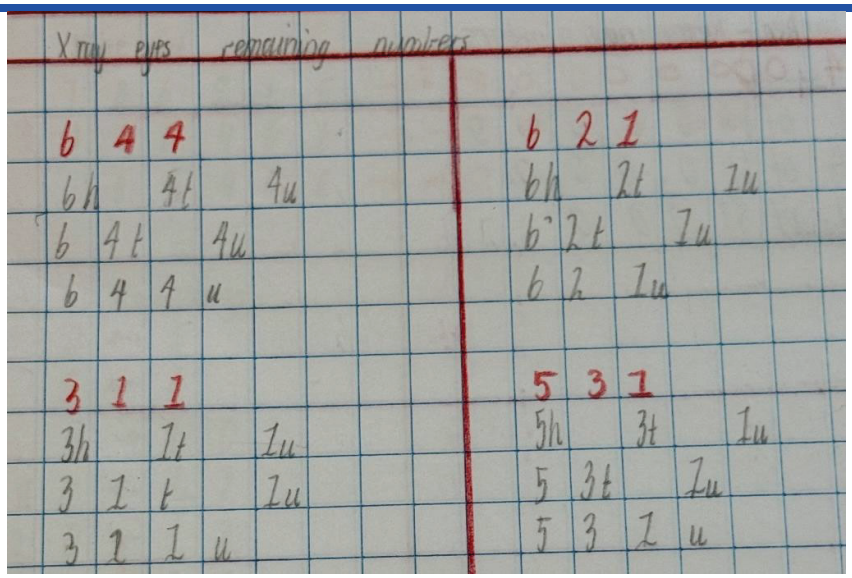
Fishbowl modelling at Chirnside Park PS with a document camera to show work in the grid book while using the materials.



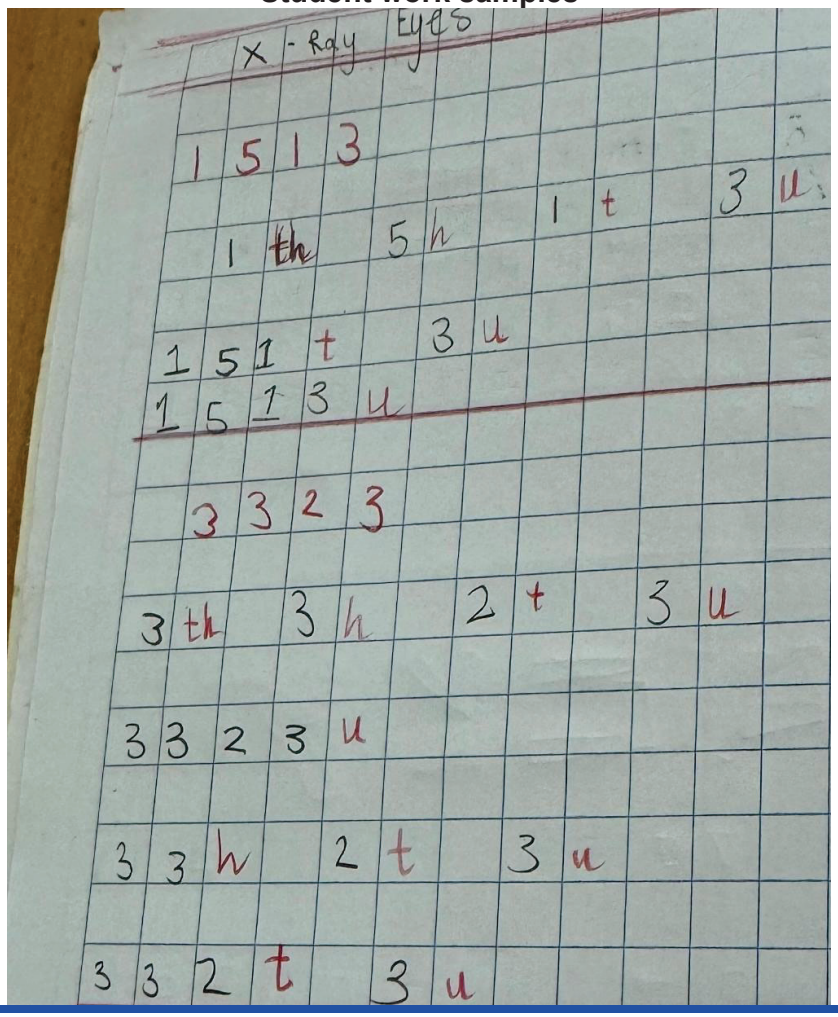


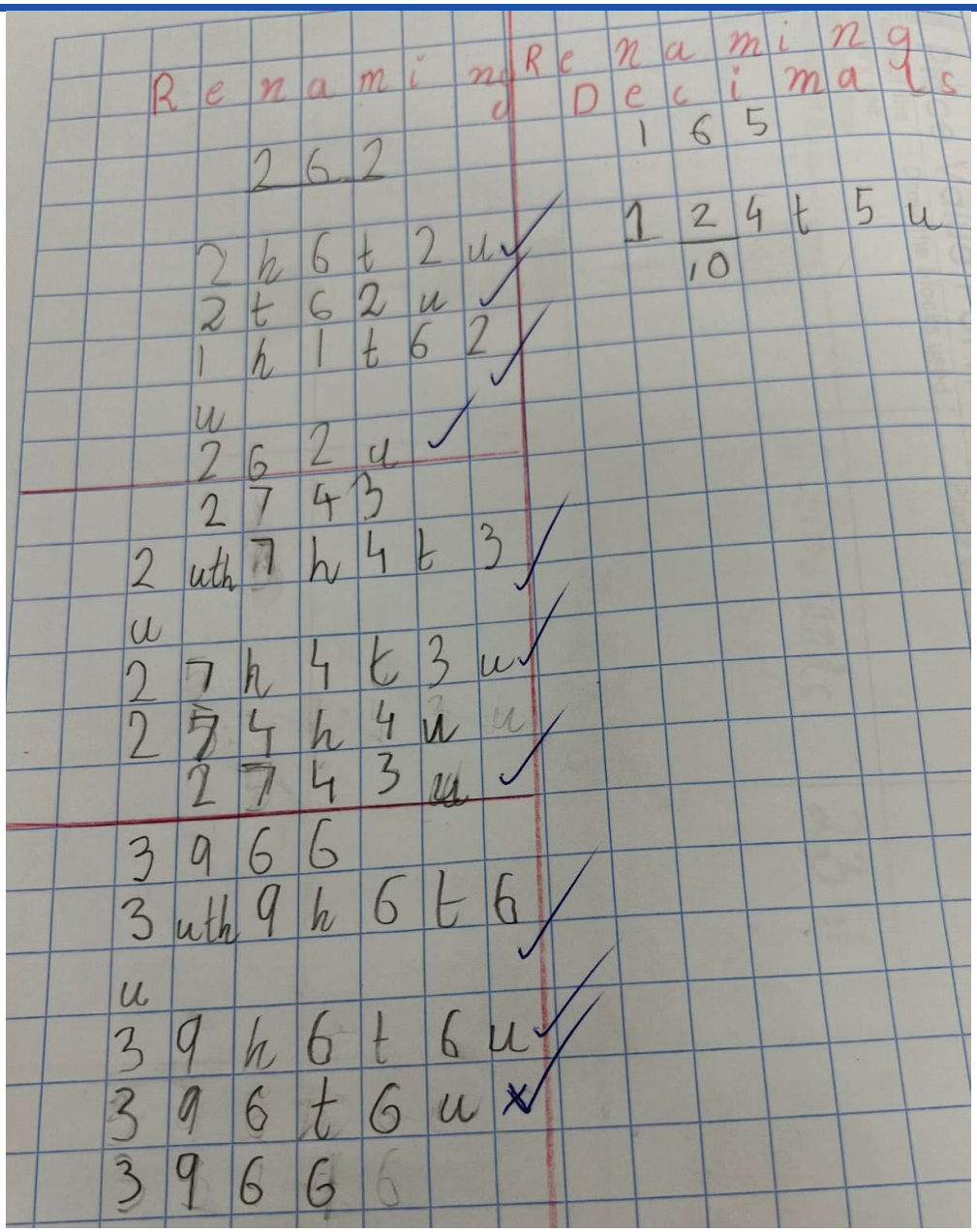
Fishbowl modelling in action



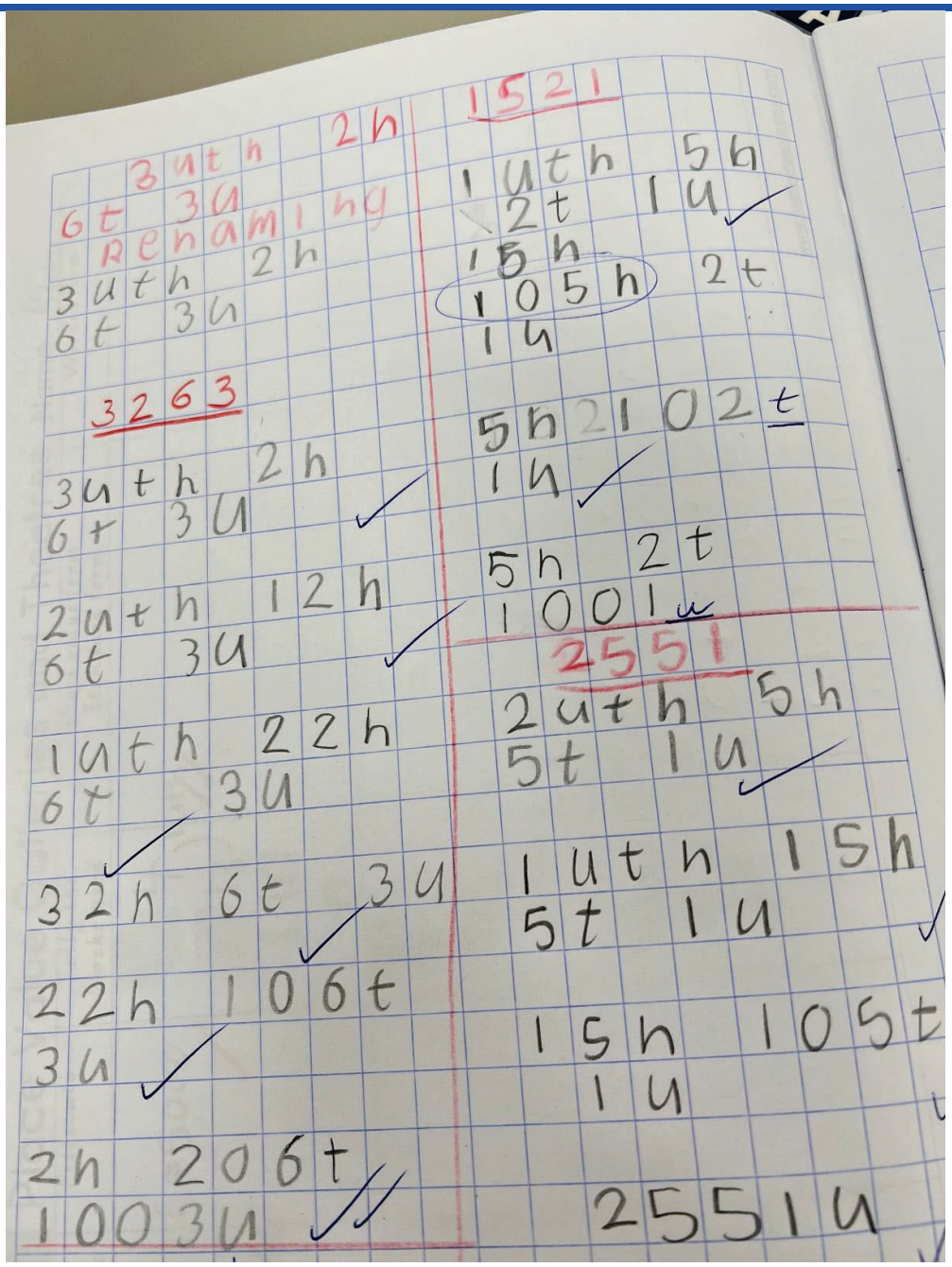


Student work samples

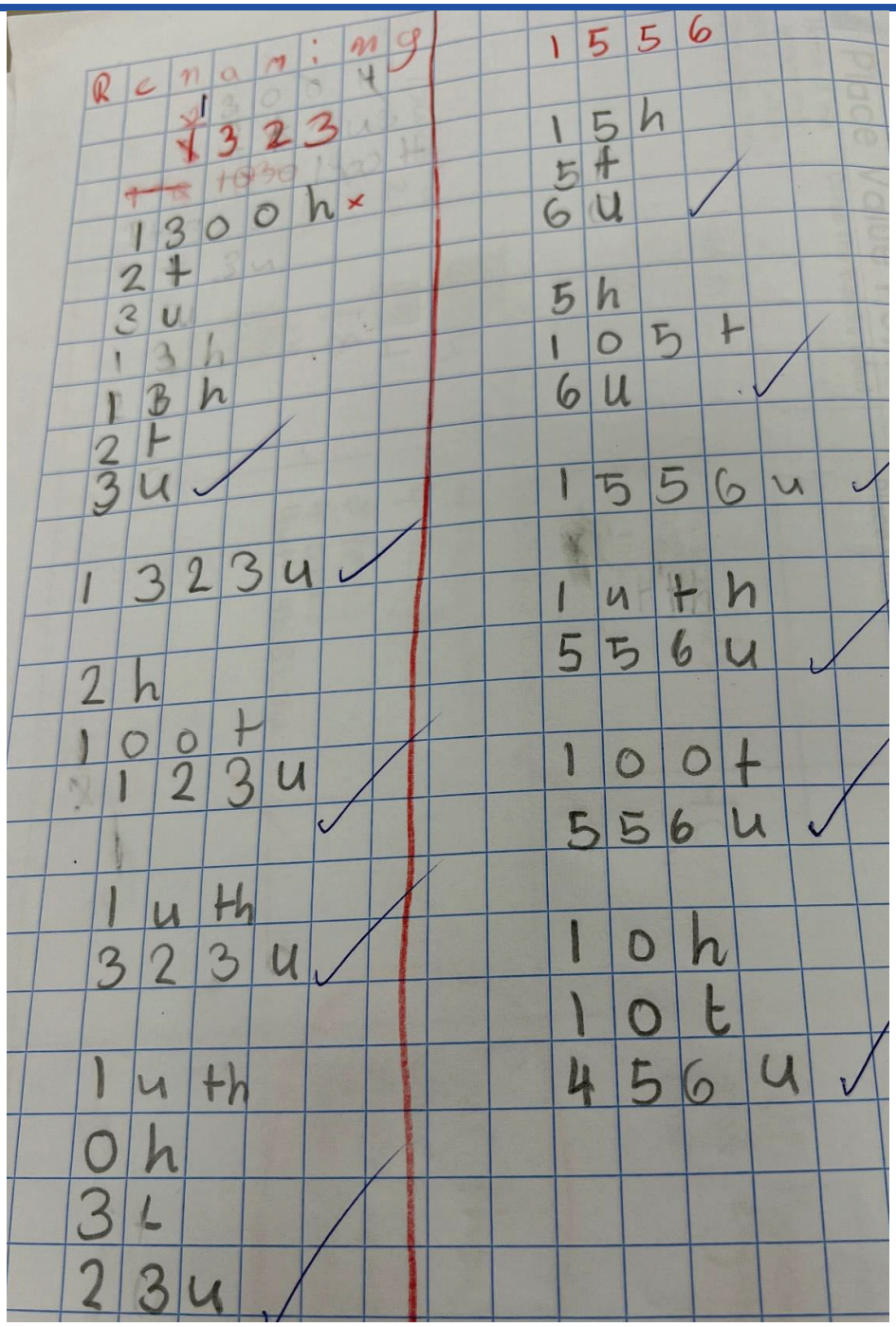




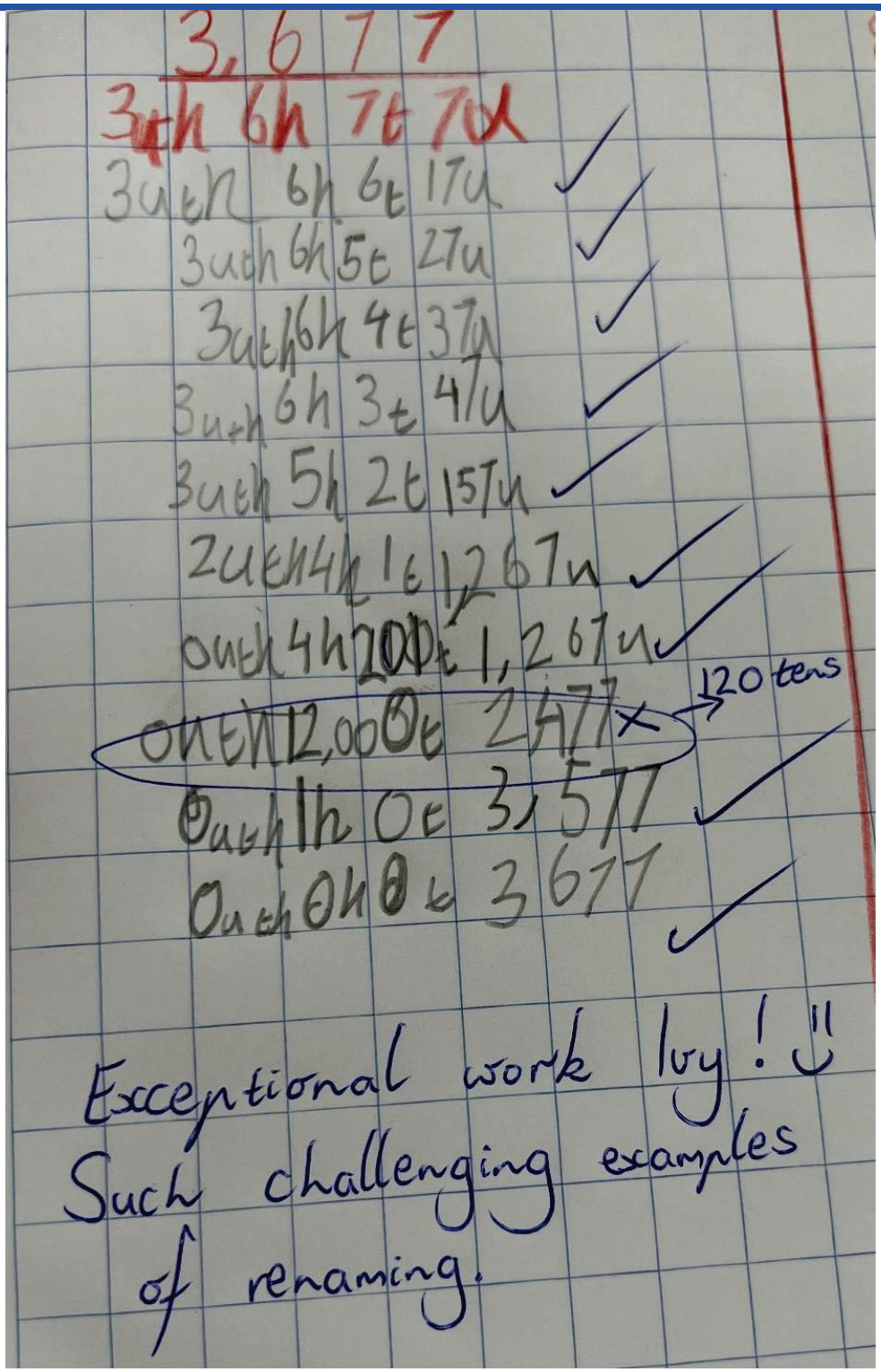
Student work sample



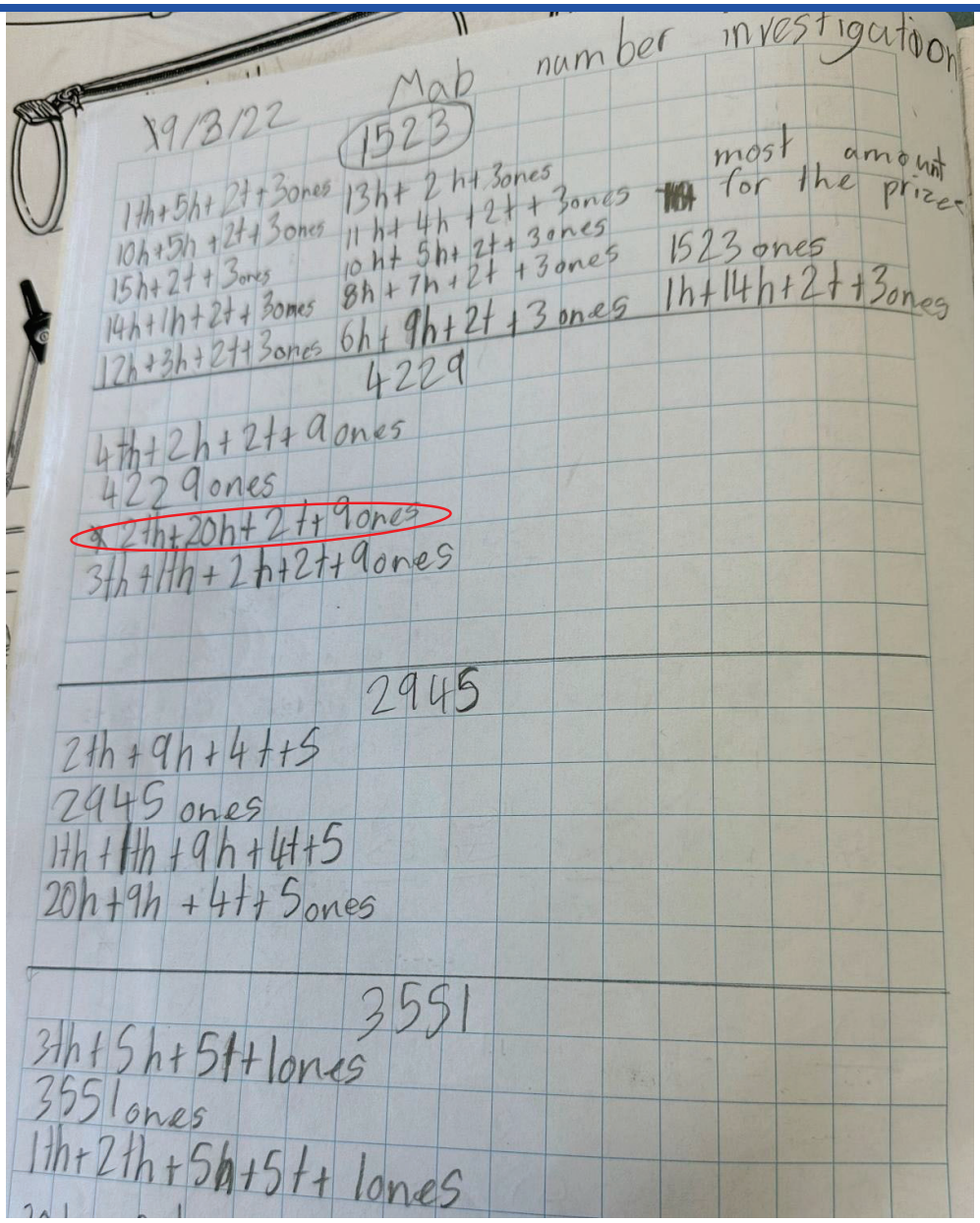
Student work sample



Student work sample

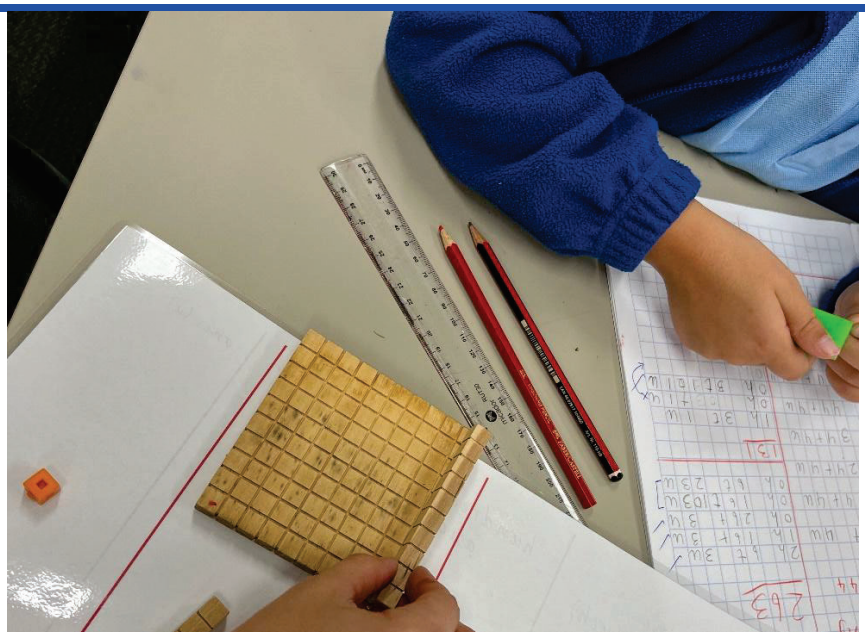


Student work sample



Student work sample

Lesson in action

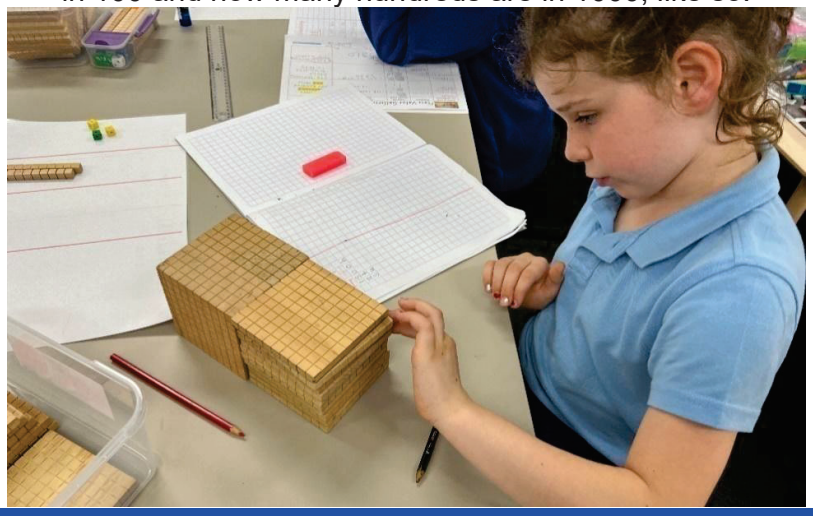


Support: If students struggle to see how many tens are in the hundreds, encourage them to pick up a tens block and count it, laying the tens block over/on top of the hundreds block and counting, “1 ten, 2 tens, 3 tens, 4 tens,” and so on.

