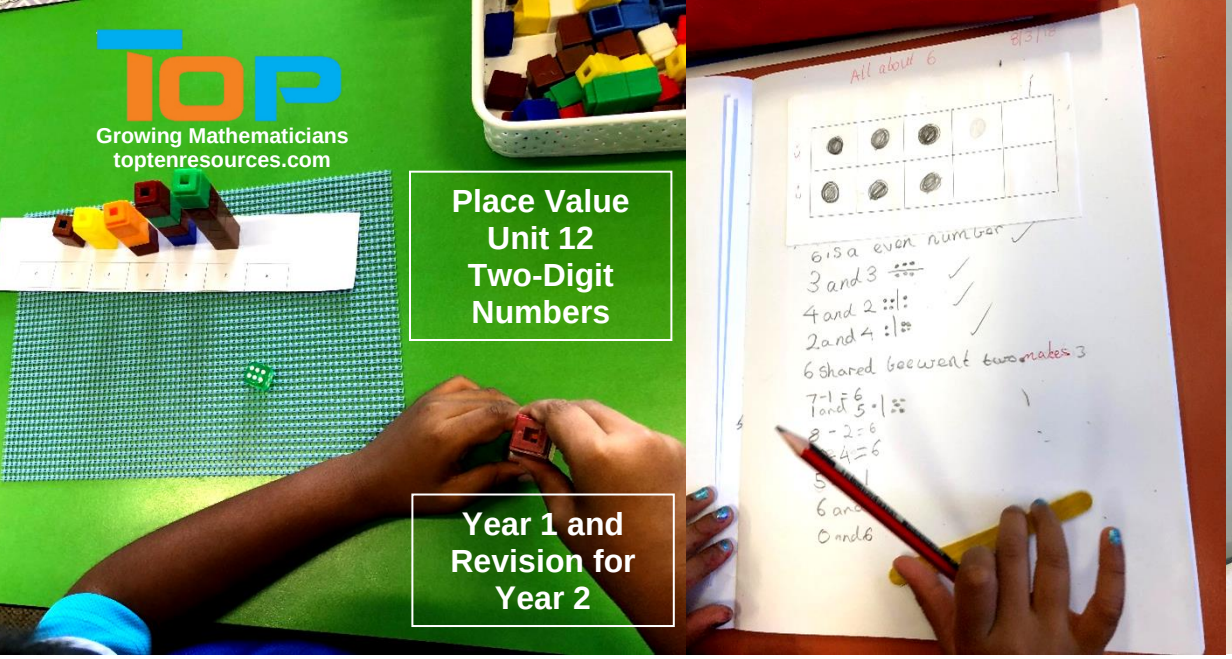

Developmentally Sequenced Materials-Based Mathematics

EARLY YEARS PACKAGE

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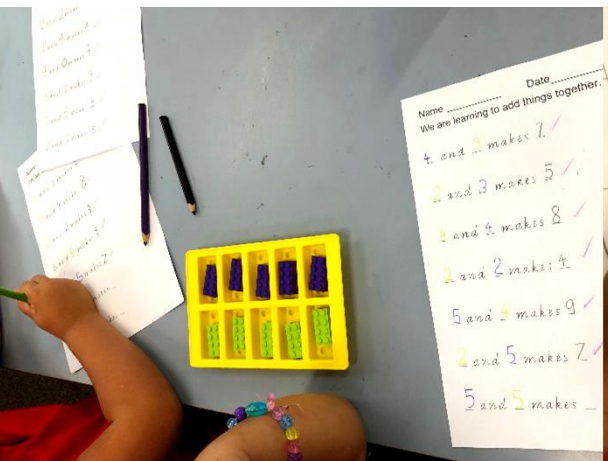

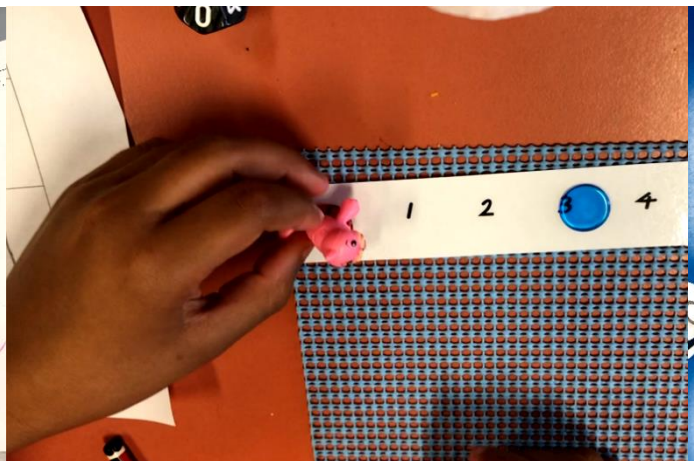

Please note: It is not intended for teachers to attempt to deliver every lesson in this sequence, nor read the unit in full.