Misconception alert: Do not count 10, 20, 30, 40, count 1 ten, 2 tens, 3 tens.

Misconception alert: Some students may say there are 100 tens in a 100 block. Prove this wrong by asking them to lay out 100 tens blocks on top of the 100 block (not 100 of the ones, 100 of the tens). Do they fit?

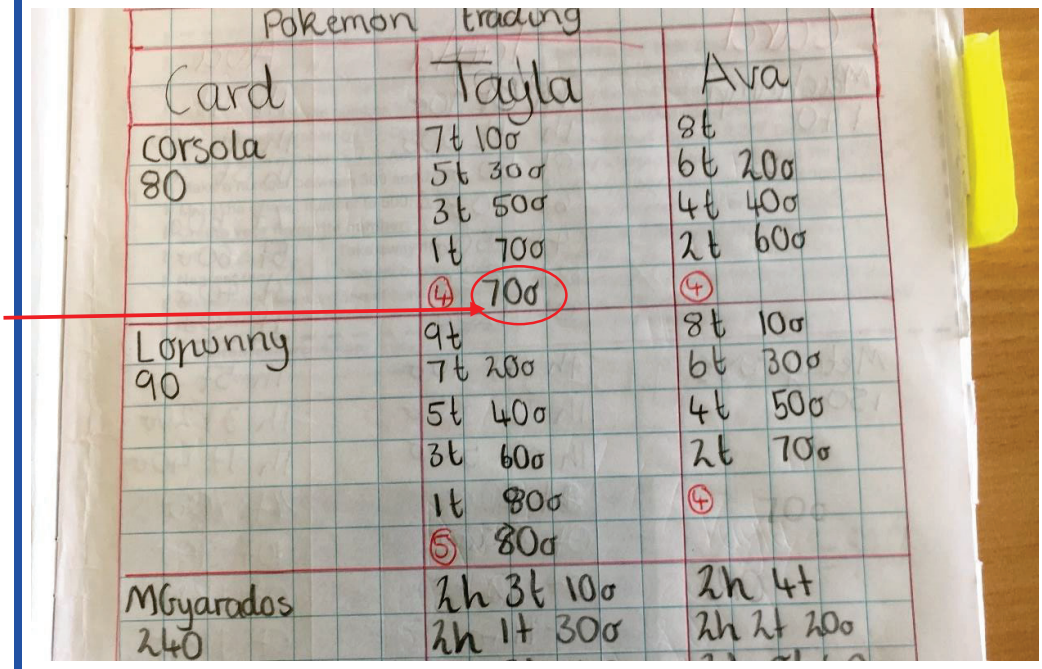
Until they trust it, students often need to physically count how many tens are in 100 and how many hundreds are in 1000, like so:



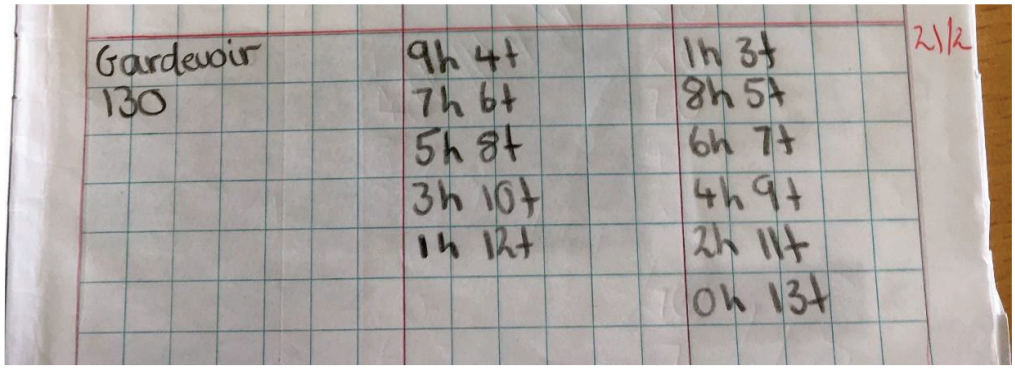
Real-Life Link – Trading Cards

Common misconception: The student does not know that 80 is 80 ones!

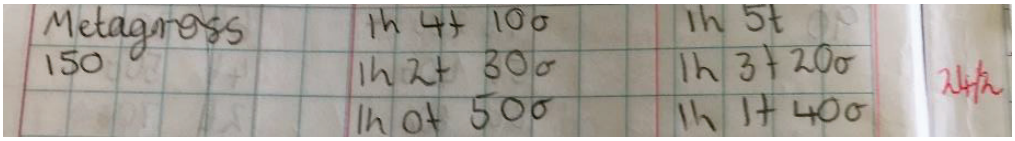
Students were given trading cards that had 'points values' on them depending on the character, and renamed their values multiple times.



Student work samples



Note: 'u' is preferred instead of 'o' for the place value form for ones, as 'o' can resemble zero, even though the preferred oral language is 'ones.'



Recommended exit tickets

Renaming – exit ticket 1

Renaming – exit ticket 2

Renaming – exit ticket 3

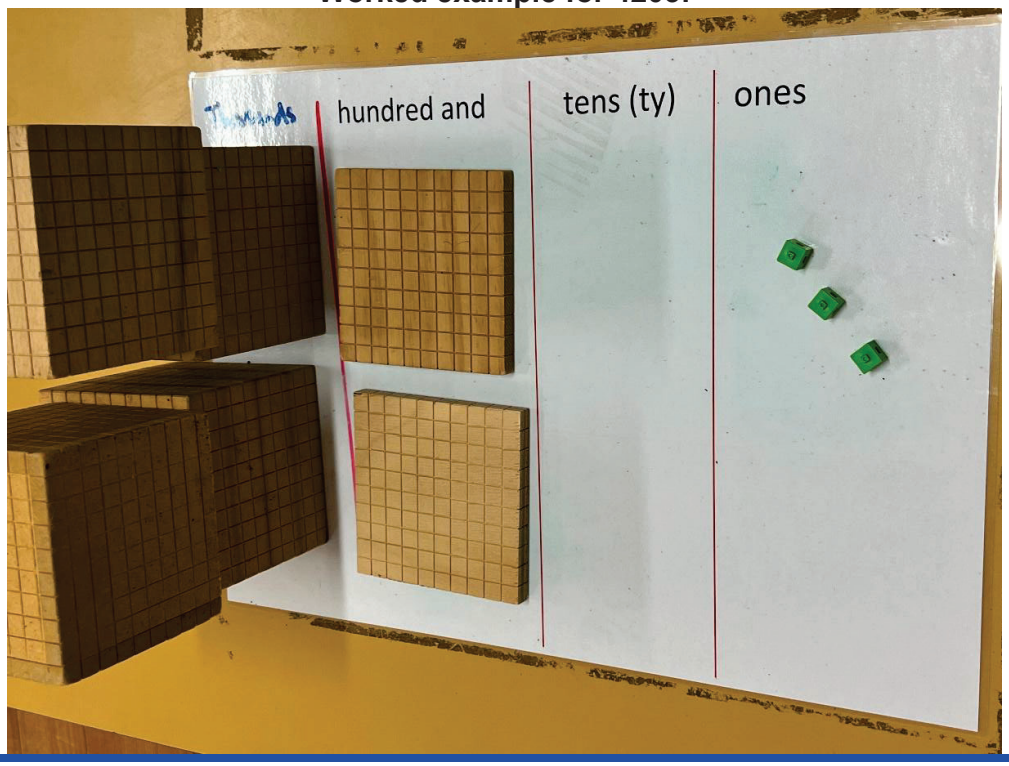
Source: Credit for the creation of these resources to Tamara from Glen Katherine PS.

1. Add 20 tens to 30 tens. _____
2. Add 10 tens to 25 tens. _____
3. Add 14 tens to 20 tens. _____
4. Add 12 tens and 5 ones to 30 tens. _____
5. Add 2 tens and 8 ones from 40 tens. _____
6. Add 3 tens and 3 ones from 33 tens. _____
7. Add 4 tens and 6 ones to 50 tens. _____

Second lesson repeat session – 4-digit focus

Rename one thousands numbers (as soon as students show readiness for this during lesson 2). At first, just rename 1000 exactly, then try other thousands numbers, such as 1520, or 3405.

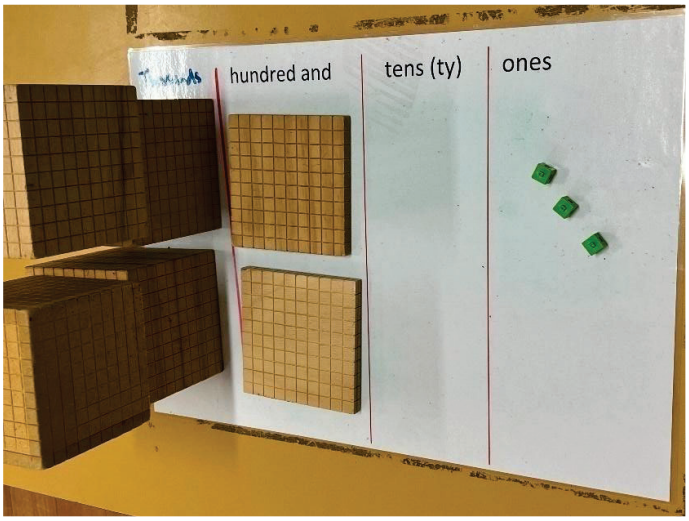
Worked example for 4203:



Questioning: “How many hundreds make 1 thousand? How many tens? How many ones?”

Misconception alert: Often students believe 1 thousand is 6 hundreds. Place the 1 thousand cube (wooden) on a balance scale and 6 hundreds on the other side – it does not balance! Now ask students to balance it – it takes 10 hundreds to balance 1 thousand. How many tens does it take? How many ones? (Don’t fill it with actual ones, use hundreds blocks and just count by 100, 100 ones, 200 ones, 300 ones, 400 ones).

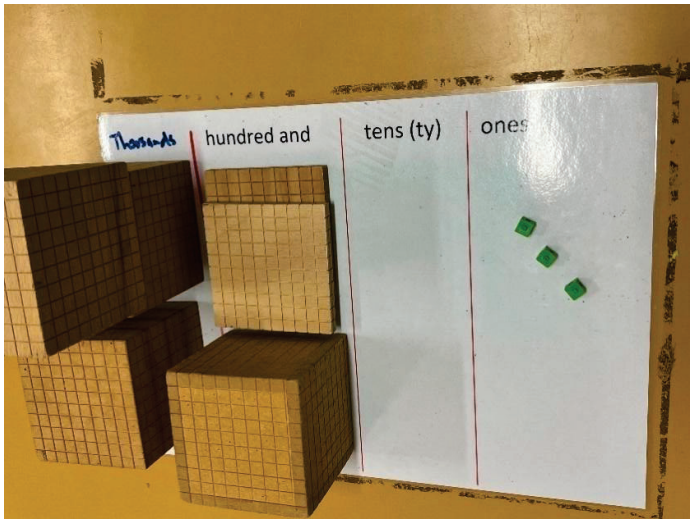
Worked example for 4203: Always start with the regular place value form:



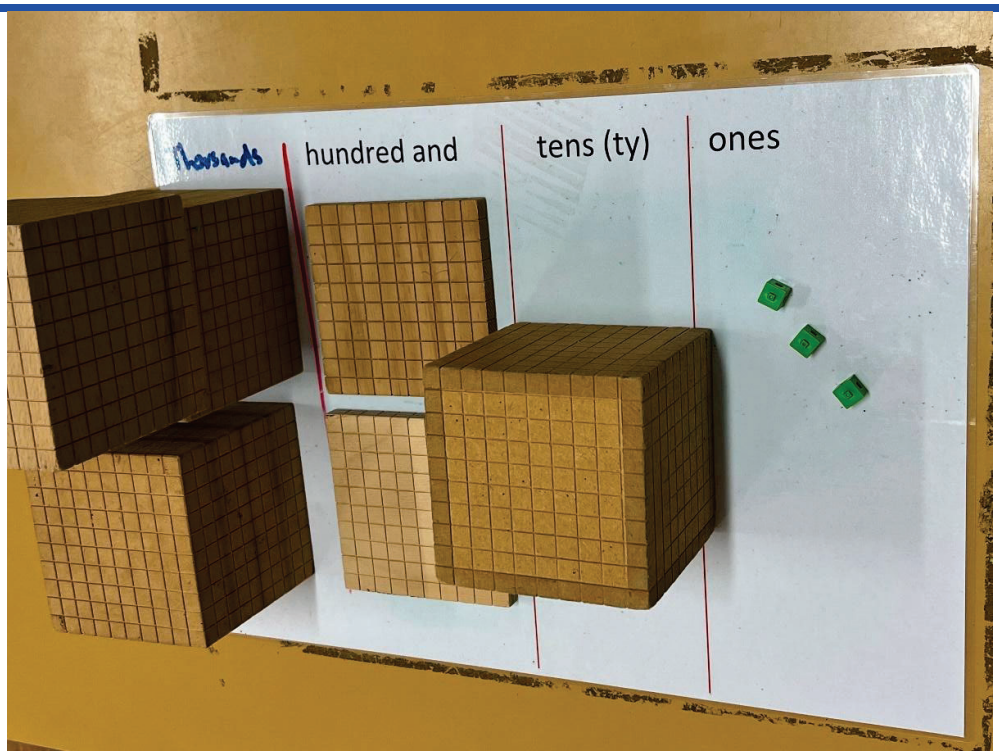
4 one thousands, 2 hundreds, 0 tens, 3 ones

(its proper or regular name in place value form)

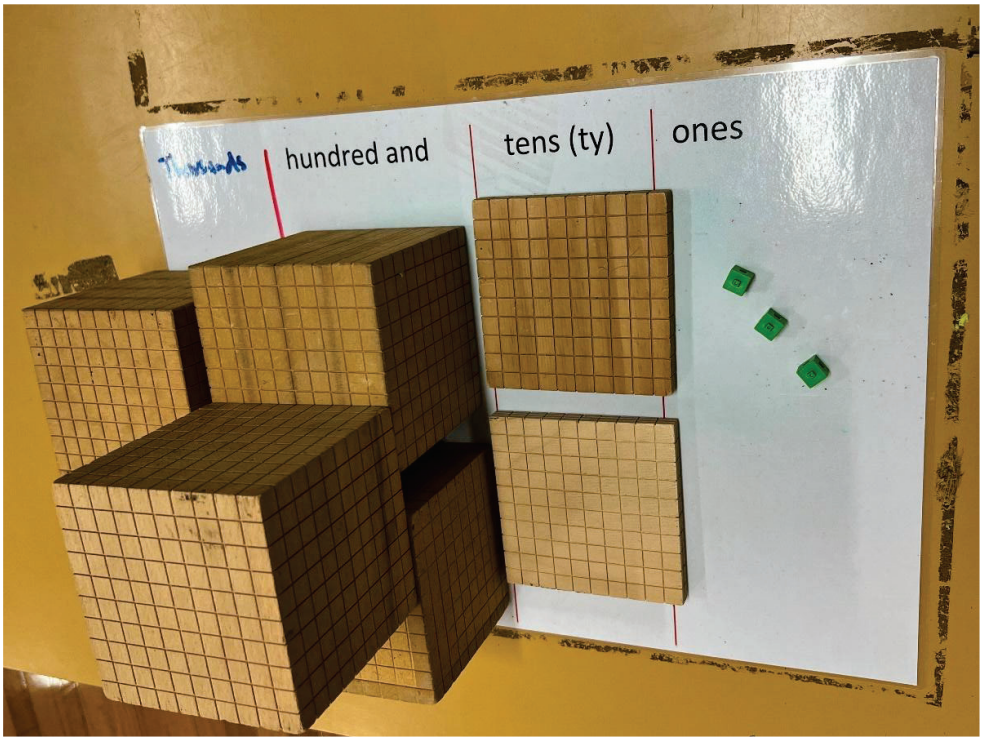
“The name on the number’s birth certificate!”



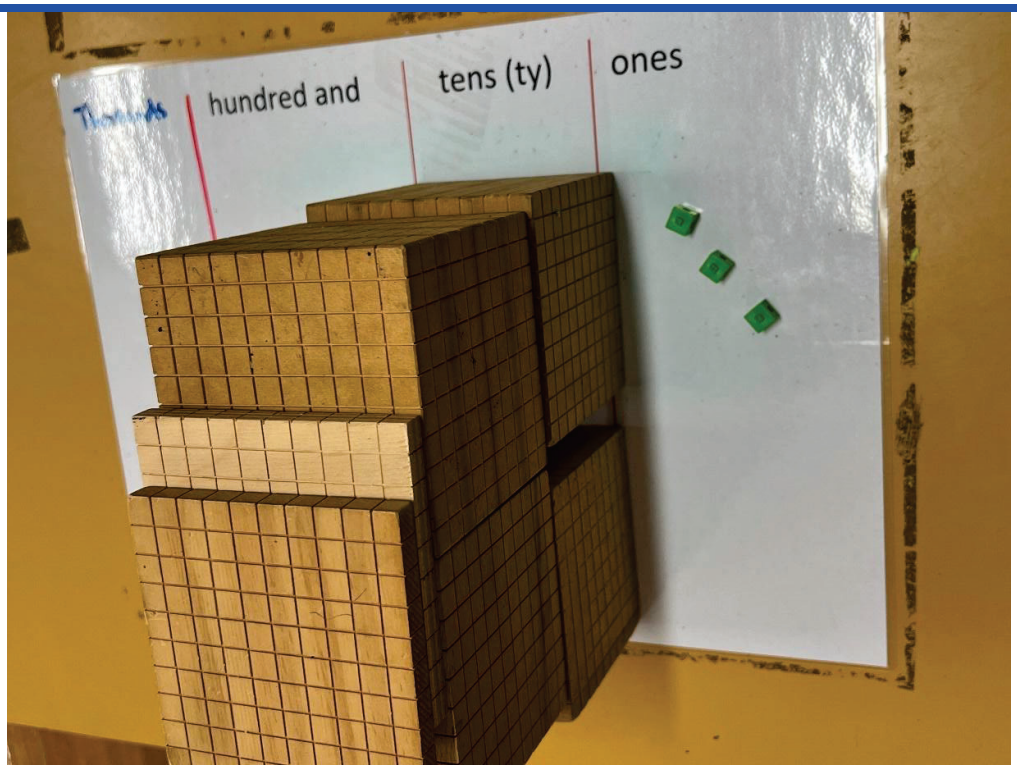
3 one thousands, 12 hundreds, 0 tens, 3 ones



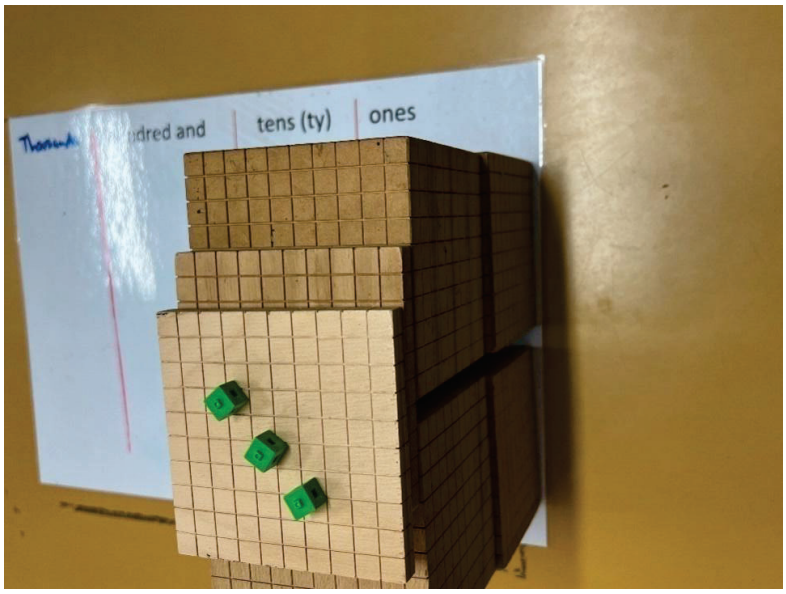
3 one thousands, 2 hundreds, 100 tens, 3 ones



1 one thousand, 30 hundreds, 20 tens, 3 ones



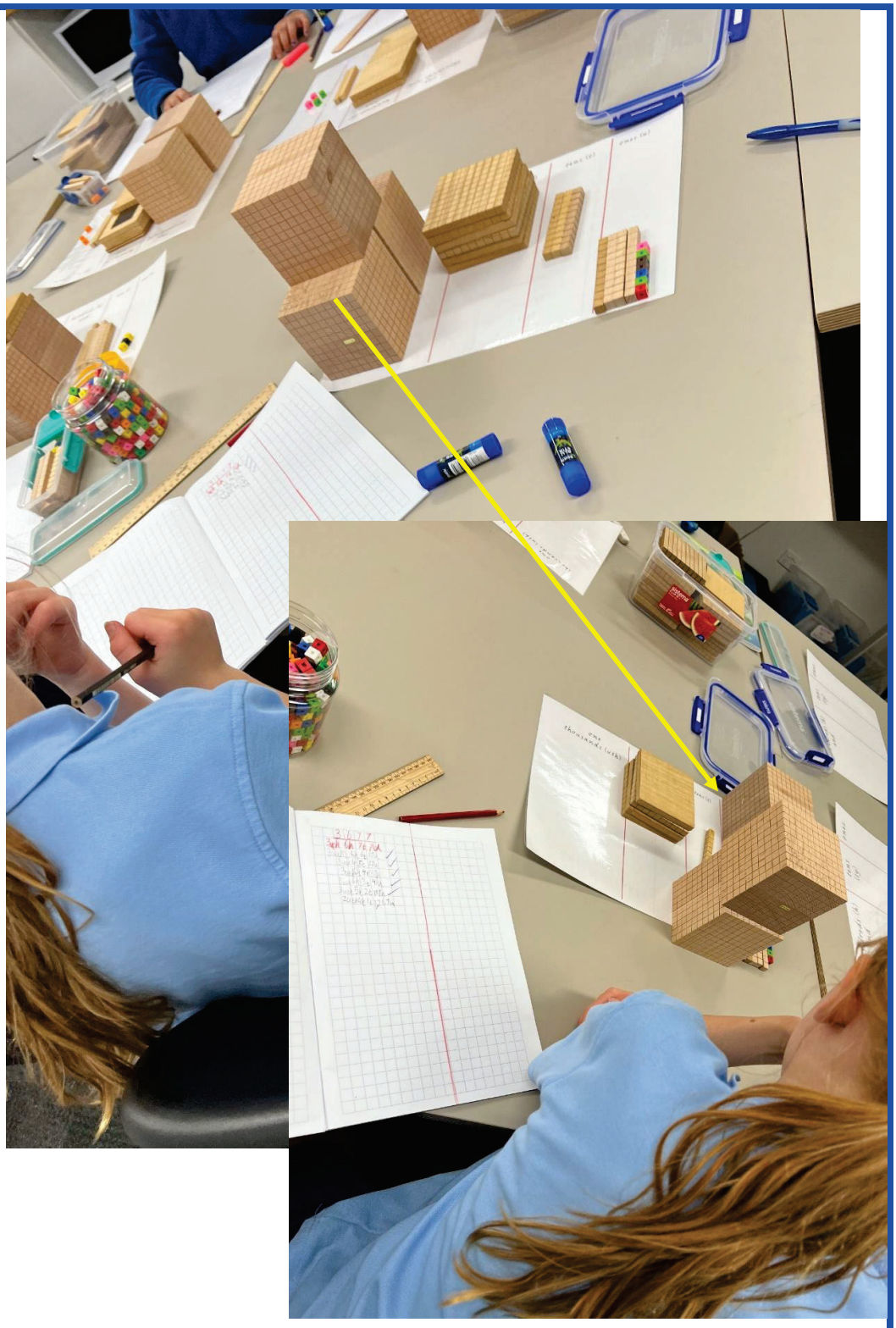
0 one thousands, 0 hundreds, 420 tens, 3 ones



4203 ones

Misconception alert: It is often surprising how many students do not fluently know or trust that 4203 has 4203 ones. It often helps to use money as a real-life context: “If you had to pay $4203 for a jet ski or electric scooter, but you only had $1 coins, how many $1 coins would you need?”

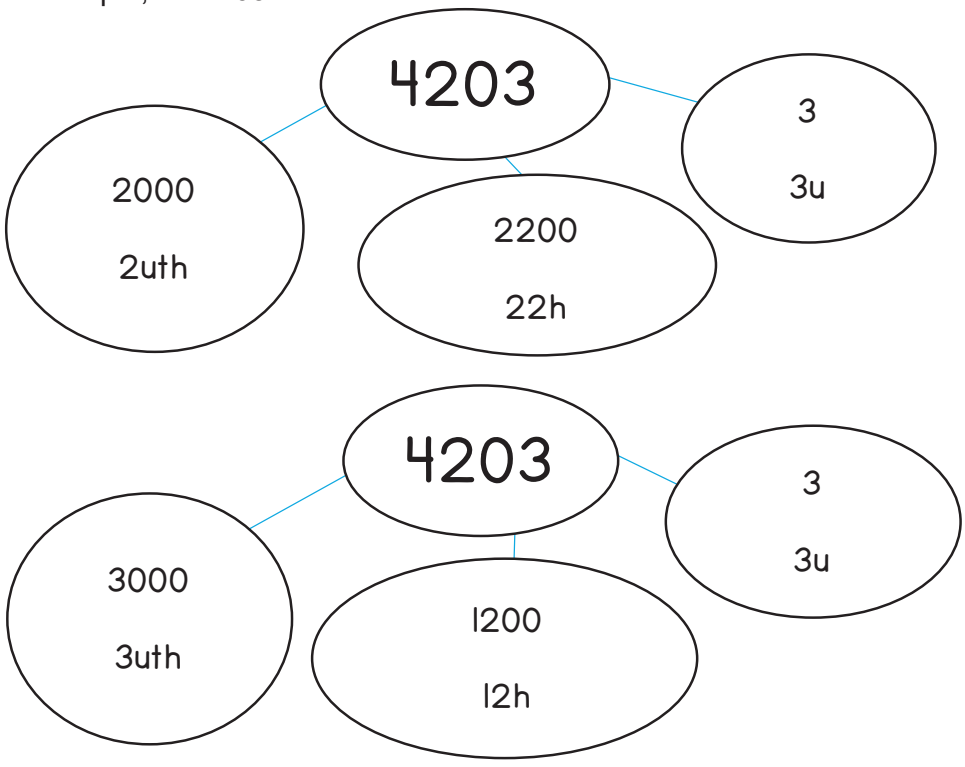
Lesson in action



Lesson in action

Variation when students are ready: Show it a different way by breaking some place values into 2 parts.

For example, for 4203:

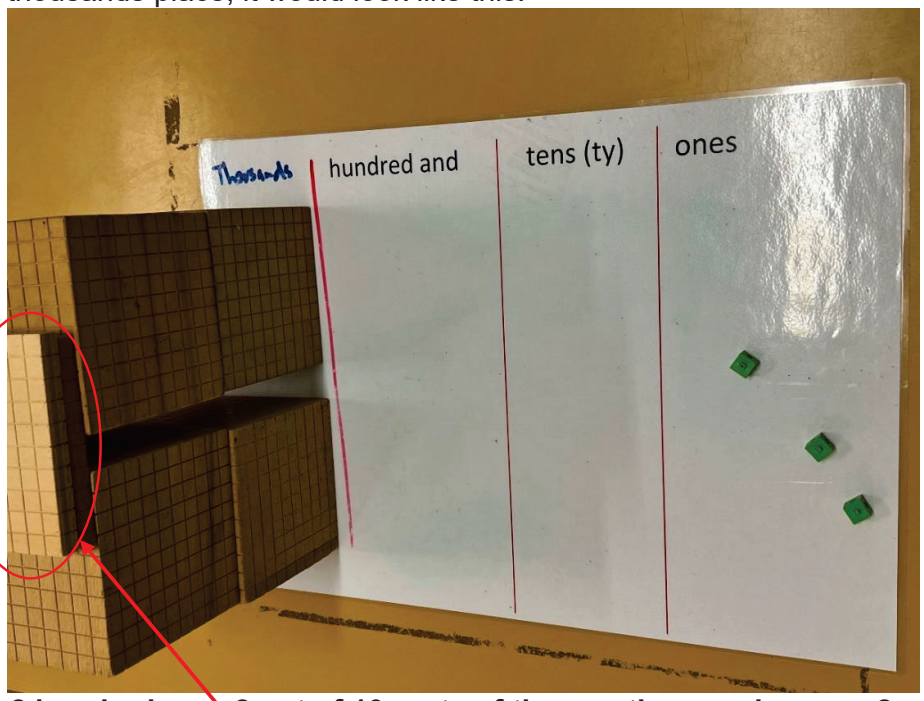


Create 5 examples for each number.

Extension 1 – The Decimal Connection

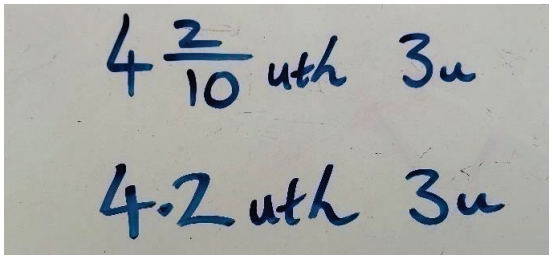
From the outset, it must be made clear that this extension does not involve using MAB/place value blocks to learn decimal concepts in that the hundreds block is not being used to represent a 'whole' or anything of that nature. Instead, this extension was created by a year 5 student who saw that if the place value blocks were shifted towards the left direction (rather than only to the right), they would decrease in value, becoming 1/10 or one tenth of their value when in the hundreds place.

It works like this: 4203 is the total, but if the 2 hundreds are moved into the one thousands place, it would look like this:

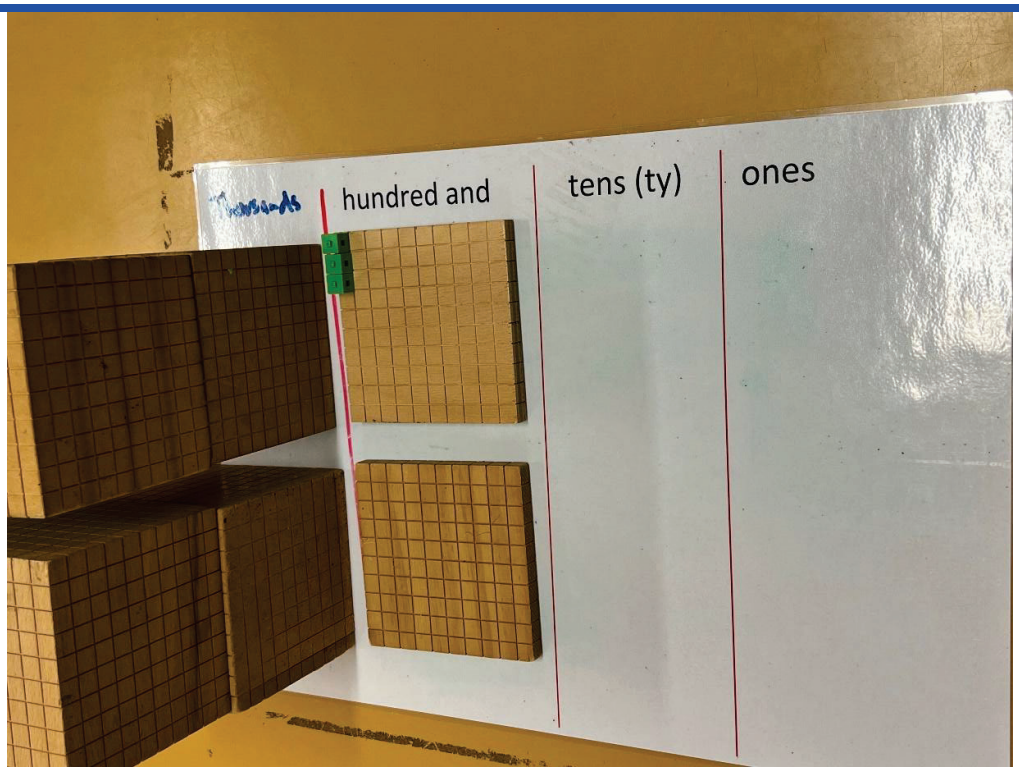


The 2 hundreds are 2 out of 10 parts of the one thousand, so are 2 tenths of the way towards forming another one thousand, or worth 0.2 one thousands.

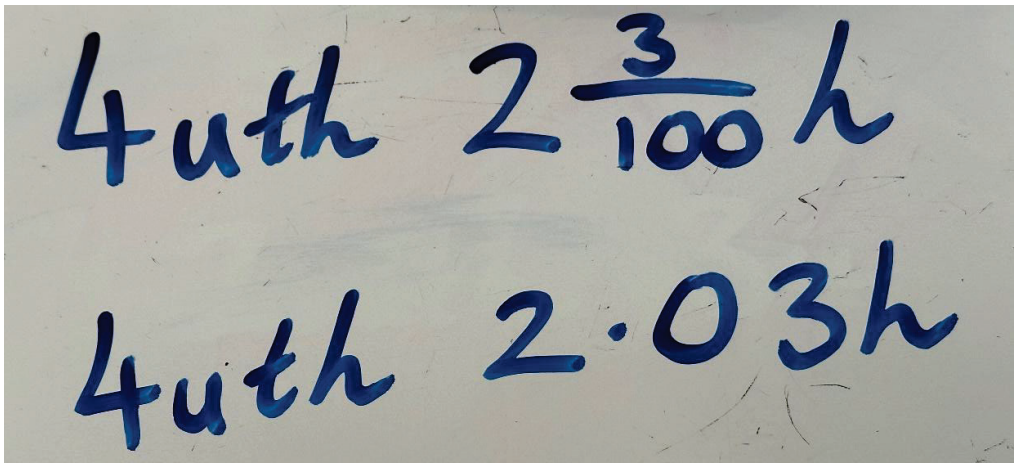
2 hundreds renamed into the one thousands place.



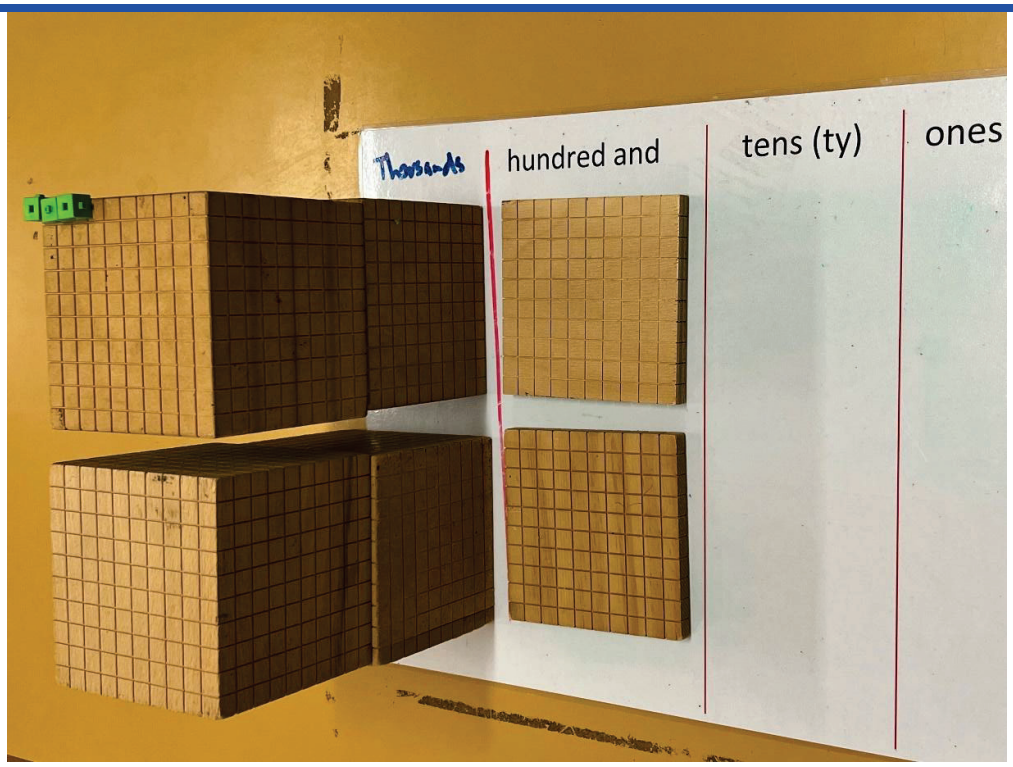
Critical tip: The 'out of' recording (first row on the whiteboard) is the better to begin with (compared to the decimal recording, which is more abstract). This is particularly so when the fraction is read as 'out of.' For example, "4 and 2 out of 10 parts of one thousand, 3 ones."



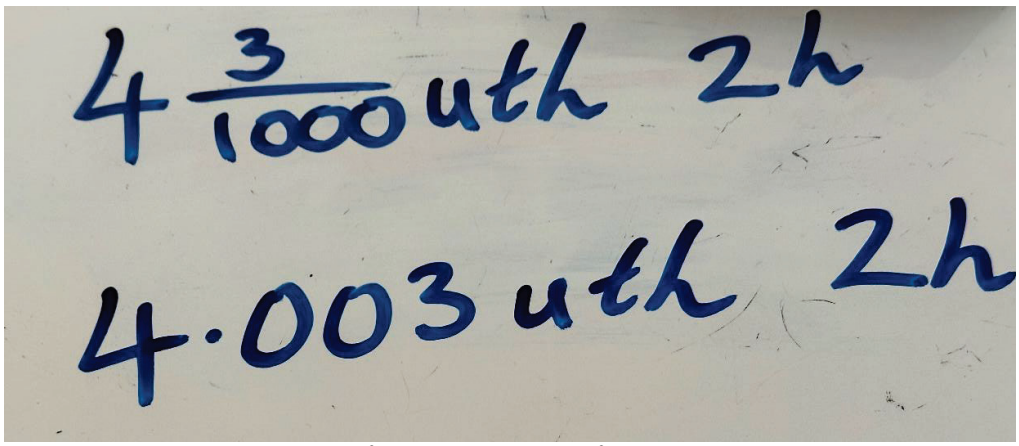
The 3 ones are worth 3 out of 100 parts of the hundreds, because you need 100 ones to make 1 hundred and there are only 3, so it is $\frac{3}{100}$h (read as 3 out of 100 parts of the hundred), or 3 hundredths, or 0.03h.



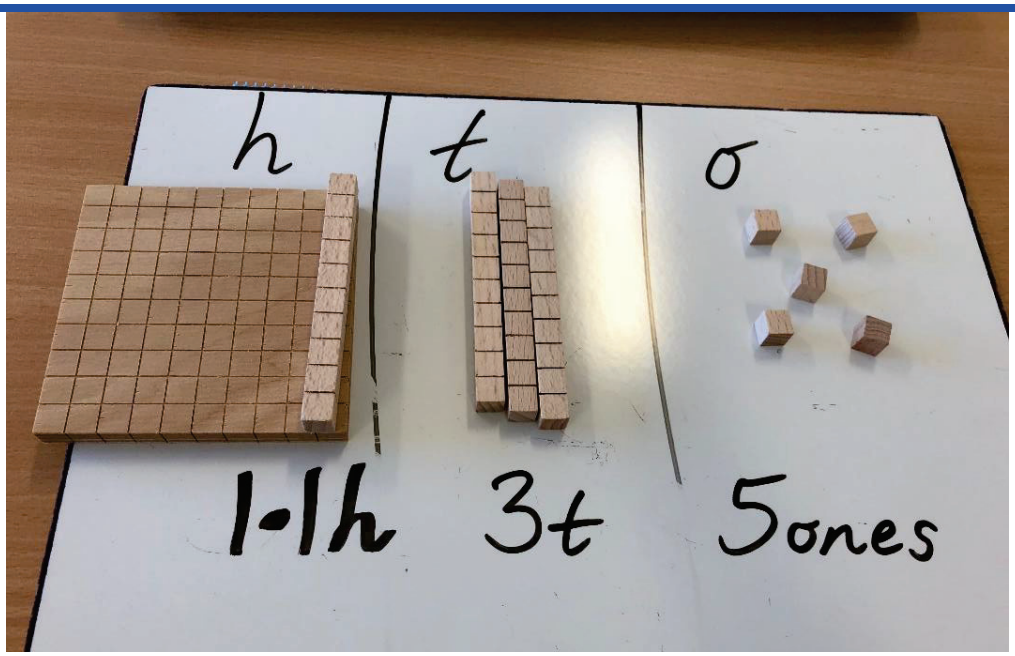
Read as: "4 one thousands, 2 and 3 out of 100 parts of one hundred."



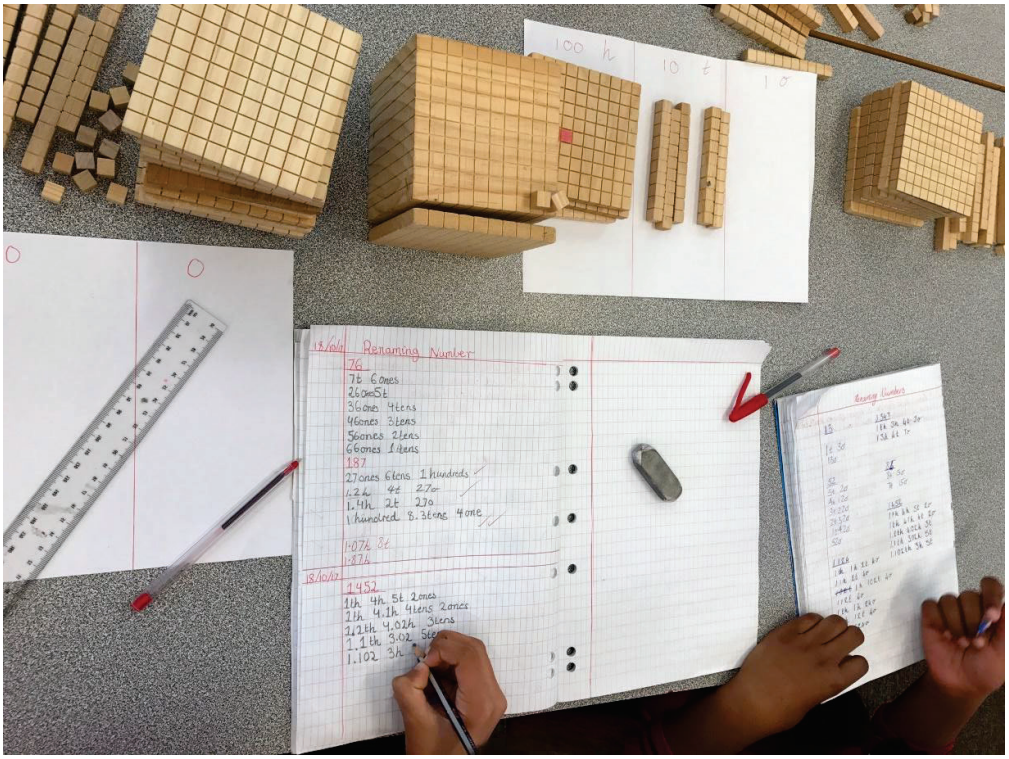
The 3 ones are 3 out of 1000 parts of the one thousand cube, because you need 1000 ones to make 1 thousand, and there are only 3, or $\frac{3}{1000}$uth as in '3 out of 1000 parts of one thousand, or 3 thousandths, or 0.003.



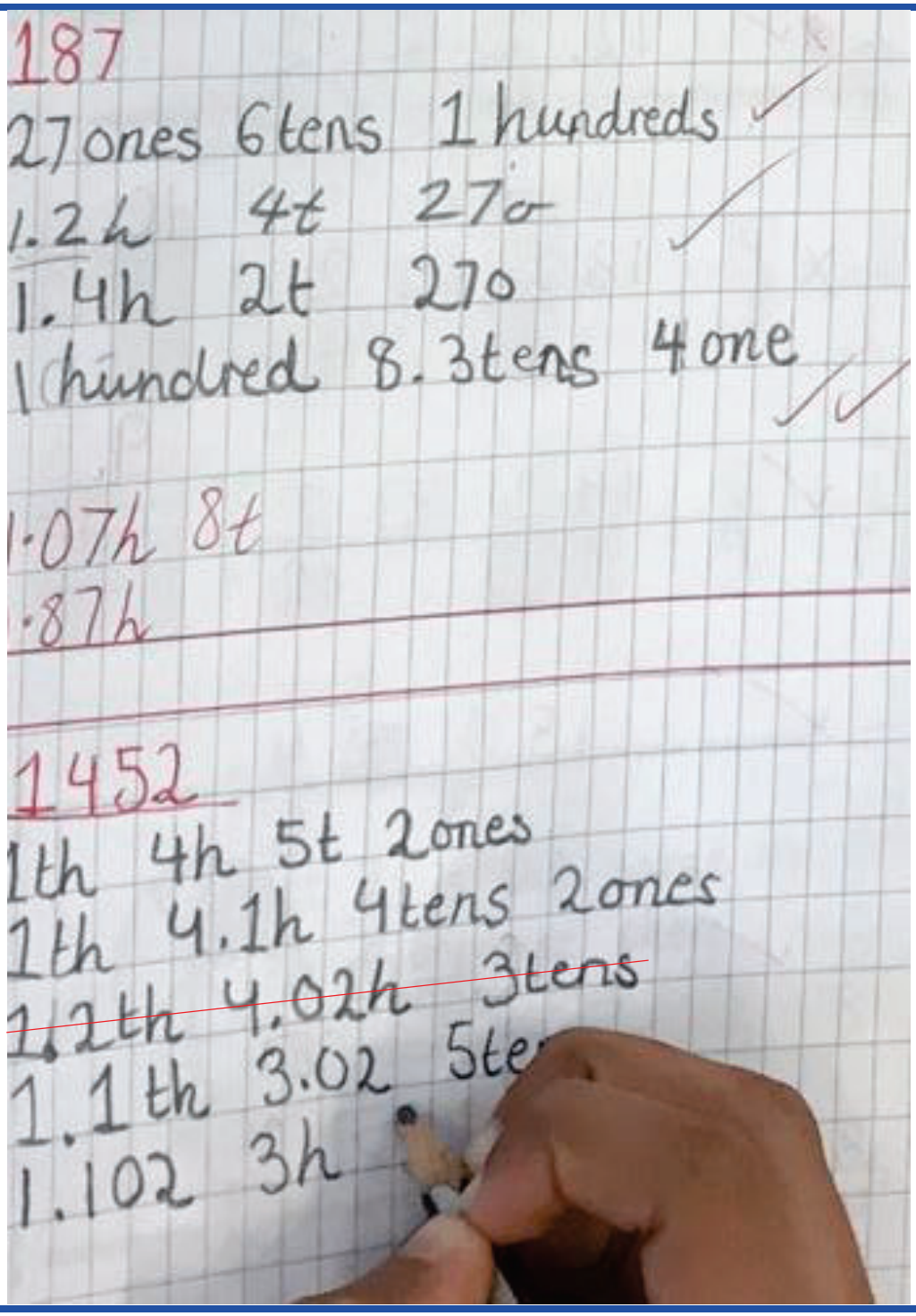
Read as: "4 and 3 out of 1000 parts of one thousand, 2 hundreds.

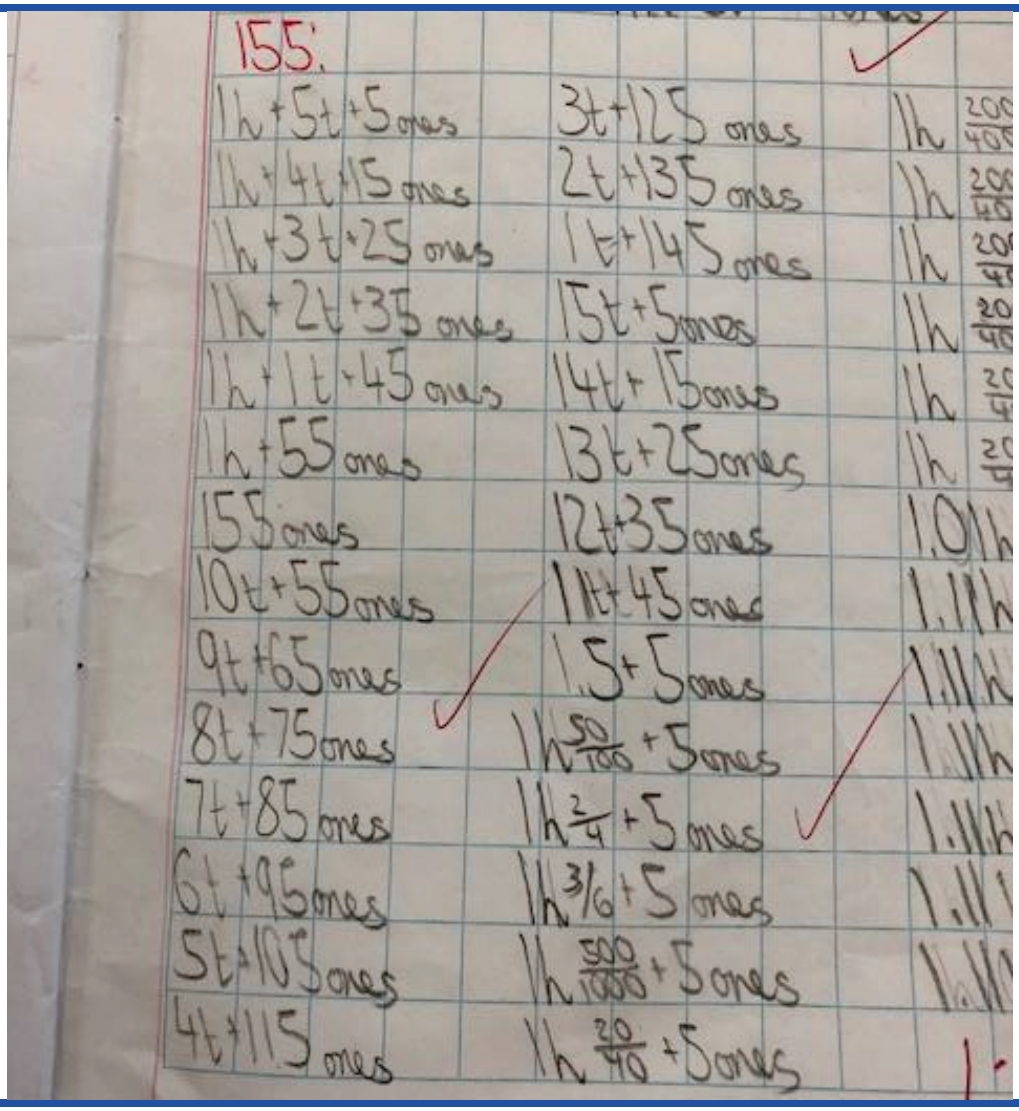


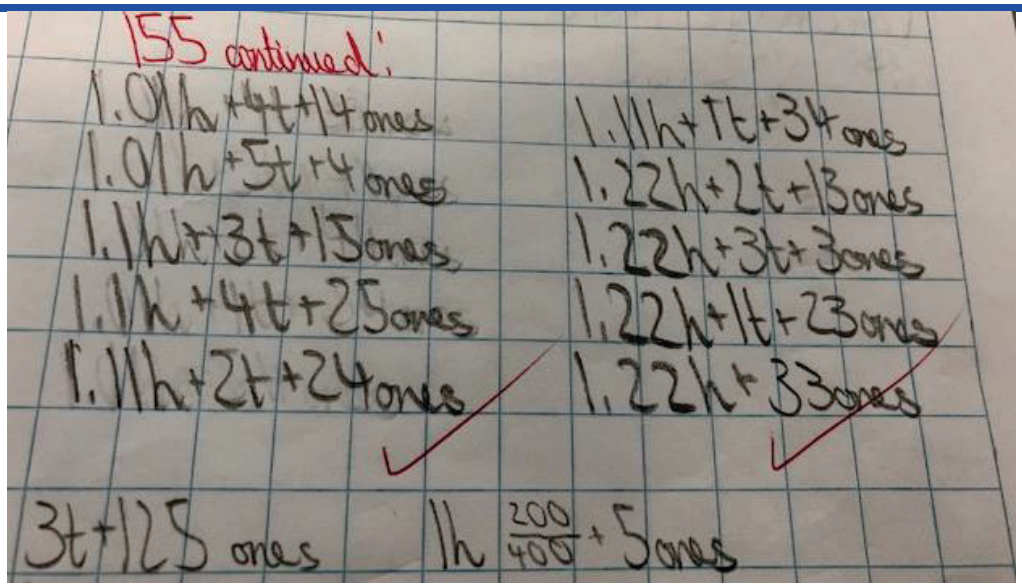
Decimal extension in action



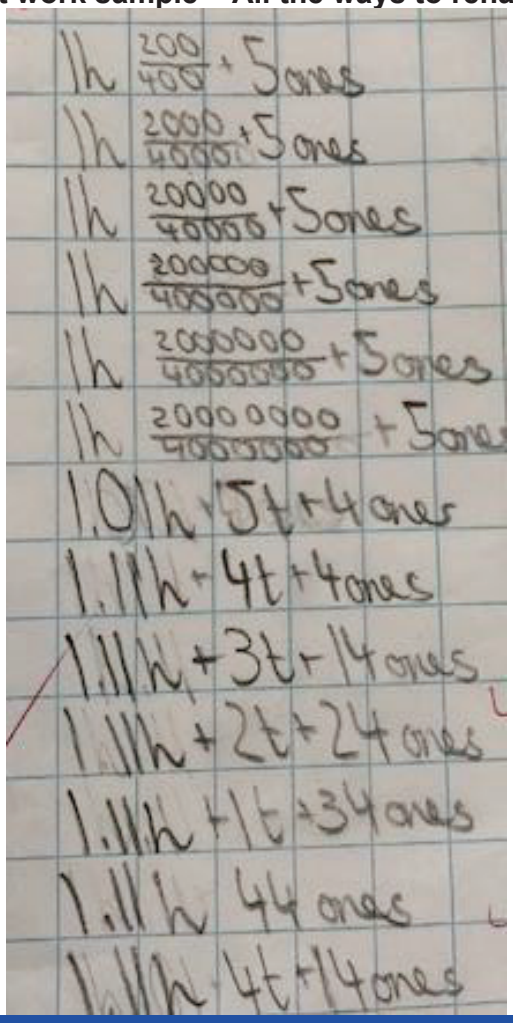
In the photo above, these extension students have placed 2 ones and a hundred in the one thousands place, and are recording 1452 as '1.102uth 3h 5t 0u' (recording work samples are enlarged on the following pages).







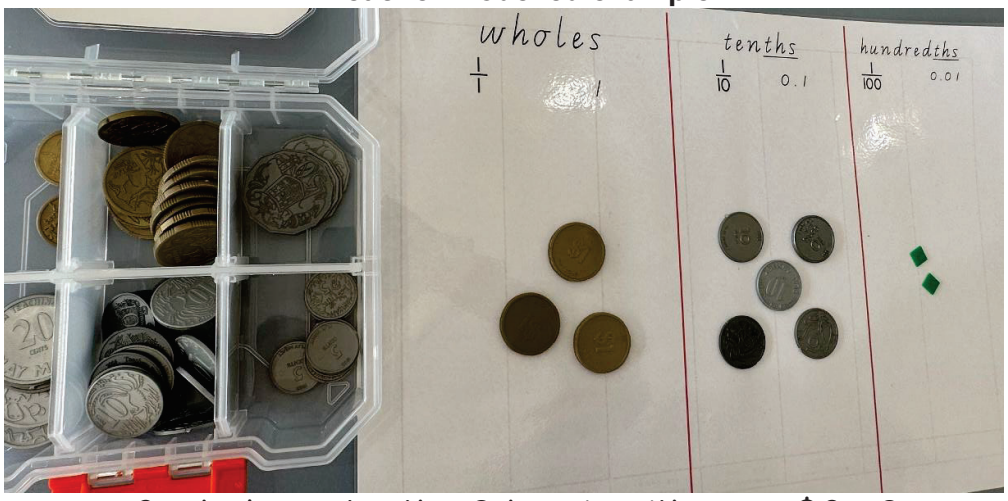
Student work sample – All the ways to rename 155



Extension 2 – The Additional Decimal Extension

Extension: Use coins in a wholes-tenths-hundredths chart (page 5 for *cursive*) or wholes-tenths-hundredths chart (*stick and ball font*) using dollars as the wholes, ten cent coins as the tenths (1 out of 10 parts of $1, so tenths) and transparent counters as the single cents (1 out of 100 parts of $1, so hundredths).

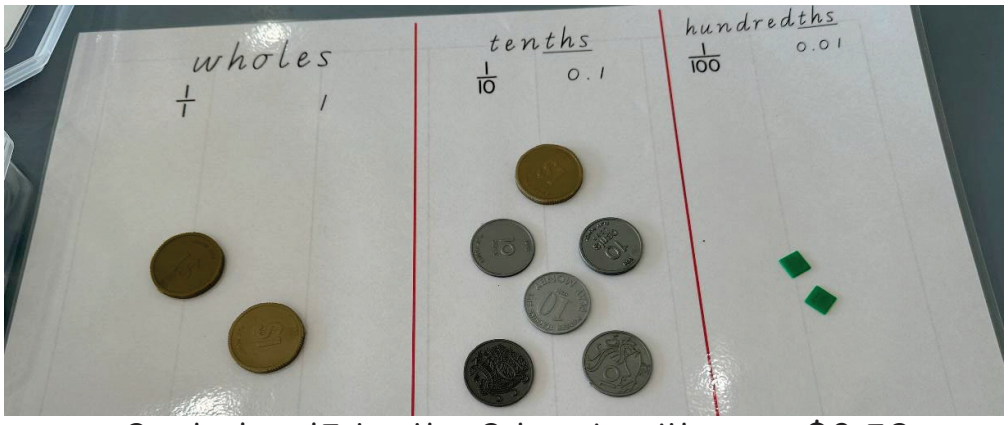
Teacher modelled example



3 wholes 5 tenths 2 hundredths $3.52

$3\frac{5}{10}+\frac{2}{100}$

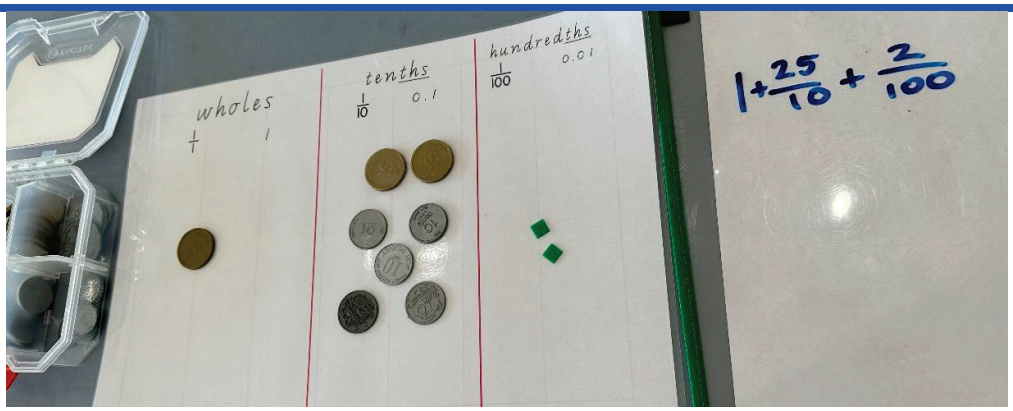
also written as $3\frac{52}{100}$ (3 wholes and 52 **out of** 100 parts of the next whole)



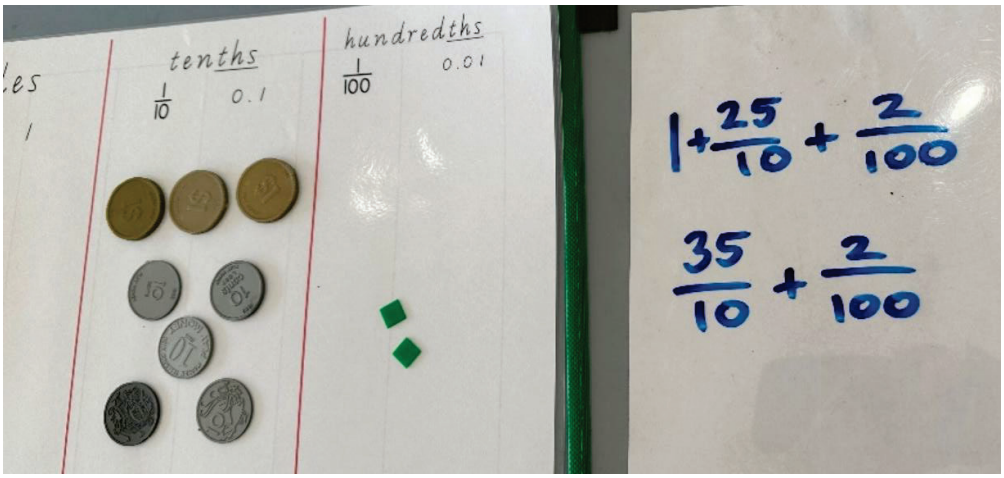
2 wholes 15 tenths 2 hundredths $3.52

$2\frac{15}{10}+\frac{2}{100}$

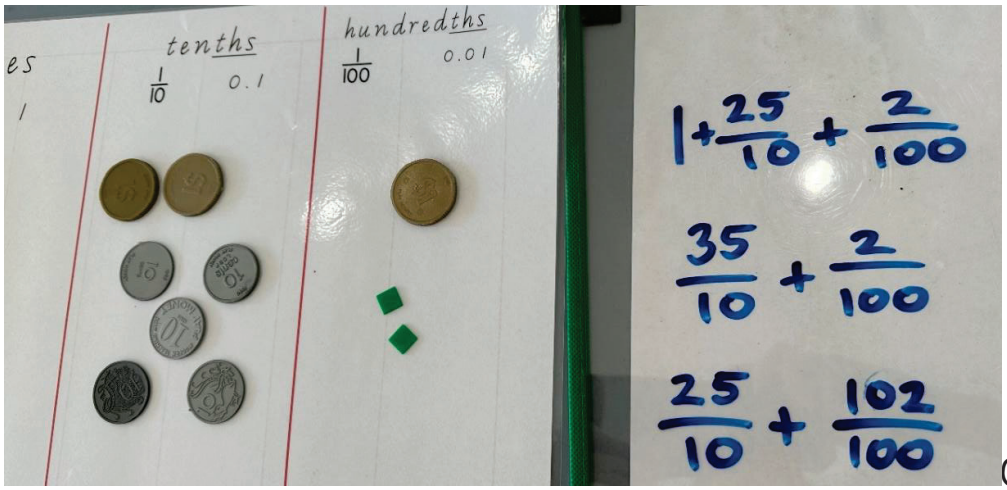
also written as $2\frac{152}{100}$



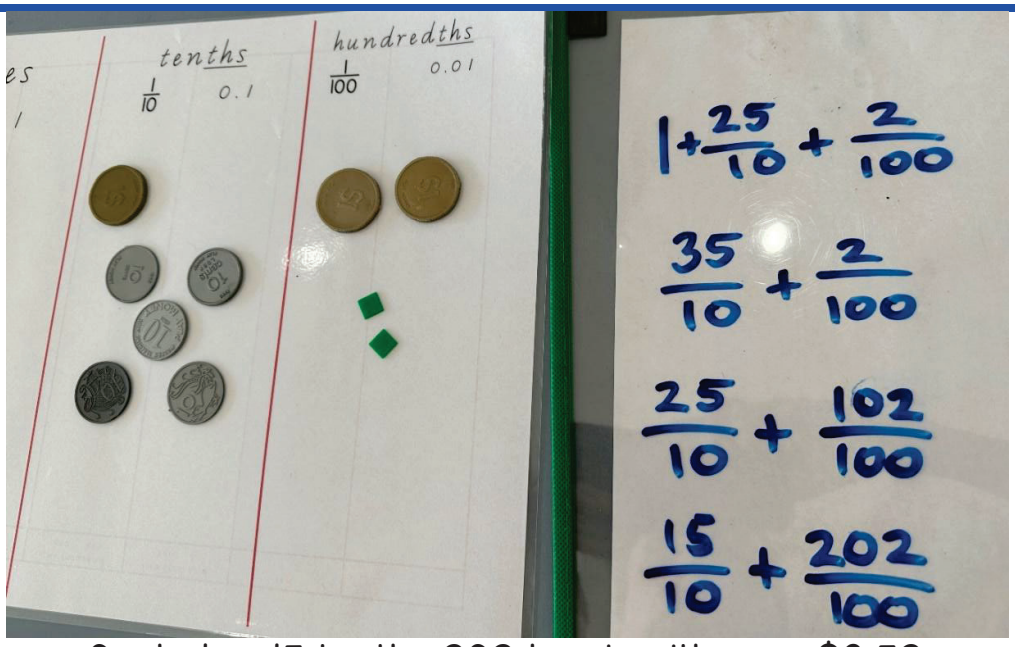
1 whole 25 tenths 2 hundredths $3.52



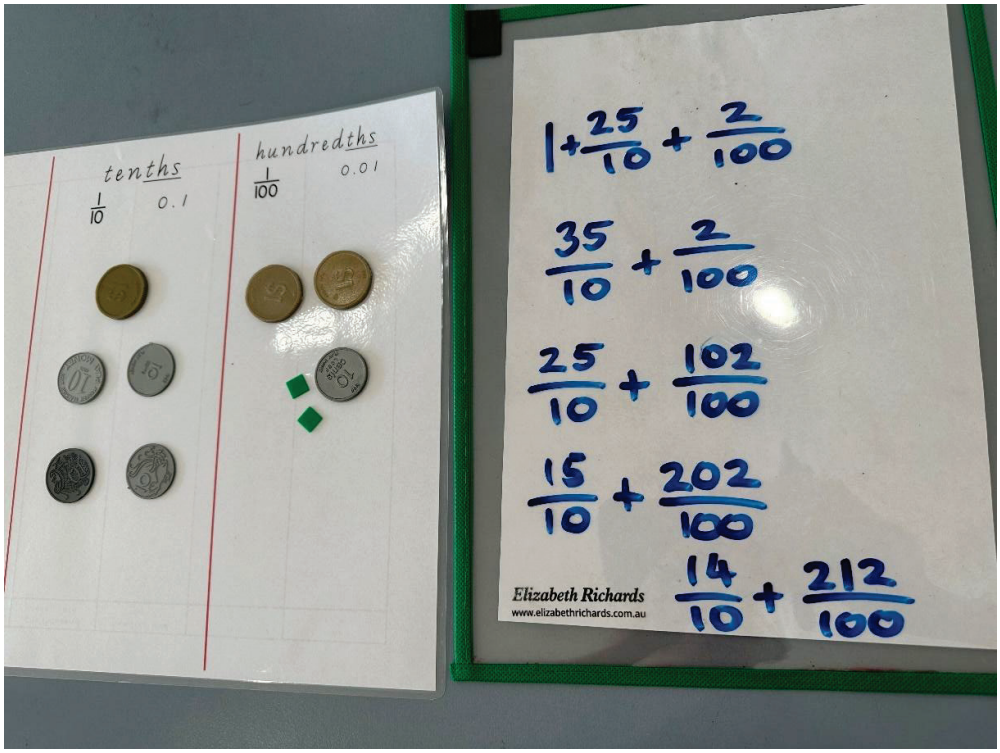
0 wholes 35 tenths 2 hundredths $3.52



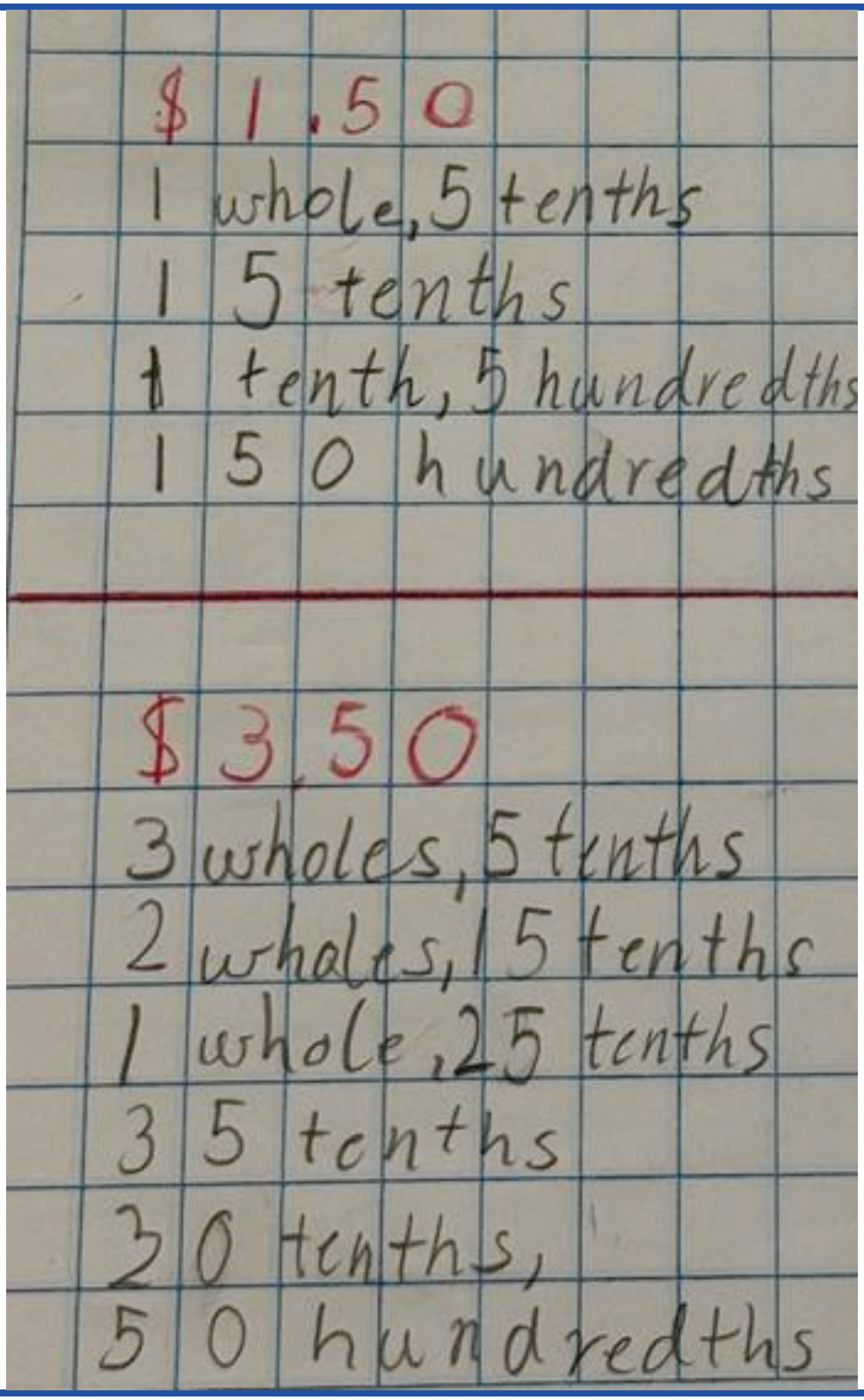
wholes 25 tenths 102 hundredths $3.52

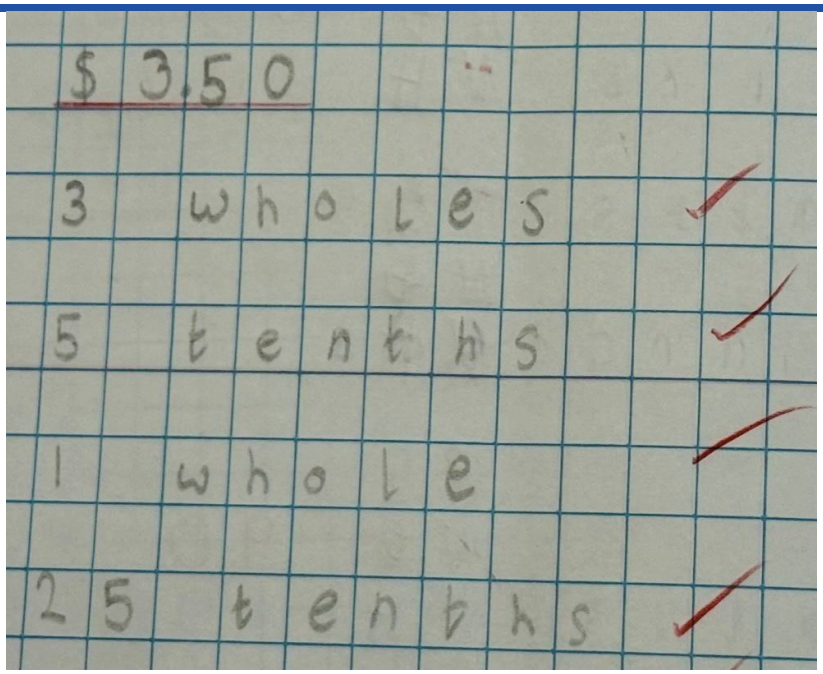


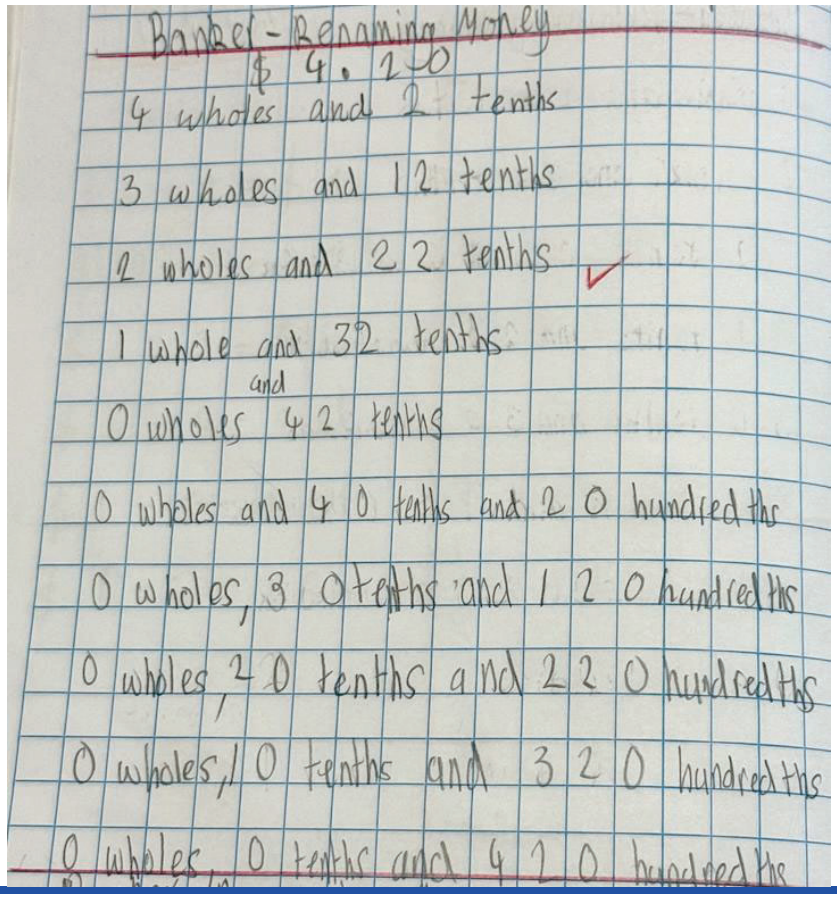
0 wholes 15 tenths 202 hundredths $3.52

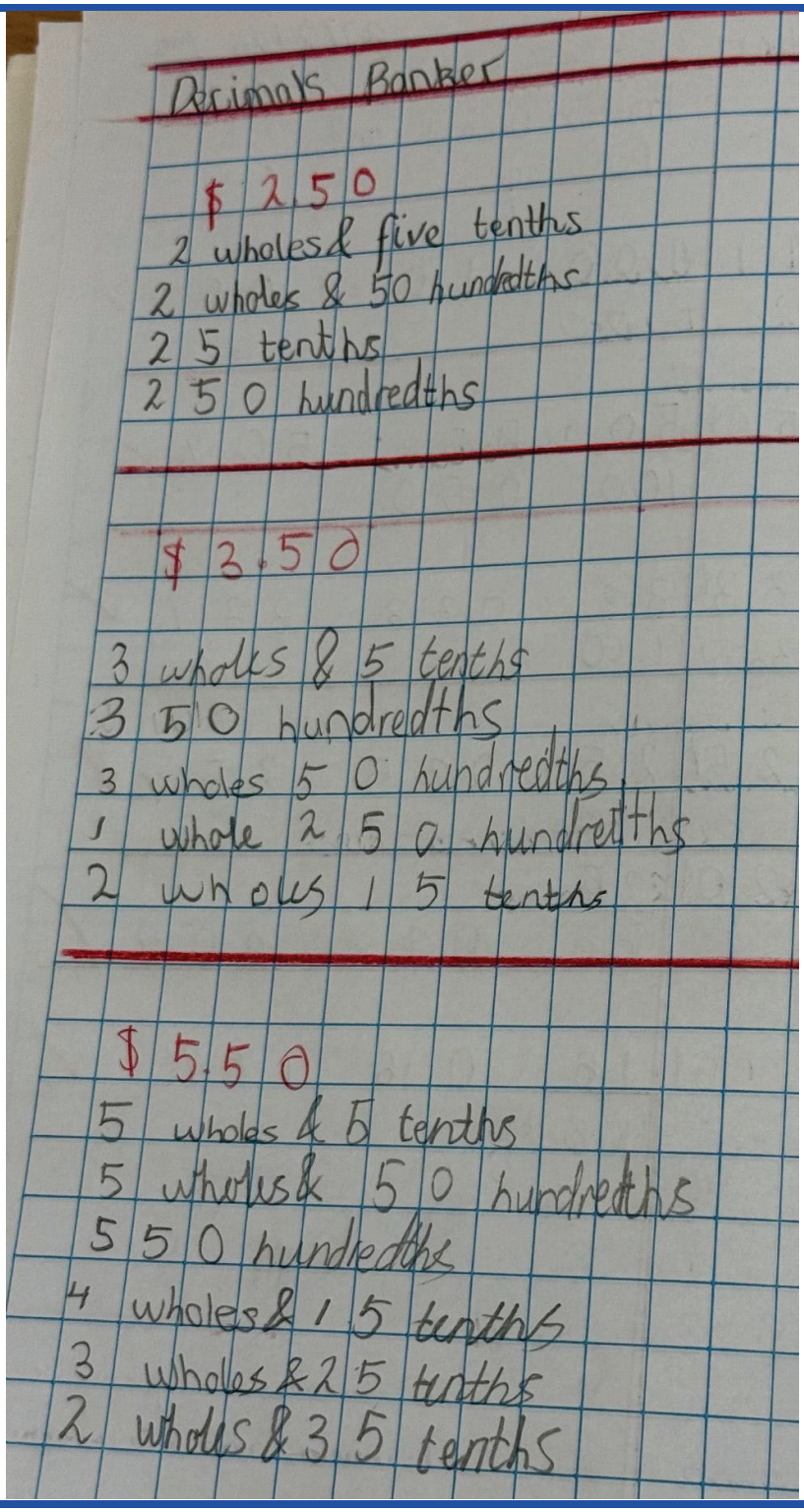


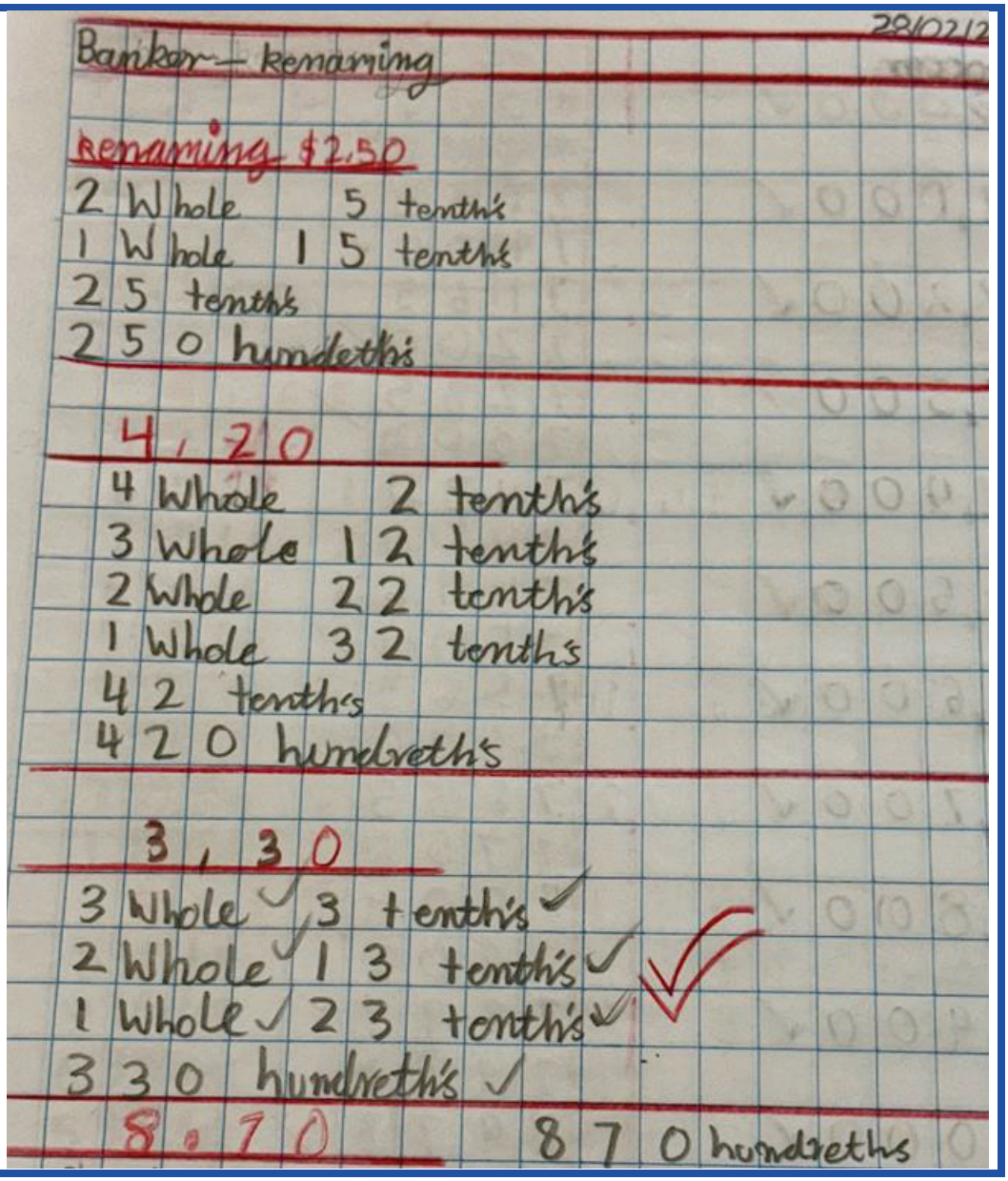
0 wholes 14 tenths 212 hundredths $3.52









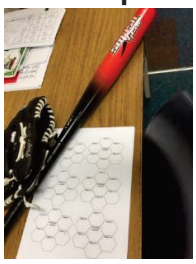


Place Value Year 4C Lesson 3

Place Value Softball

Learning intention: Add and subtract place values by thinking in tens, hundreds and other place values (instead of counting by ones). Notice which places change and which stay the same.
Maths vocabulary: change, stay the same, pattern, add, more, subtract, less, bridging, renaming, hexagon

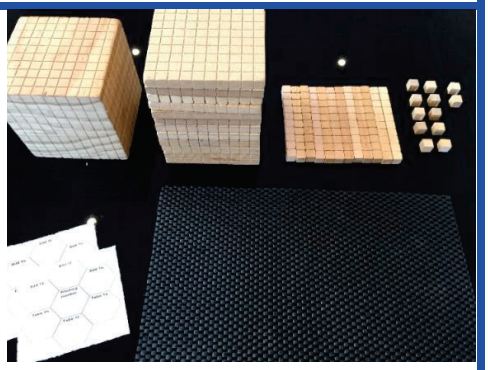
YouTube hook and link to sport:



Bring in props from the P.E. storeroom and show students some awesome softball clips: https://www.youtube.com/watch?v=MCagd71zmFw&ab_channel=NCAAChampionships and https://www.youtube.com/watch?v=Hd8J59GYZUo&ab_channel=Pac-12Networks

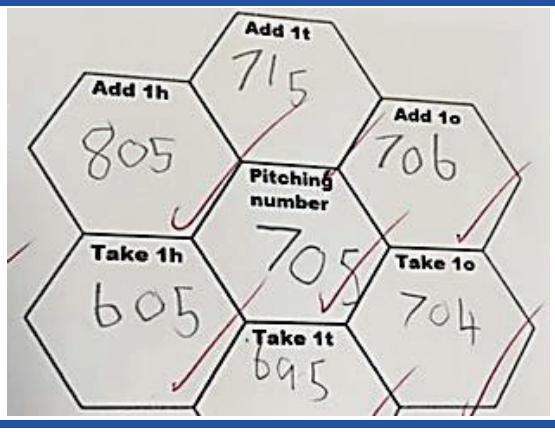
Lesson summary: Students create a base number from the provided list (intended to involve bridging and internal zeroes). Students investigate adding and subtracting place values from their base number to practise thinking in tens/hundreds/thousands (not ones) and notice place value patterns (if you add 1 hundred, the tens and ones do not change).

Materials:



- A3 paper thinly sliced to create 'scrolls.'
- Place value block banks – 1 thousand, 12 hundreds, 12 tens, 12 ones per pair, plus a centre bank of thousands in the middle of the classroom.
- Red counting sticks, or popsicle sticks coloured in red.
- Add and subtract recording hexagon templates. There are 3 templates, each progressively more challenging. Templates are also available in a separate softball templates document for ease of printing.

Best set-up: Three-session investigation to allow students to see patterns. Start with the **calculator scrolls investigation** as a whole-class (students on floor with 'scrolls' – see next page). Whole-class model a few examples of your own base numbers using the place value blocks and recording using an enlarged A3 version of the templates, at a desk with materials. Students work independently, progressing through the pitcher lists and using more challenging recording templates as they show readiness for these.

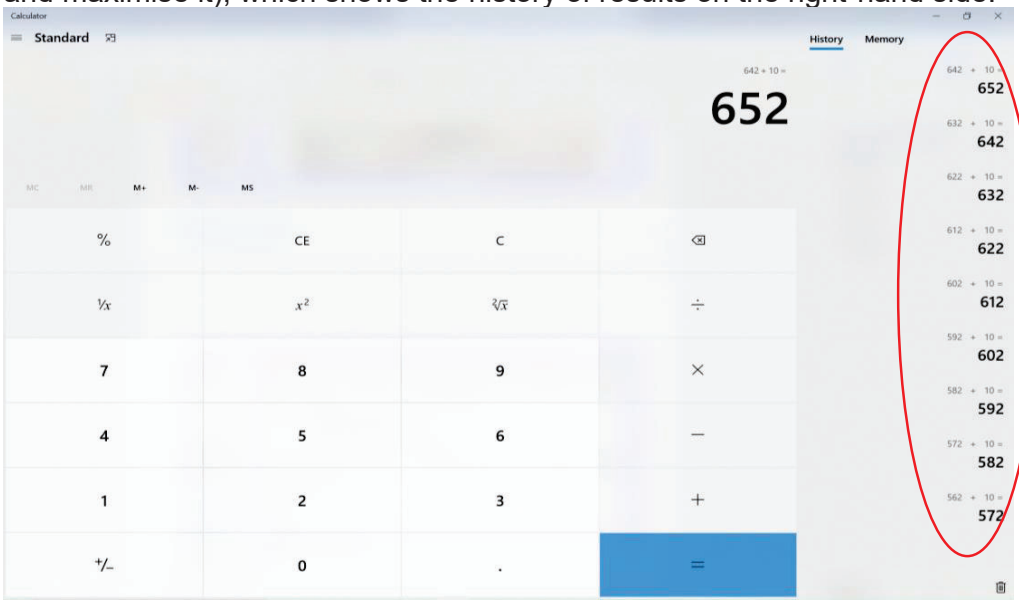


Incentive: Offer softball for Friday sport, or as an extra sport, if students focus and work very hard throughout all 3 sessions.

Art hook and link to sports*:* Tell students that they are becoming a softball champion! First, they need to create a character, like in a video game where you select your player or team. Provide students with 5 minutes of art time to sketch a softball character in the template cards and brainstorm a name (write this in the lower space). Next, their character needs to

Calculator scrolls investigation: All students sit at the front of the room with a thin strip of A3 paper, representing a long scroll. The teacher asks all students to write the same number at the top of their scroll, for example, '562.' "Let's add 1 ten to that number. Write down what you think that number will be." Then click +10, ensuring students keep making their predictions on their scroll before you click = = = after each one.

Display a massive calculator on the board (open the computer calculator and maximise it), which shows the history of results on the right-hand side:



This greatly assists students to see the pattern that forms. Repeat with taking away 1 ten at a time from a starting number on a new scroll; then adding 1 hundred on another scroll; then taking away 1 hundred over and over again. Later, try adding 20 – just think 2 more tens. Then 30 – 3 more tens. Then taking away 2 tens each time. Later, try adding 32 (think 3 more tens, 2 more ones each time), which is excellent front-loading and a solid place value foundation to build the jump strategy during addition units.

Questioning:

- How many tens will it have? 562 has 6 tens, if we add 1 ten, how many tens will there be? Do you need to count on by 10 ones, or can you just think '1 more ten'? Imagine that number on the h-t-u chart made in place value blocks and one more ten block coming onto it. Will the ones change? Why/why not?
- When will the hundreds change (from 5 hundreds to 6 hundreds)? Why? This is called **bridging** – essentially like building a bridge from one hundred to the next, because you have run out of space for the tens (you already have 9), so you need to go to the next hundred.

Remind students that our entire number system is based on just a few digits: 0 1 2 3 4 5 6 7 8 9, which after that grouped into tens, hundreds, and so on.

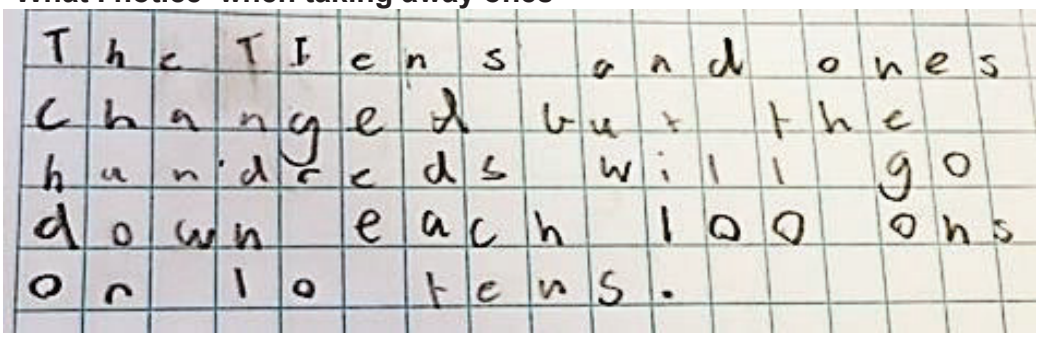
earn home runs! To do this, they must complete all six bases on each hexagon template = 1 home run! At the end of each session, tally their score and write it on their card, along the top section. Repeat this session more than once (up to 3 times), using the graduated recording templates, so that students can earn 3 rounds of home runs over 3 maths sessions, then total these for the final softball champion leadership board. This encourages students to practise, practise, practise, and work hard throughout

Questioning:

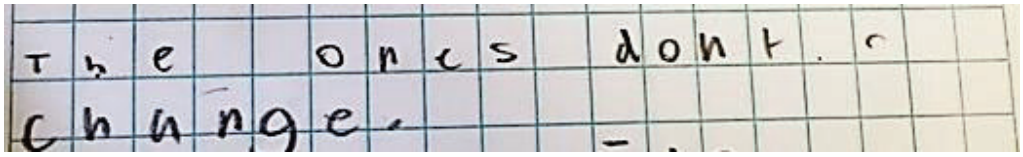
- What place value patterns do you notice?
- How do these help you work out the answers more quickly than just thinking in ones?

Student work samples for 'write down what do you notice' following the calculator investigation:

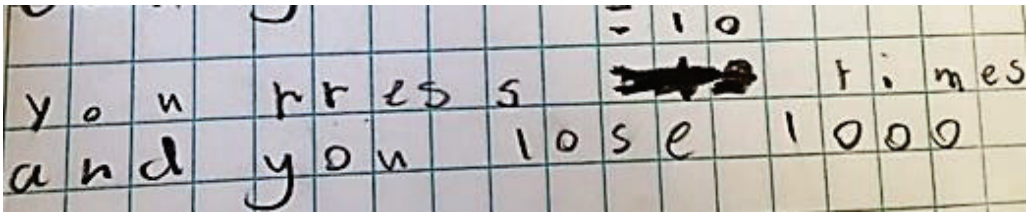
'What I notice' when taking away ones



'What I notice' when adding and taking away tens



'What I notice' when subtracting hundreds



Starting numbers for students: Next, students build a starting/base number from the list on the next page, choosing which list to start from, depending on their current level of confidence. Most students can make a good decision about which list is most appropriate for them, however, the teacher may need to push some students to challenge themselves from the start (Pitcher C), or ask others to try the more supportive section first (Pitcher A) if their decision does not align well with their actual ability levels at this point.

Pitcher A is focused on building the pattern. For taking away one hundred, where the answer would be negative, students can just write 'negative' if they cannot work it out.

these sessions to complete as many templates as possible, which maximises the opportunity for them to internalise the place value patterns.

Additional hook: Students could bring in a mini figurine, such as a Lego figurine, which runs around the bases as they complete each hexagon!

Pitcher B is where most students start, to build their awareness of the place value patterns, then extend this to the larger numbers when they progress to list C. Pitcher C involves the most bridging.

The critical part is for students to start thinking in tens, hundreds (and other place values) when adding or subtracting, rather than just ones (expanded form).

Zoom in to display on the board, or click for a full page version:

Pitcher A	Pitcher B	Pitcher C
40	149	645
70	209	819
58	260	989
82	275	1009
110	309	1056
101	432	1200
129	599	3027
179	705	4007
219	899	5498

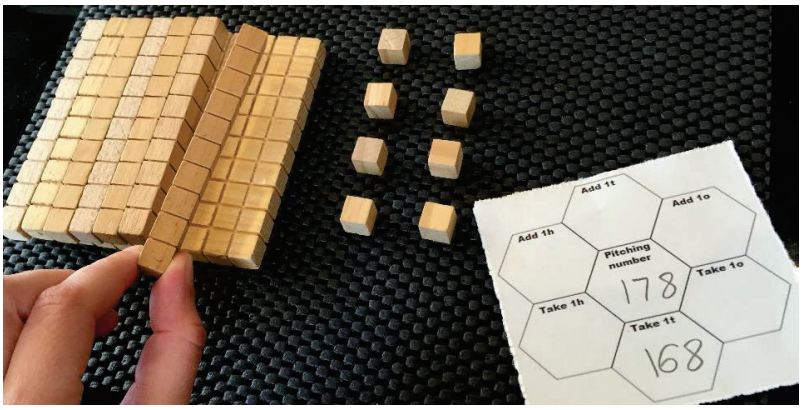
For each number in the list, students make it using place value blocks, then progress around the hexagon templates, adding one, adding one ten, adding one hundred, then taking away one, taking away one ten, and taking away one hundred.

Tip! The most important practical tip for this lesson!
Students must 'go back to their base/starting number' each time. For example, for 179, when adding ten it will become 189. After writing this in their recording template, the student must make sure they return to 179 (go back to their base number), before adding one hundred. Do not add 1 hundred to 189 – that is not your base number! "Always start back at your base!"

Student's published baseball card – each finished base number is a home run!

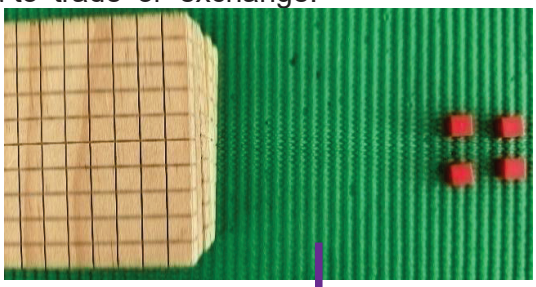
Modelling

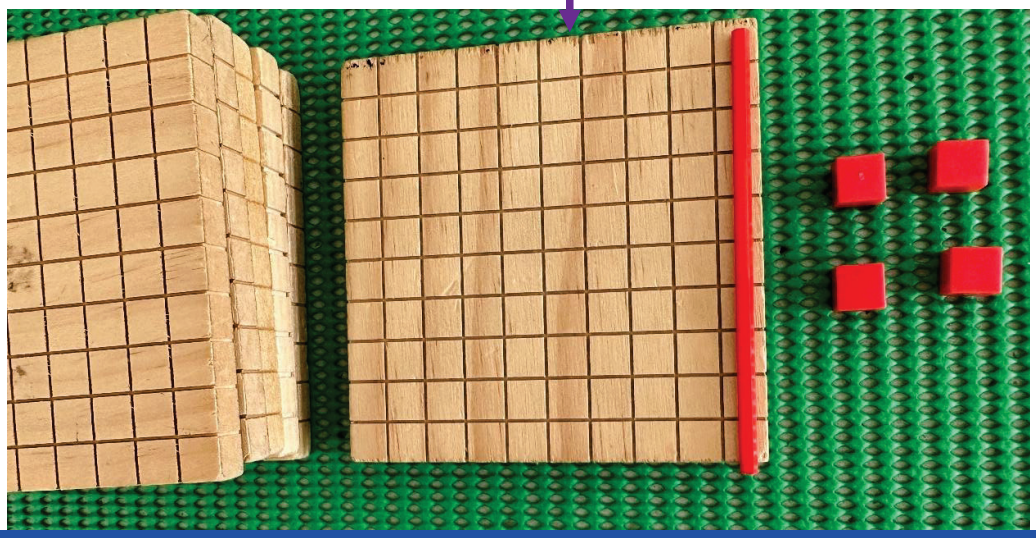
178 take away 1 ten = 1h 6t 8ones (just think 1 less ten)



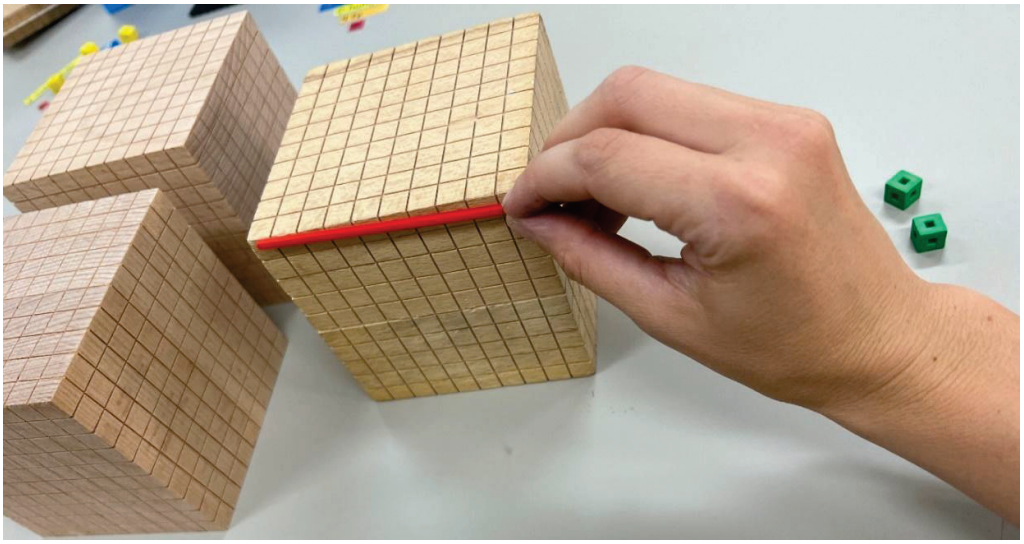
Then go back to your base number (178) and take away 1 hundred.

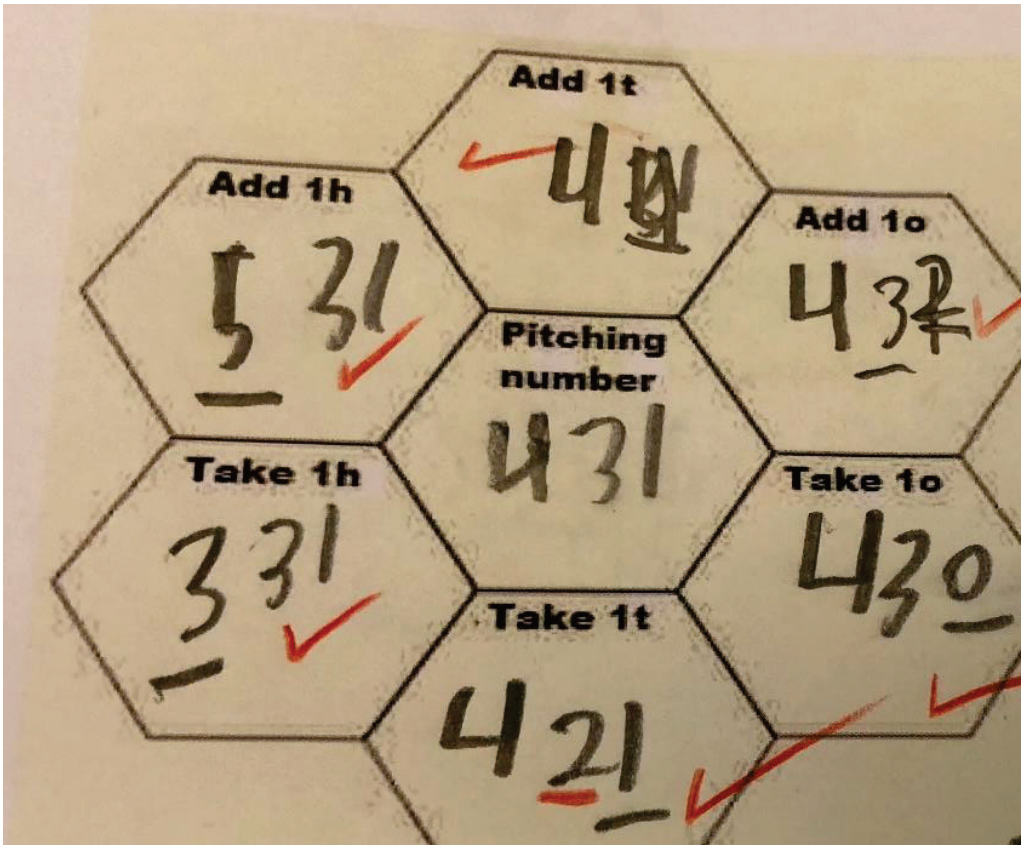
Tip! When taking away ten or one hundred for a number that is difficult to bridge and requires renaming: For example, 604 – 1 ten. Instead of taking one hundred and renaming it to make 10 tens, just lay it out, with 5 hundreds in the tower and 1 hundred to the right of this, then the 4 ones. Take a red stick (popsicle stick coloured red, or similar), and use this to effectively take away (slice off like a sword) one ten. The number can now visually be seen as '5 of the hundreds, 9 of the tens, 4 of the ones), without involving any need to 'trade' or 'exchange.'





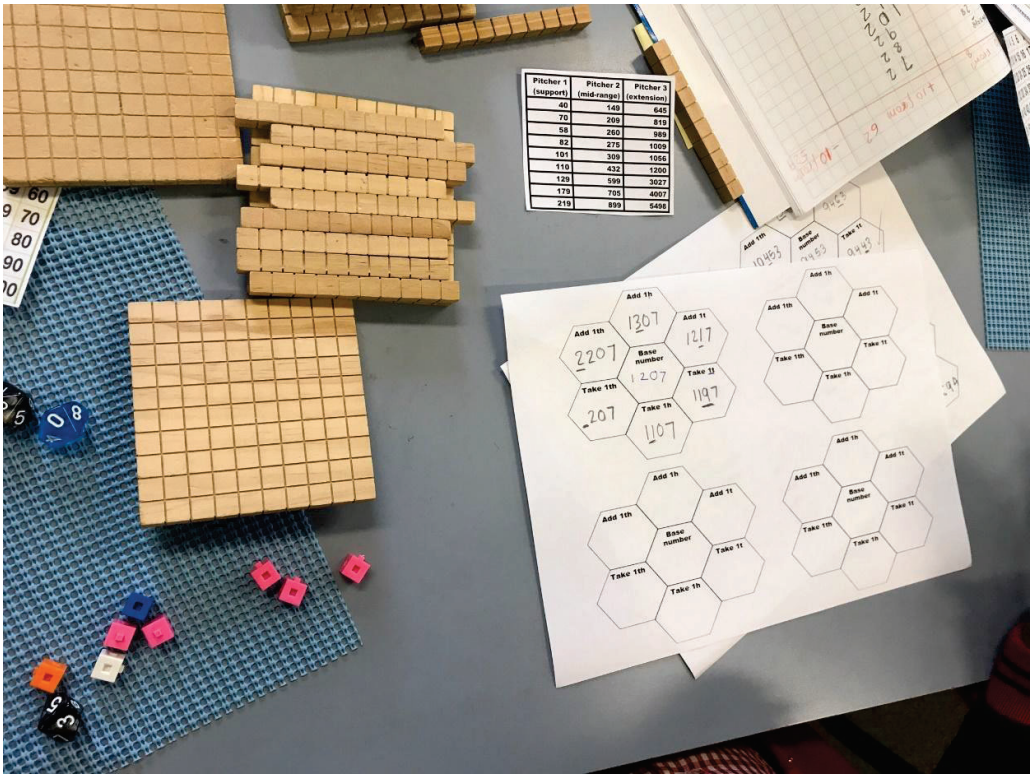
The red stick trick for taking away 100 – visualising slicing one layer off the thousands cube:

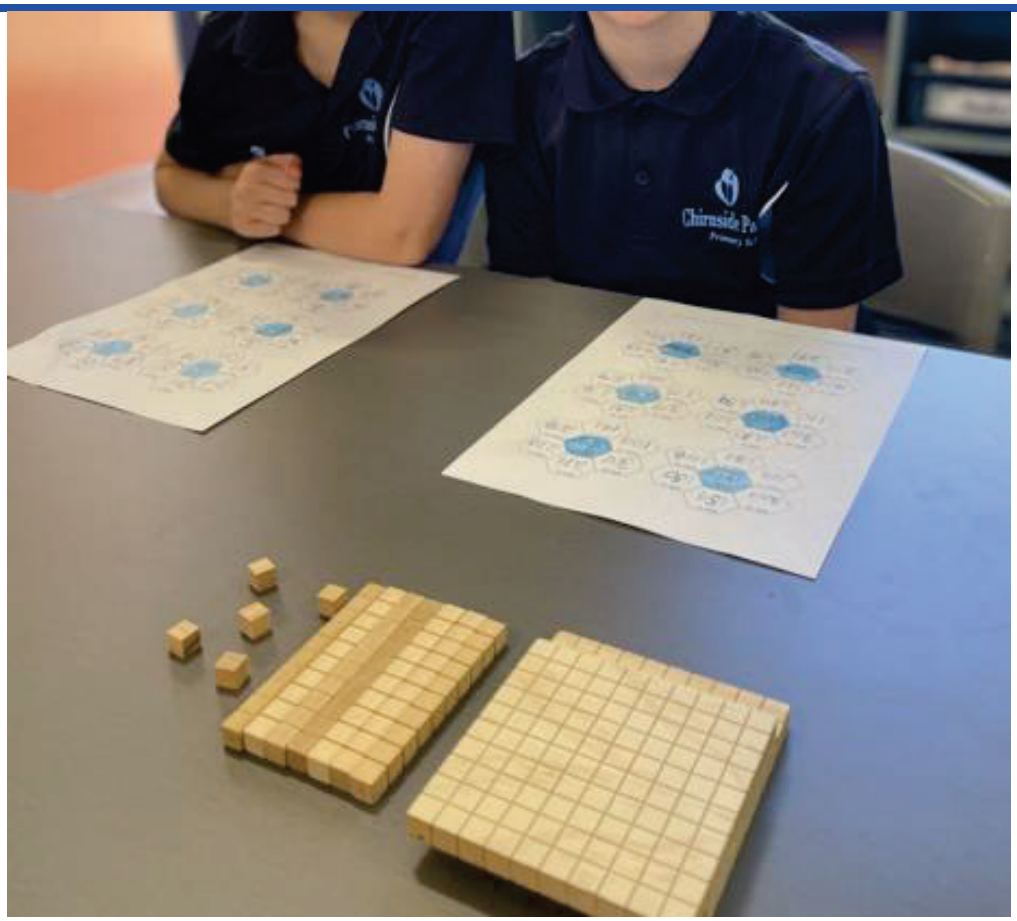




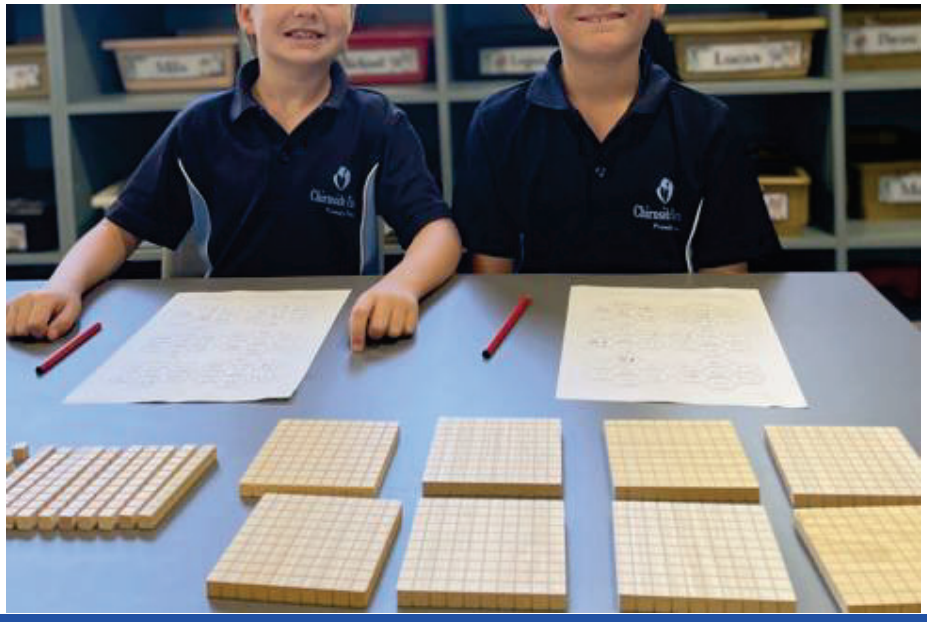
Students were challenged to underline the part/place value that changed and to look for patterns (which place values change, which stay the same).

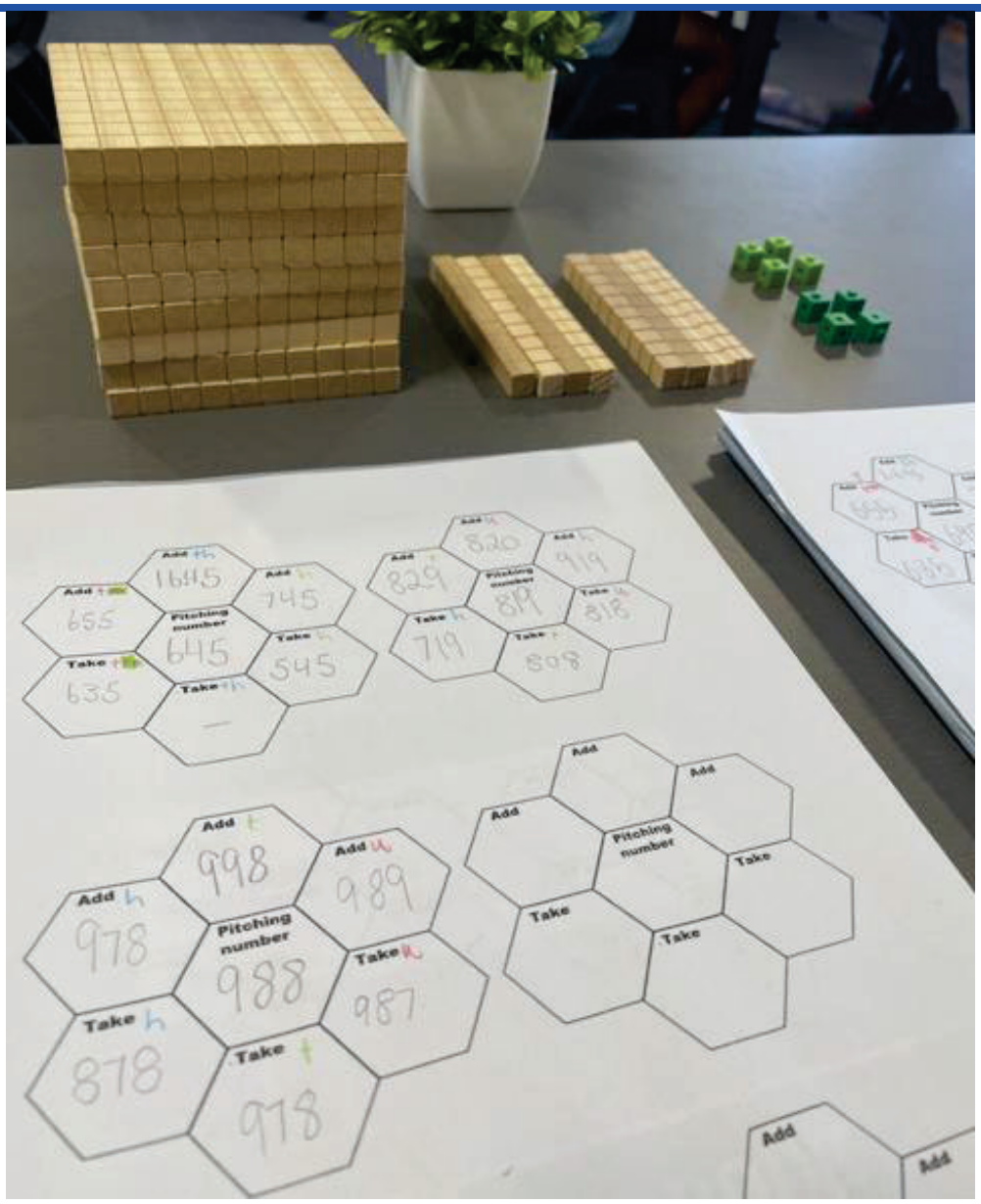
Lesson in action





Lesson in action at Chirnside Park PS

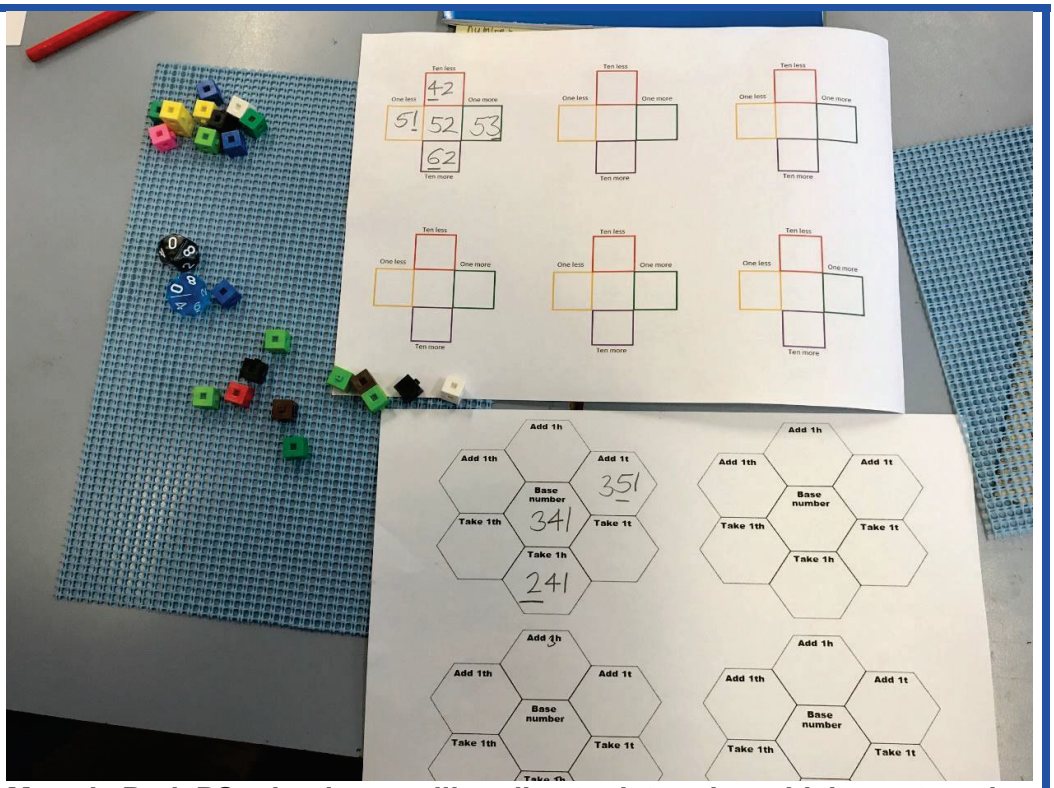




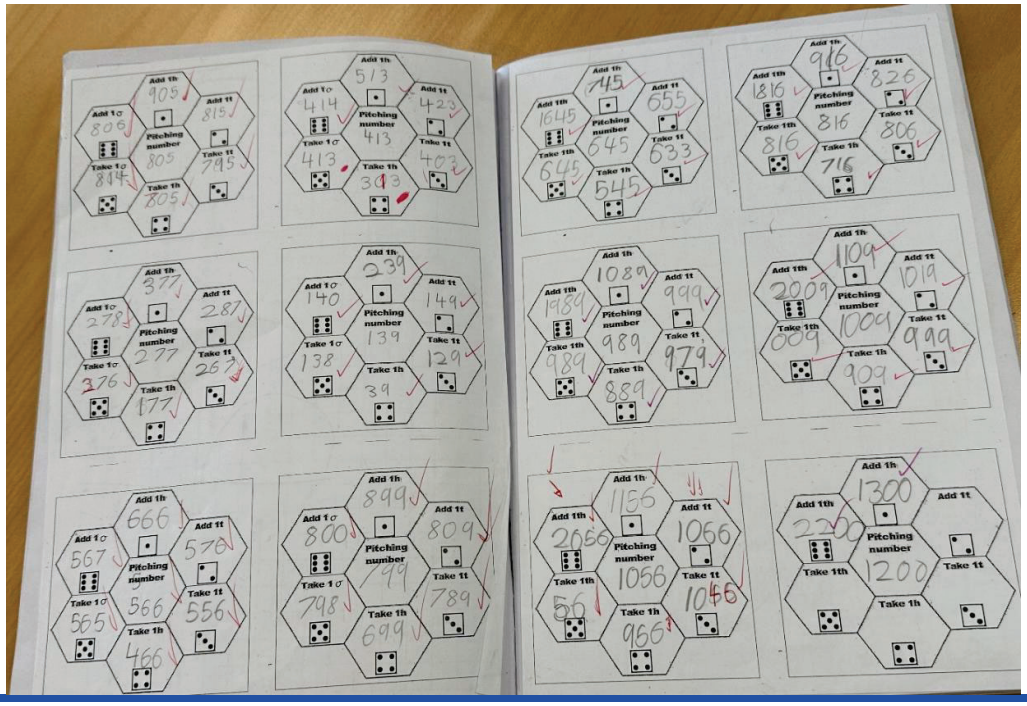
Lesson in action

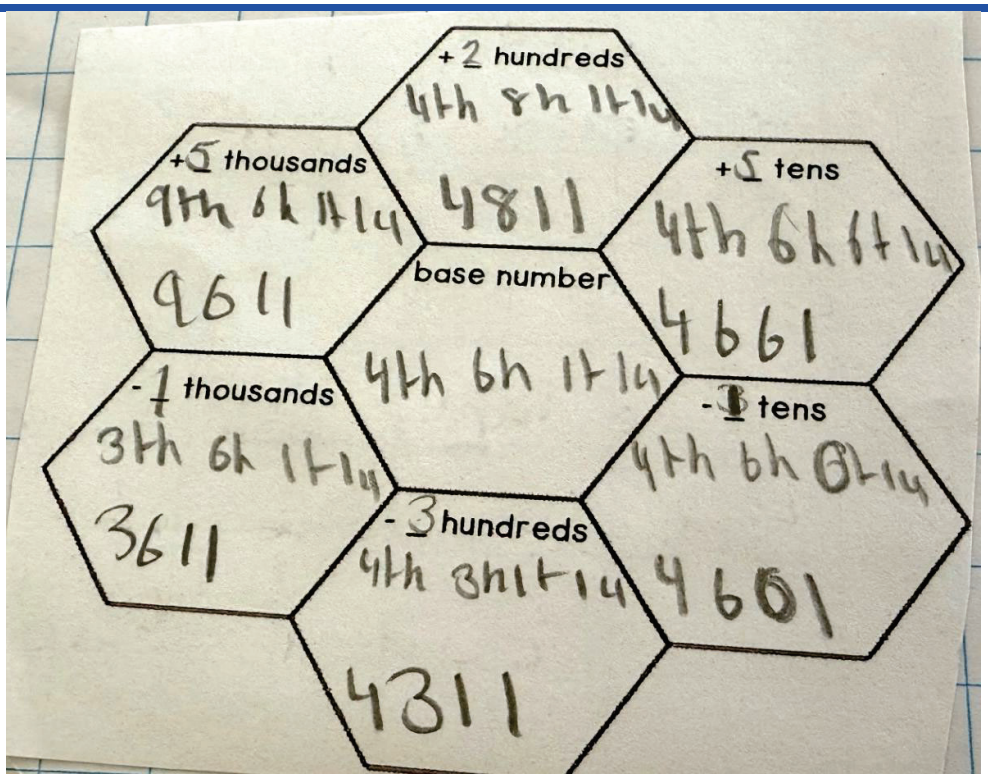
Fishbowl modelling the task

Desk set up with printed options for students to use a range of different bridging numbers depending on current confidence levels

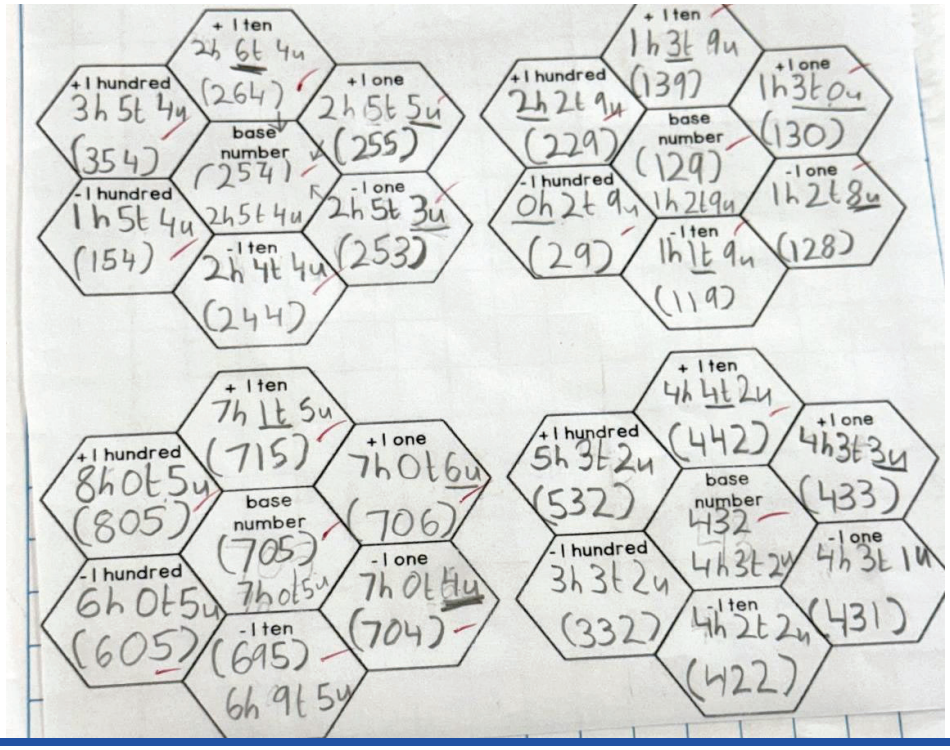


Mernda Park PS adaption – rolling dice to determine which one to solve first:

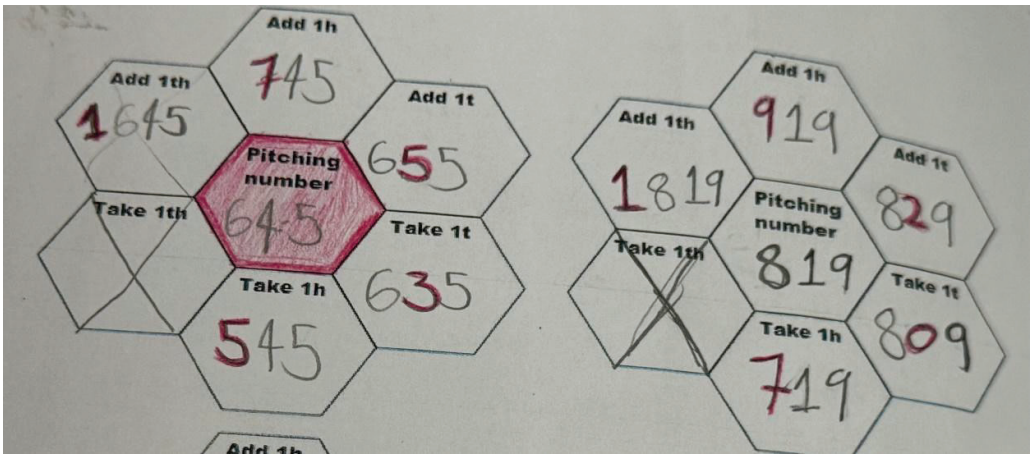




Critical tip: **Use place value form, as shown here.**
Student work samples showing place value form, as well as the answers.



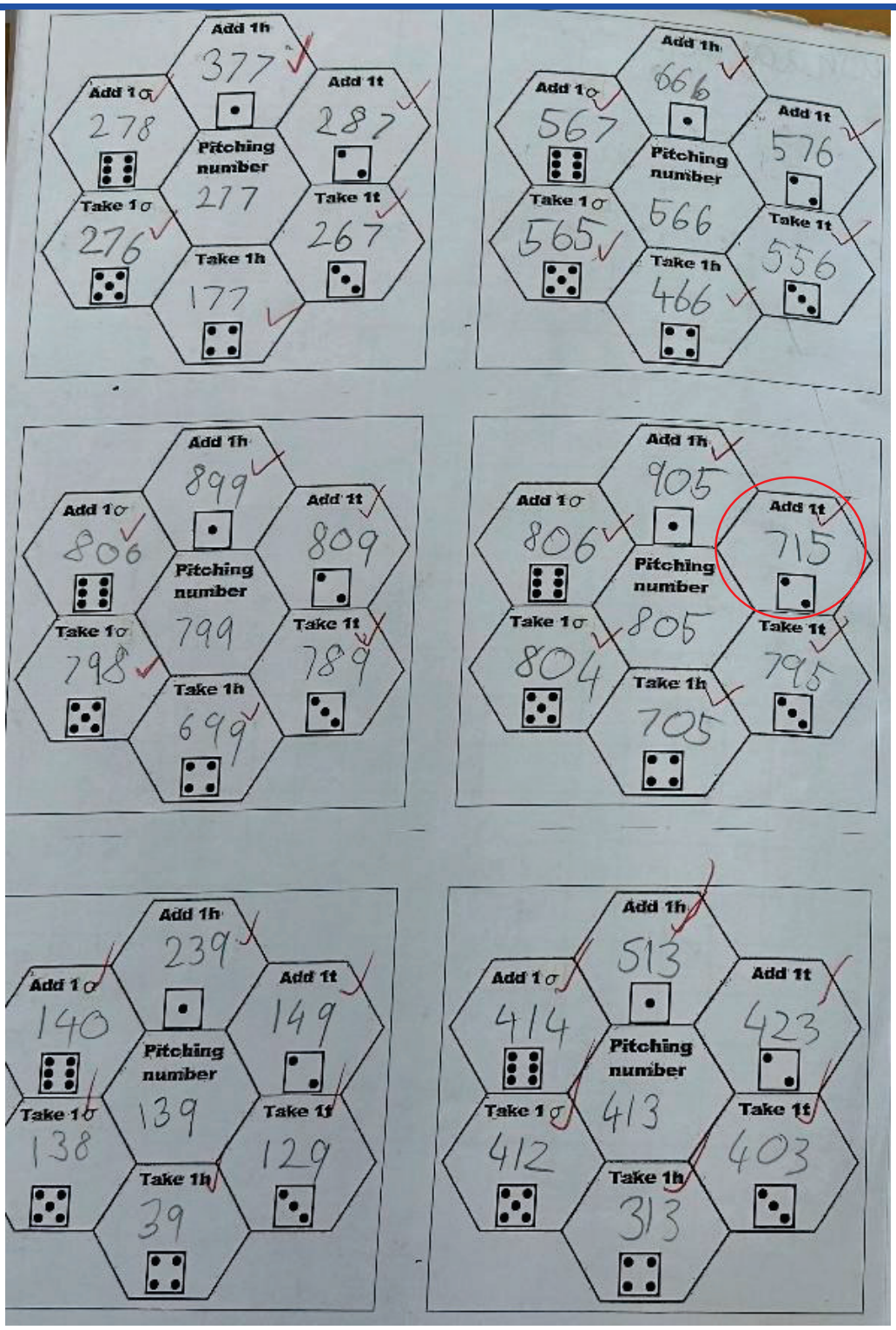
Critical tip: Use red to show which place changed:



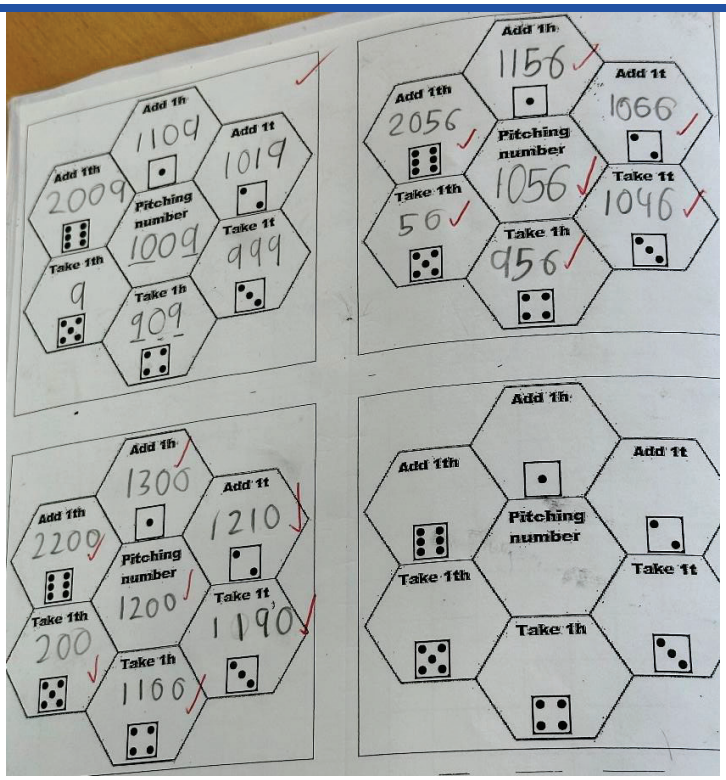
Critical questioning:

Which place changed?

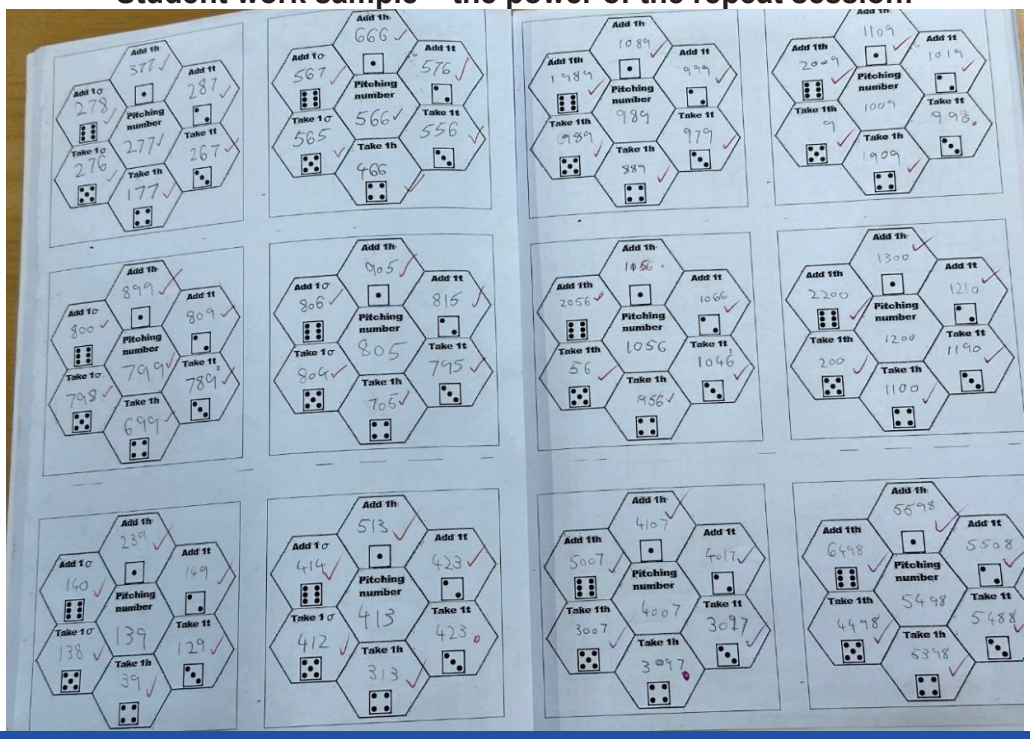
Which stayed the same?

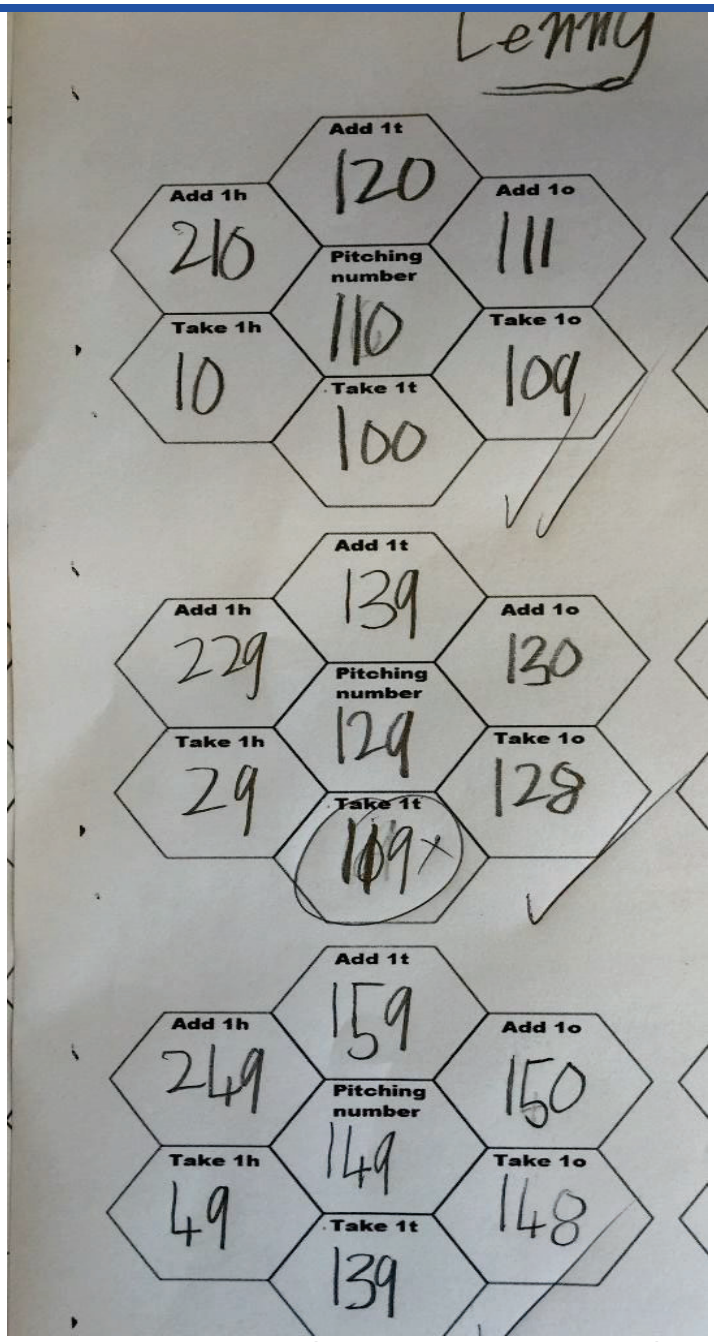


Mernda Park PS adaption
Rolling dice to determine which one to solve first.



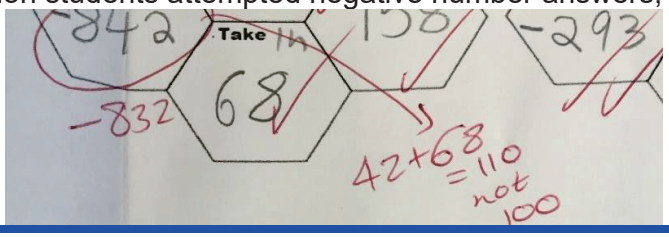
Student work sample – the power of the repeat session:



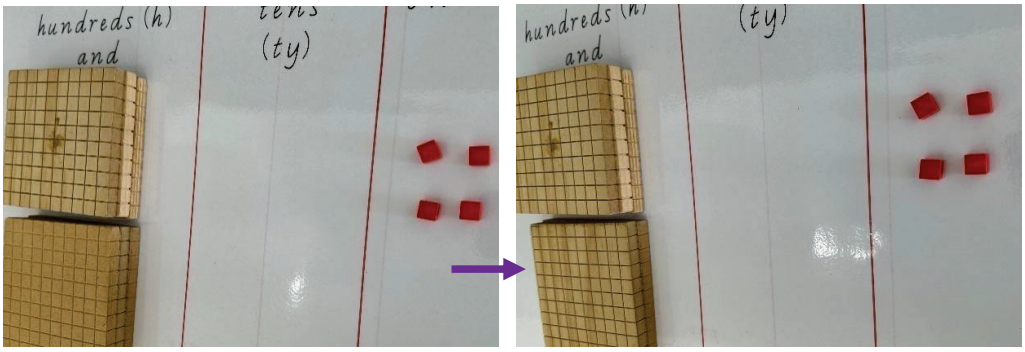


Student work sample – Glen Katherine Primary School

Extension students attempted negative number answers, like so:



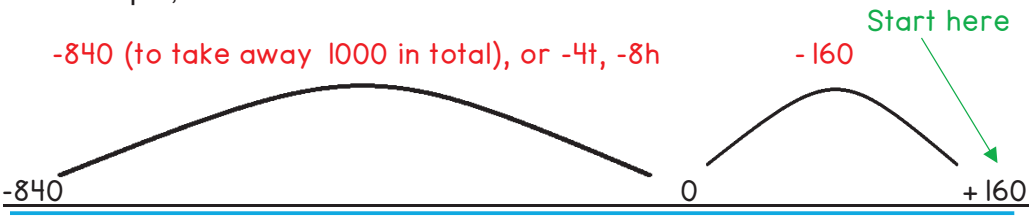
Support: Organise the investigation into a H AND-T-O chart, so that students can more visually and clearly see that they added to only one place, and the others all remained exactly the same:



604 – 1h = 504

Extension 1: Start with the Pitcher C list. If students complete this, ask two extension students to create challenging lists for one another, focusing on using numbers that have lots of internal zeroes to create bridging scenarios.

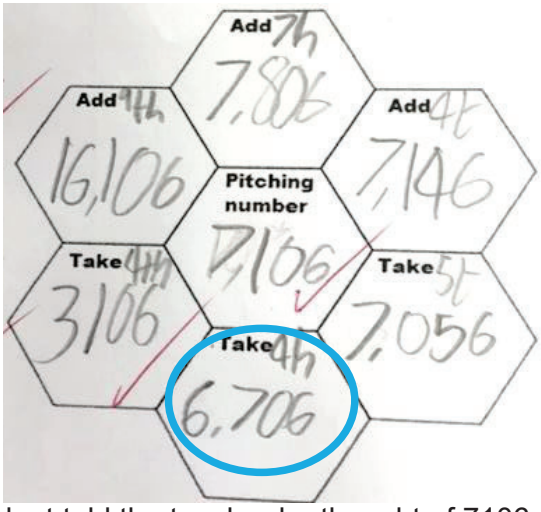
Extension 2: Start with the Pitcher A list with Template B recording hexagons, and mostly focusing on the negative integer results (-1 thousand). For example, work out 160 – 1 one thousand:



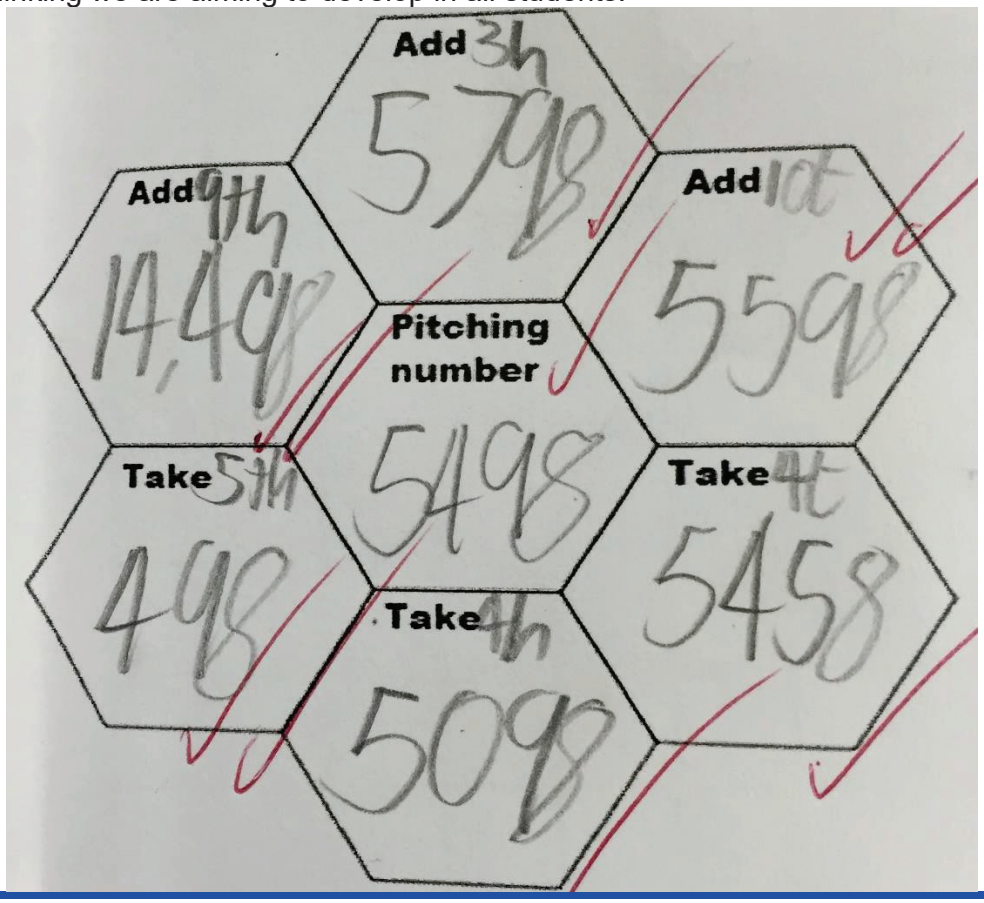
= - 840

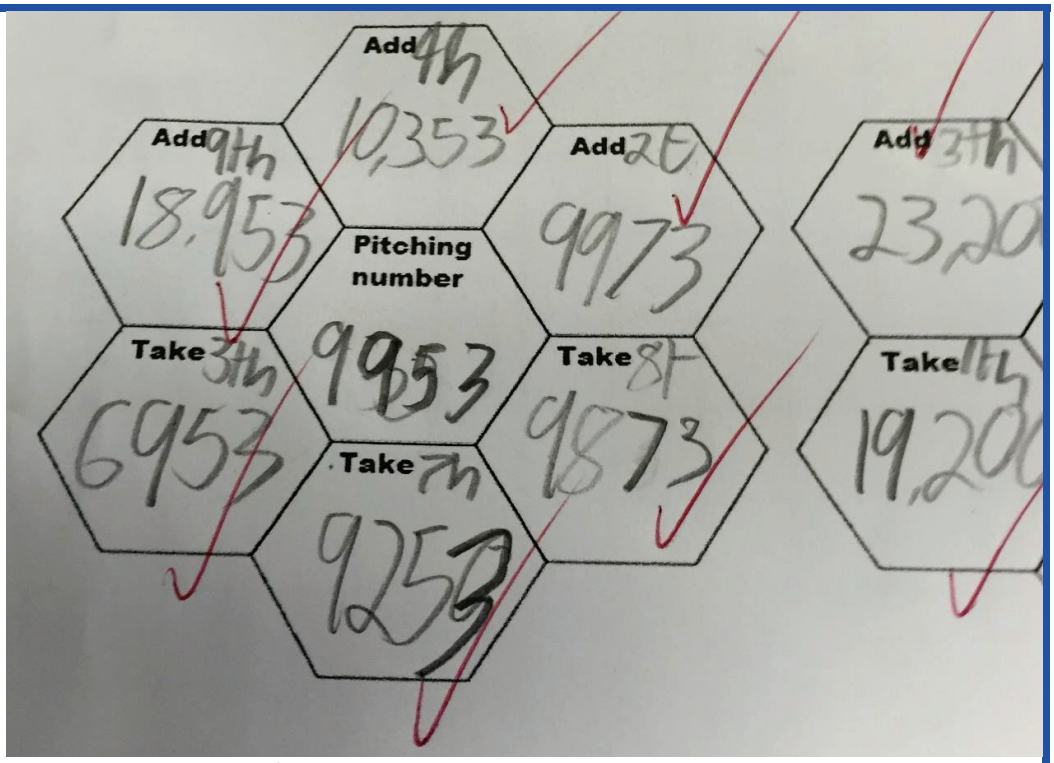
To work this out, use complements of 1000. For example, 160 + 840 makes 1000 as a positive number. So, 160 – 160 would make 0, and then there would be another 840 still left to take away, which would then be negative. Track this using an open number line, with 160 on the far right, jump back 160 to 0, then the rest to reach the answer.

Extension 2: Start with Template C, adding or subtracting multiples of thousands, hundreds and tens from the Pitcher C list by rolling a 10-sided dice. For example, the extension student starts with '1009,' then rolls '4' on the dice. If they were up to their '- hundreds' hexagon, they would need to take away 4 hundreds from 1009. This is where renaming comes into play. If the student is well-versed in renaming (X-Ray Eyes Lesson from this unit plan) they will be able to think: 1009 is 10 hundreds and 9 ones, take away 4 hundreds, is 6 hundreds and 9 ones, so 609.

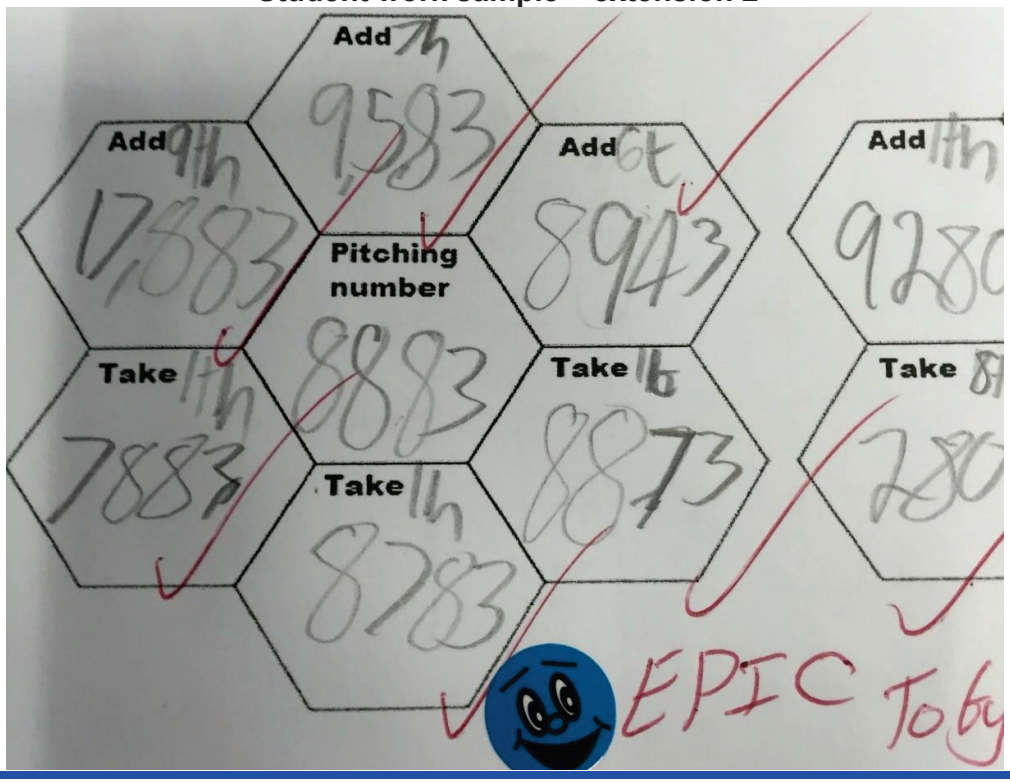


For example, in the student work sample here, for 7106 – 4h, the student told the teacher he thought of 7106 as 71 hundreds, then simply took away 4h, making it 67 hundreds and the other places just stay the same. This is the kind of place value-based thinking we are aiming to develop in all students.





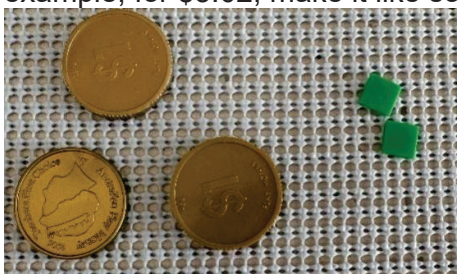
Student work sample – extension 2



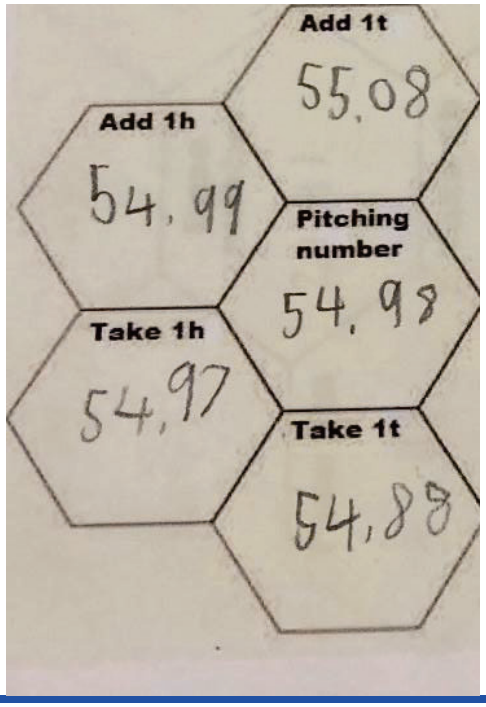
Extension 3: Make decimal starting numbers. Make these with Australian coins. Add ten cents as tenths, and transparent counters to represent single cents/hundredths. Roll the dice and add multiples, for example, add 4 tenths, or take away 8 hundredths.

Use Template C but just scribe in 'ths' to each part of the hexagon. This version of the lesson is commonly used in secondary schools.

Start with numbers that will create bridging, such as $3.02 or 4.1. For example, for $3.02, make it like so:



Roll the dice. Let's say it said to add 9 and you were working on the tenths hexagon, so add 90c, like so and work out the new total ($3.92):



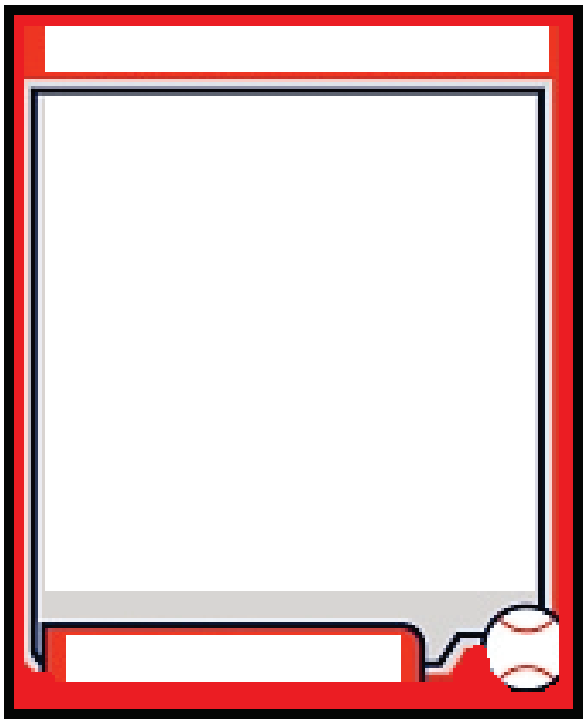
Year 3 extension student work sample where 't' was used to stand for tenths and 'h' for hundredths.

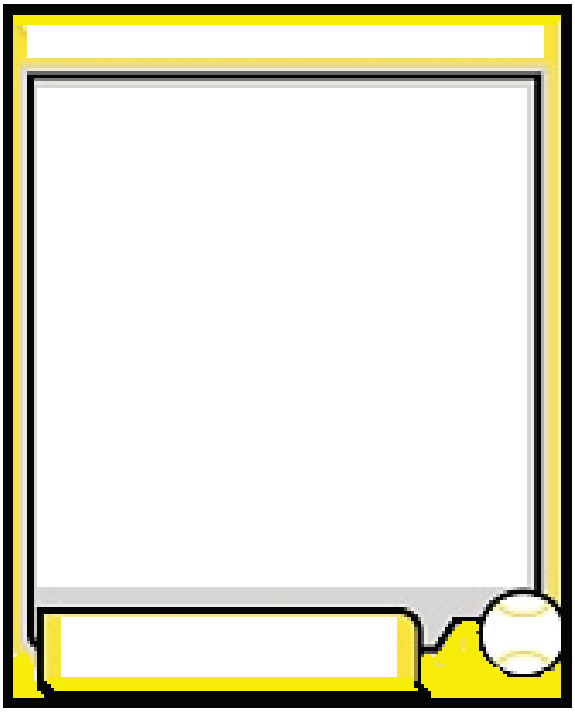
	Problem-solving exit ticket challenge – end of session 1: When Bert is asked to add 100 to 460, he starts counting forward by ones from 460. Ernie has a different strategy. What do you think it is?
	Problem-solving exit ticket challenge – end of session 2: Bert and Ernie were told to take away 4 thousand from all these starting numbers. Which place values will change and which will stay the same? Write these numbers down and underline the places that will change: 4509 8948 12567 24092 302748
	Problem-solving exit ticket challenge – final session: Bert and Ernie have been asked to add 500 to 784. Bert thinks it is best to count by ones. Ernie has a better strategy. What do you think Ernie's strategy might be? Explain (using numbers, words or drawings) at least three possibilities for Ernie.
	Warm-up game for continued practice: Play Wipeout as the warm-up game, for ongoing practice of this skill throughout the week following this investigation.

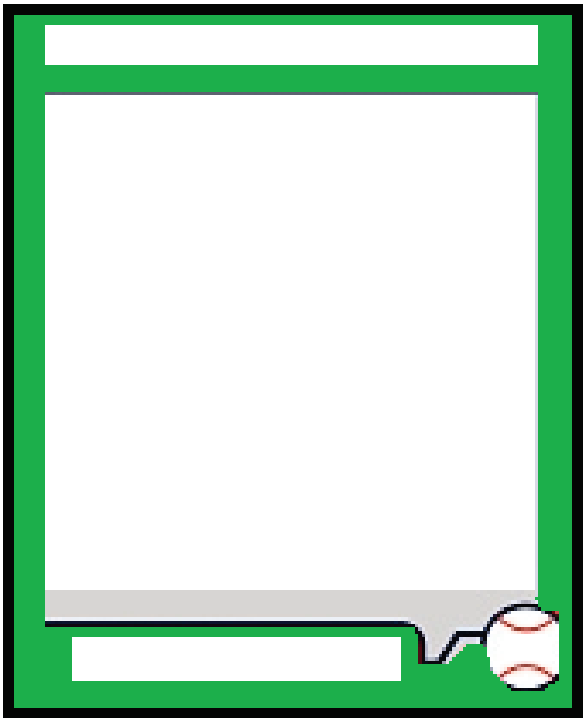
Templates from the following pages are also available in a separate softball templates document for ease of printing.

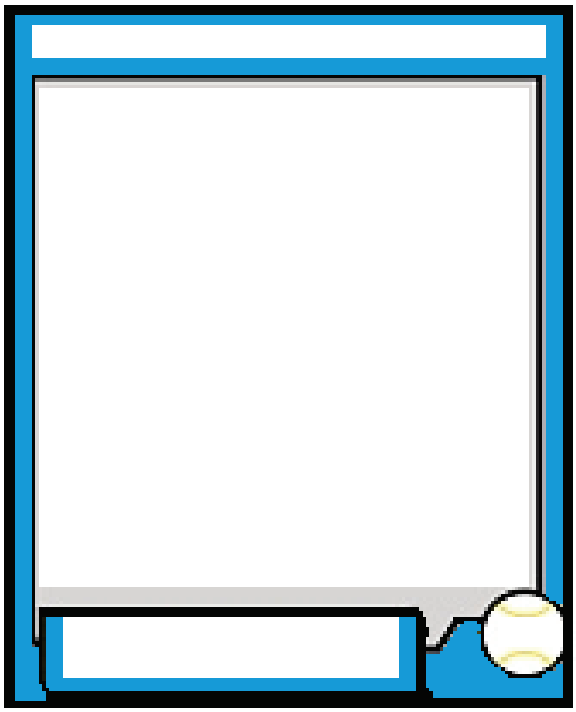
The Pitcher List can be displayed using this enlarged version of the starting numbers.

Softball card templates for the hook: Students sketch their character and name it, then keep track of how many 'home runs' it earns in the top space, according to how many hexagons they complete throughout each of the three sessions. Aim to better your character's PB each round:

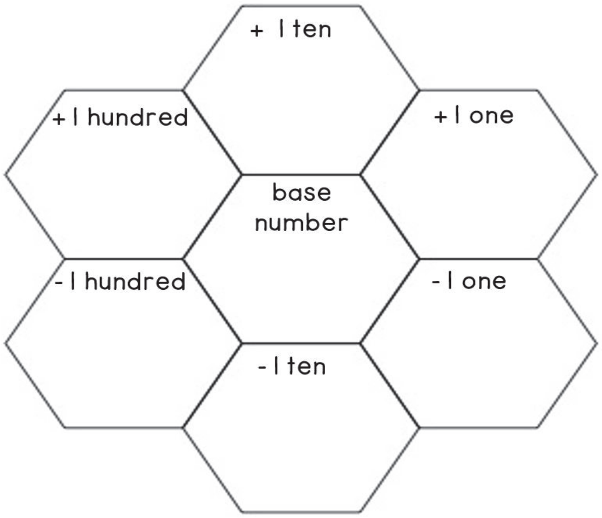


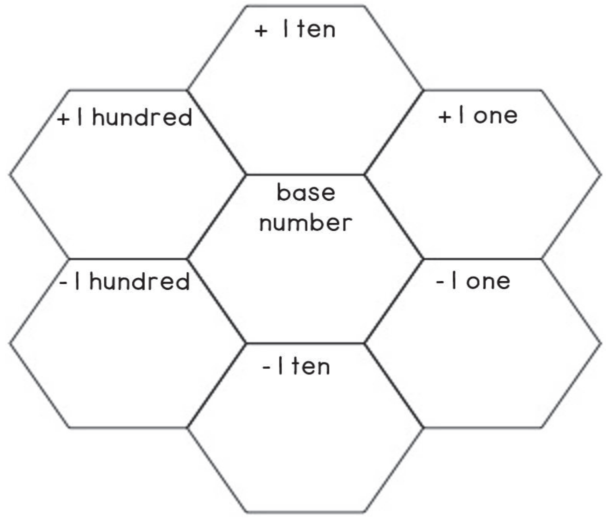


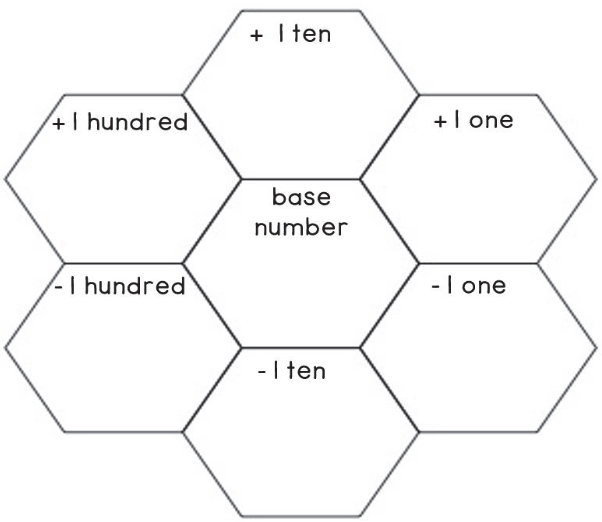


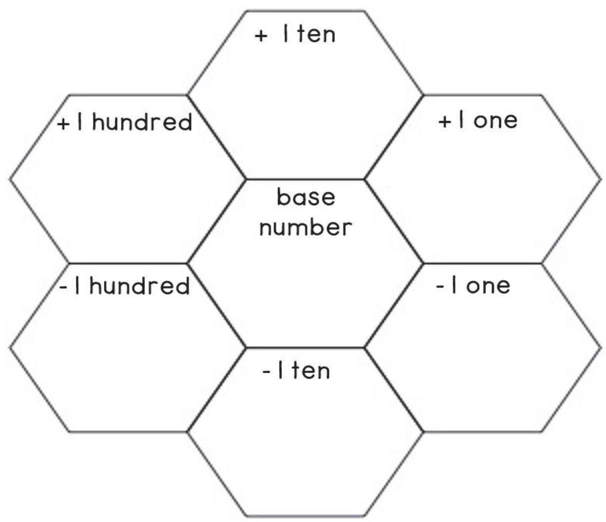


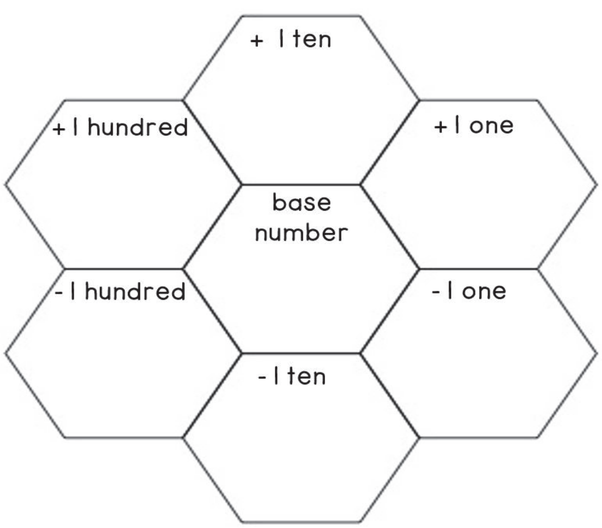
Template A: Add and subtract hundreds, tens and ones to and from your base number.

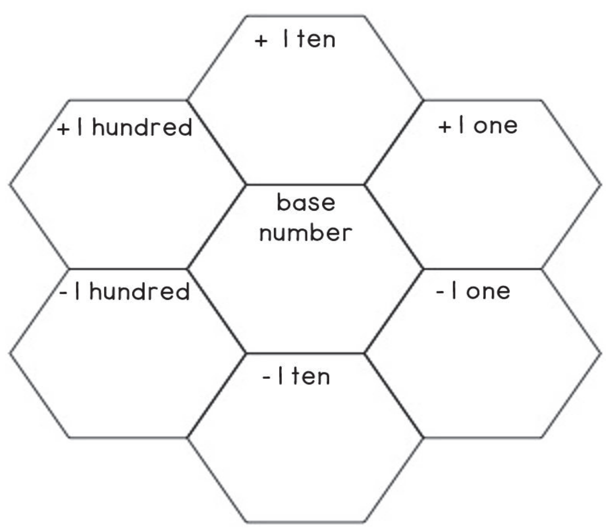




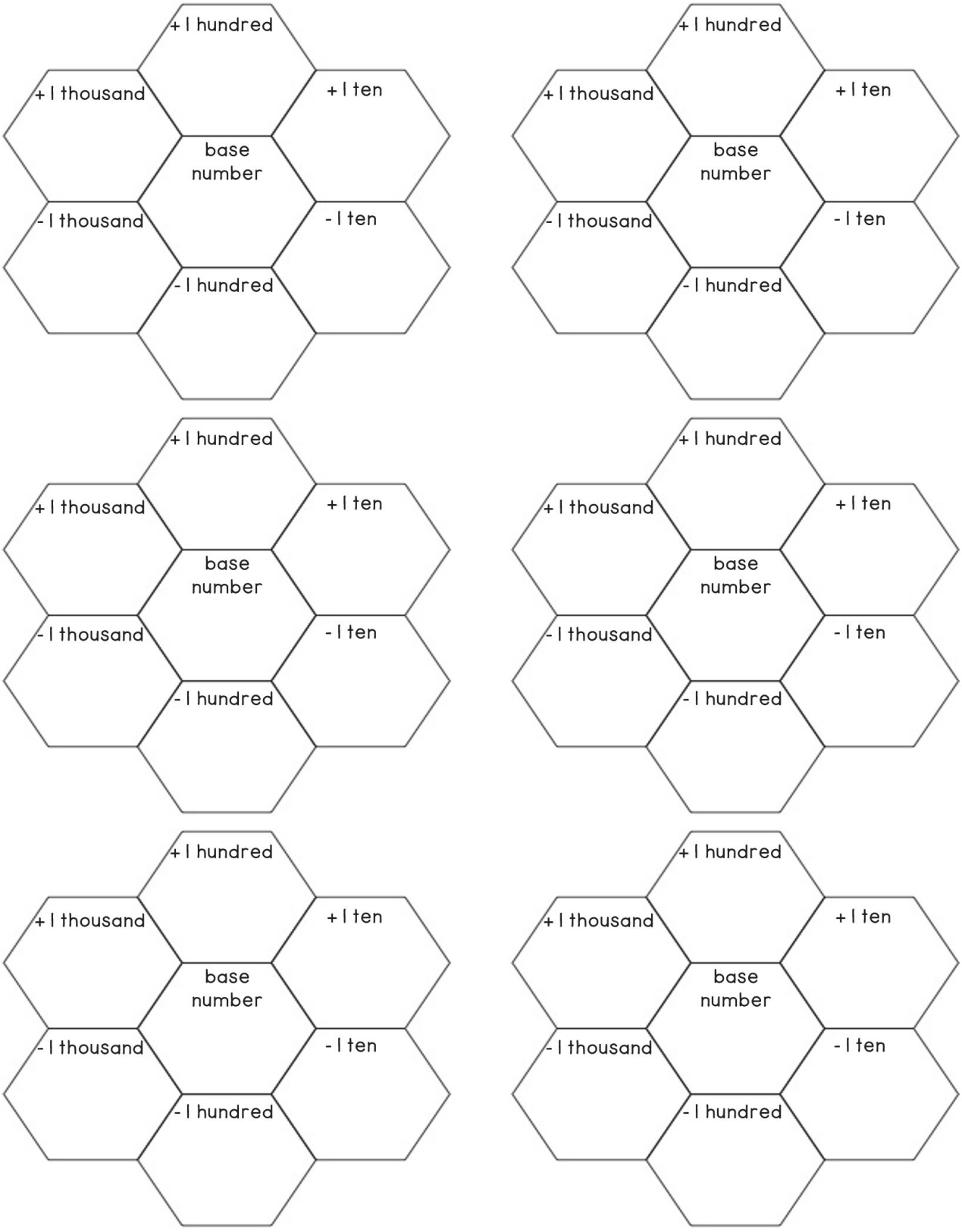








Template B: Add and subtract thousands, hundreds and tens to and from your base number.



Template C: Roll dice and add or subtract that number of thousands, hundreds and tens.