Units are designed as **a menu of options**, depending on the points-of-need for each class or cohort of students.

Please choose from these lesson options based on assessed needs, using either Top Ten or other strategy-focused diagnostic pre-assessments (not multiple-choice/click-the-answer assessments, as mathematics learning at its core focuses on reasoning, thinking and strategies, as well as deep conceptual understanding, not answers alone).

Please also select lessons that best suit students' interests and your own creativity and passion as a teacher.

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

Place Value Unit 12
Two-Digit Numbers
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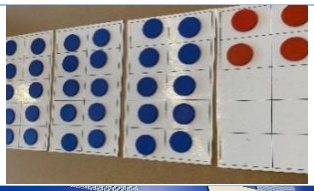
Pages 64-69</td><td>  </td></tr>
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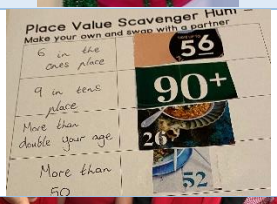
Page 78-80</td><td> 
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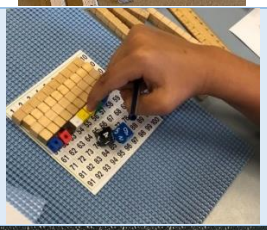
105-125</td><td>  </td></tr>
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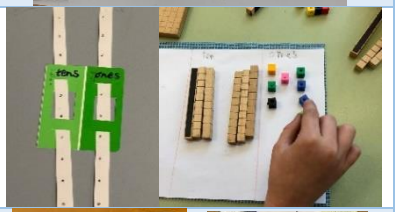
128-135</td><td> 
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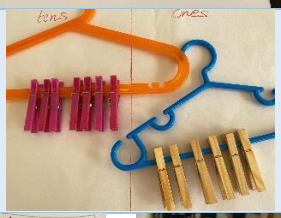
136-139</td><td> 
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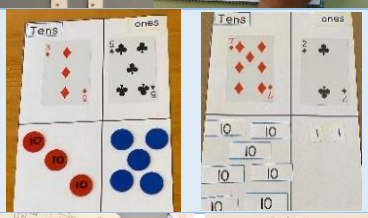
140-142</td><td> 
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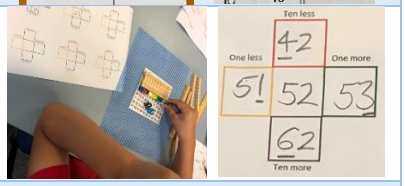
146-163</td><td> 
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Place Value Developmental Step 12: Make, read, write and order two-digit numbers (partition into tens and ones)

Curriculum/Syllabus Links for this Lesson Sequence

This unit is recommended for Year 1 students, following the previous Place Value Unit 11 on counting to 120 by ones. The focus is the bundling and renaming concept (10 of these is worth 1 of those – 10 ones makes 1 ten), as well as the partitioning concept – making, breaking apart and understanding two-digit numbers as tens and ones.

Australian Curriculum V9 AC9M1N02 and Victorian Curriculum 2.0 (VC2M1N02)

Number – Level 1: Partition one- and two-digit numbers in different ways using physical and virtual materials, including partitioning two-digit numbers into tens and ones

- **using physical and virtual materials to partition numbers into counts of tens and ones; for example, recognising 35 as 3 tens and 5 ones or as 2 tens and 15 ones**
- using part-part-whole reasoning and physical or virtual materials to represent 24, then partitioning 24 in different ways and recording the partitions using numbers; for example, 10, 10 and 4 combine to make 24 or 10 and 14 combine to make 24

See also ***Place Value – Unit 16 Renaming.***

Australian Curriculum V9 AC9M1N03 and Victorian Curriculum 2.0 (VC2M1N03)

Number – Level 1: Quantify sets of objects, to at least 120, by partitioning collections into equal groups using number knowledge and skip counting

- **counting a large collection of items using groups of fives or tens and skip counting to work out how many there are, and recording the amount and connecting the digits in the number to the grouped materials when using groups of 10**
- **counting collections of objects, such as pencils or images of birds in a tree, by grouping them in tens to enable efficient counting, and connecting the digits in the number to the groups of tens and ones**
- counting a large collection of Australian $1 coins by stacking them in piles of 10, skip counting in tens and including any leftover coins to determine the total value

Australian Curriculum V9 AC9M1N01 and Victorian Curriculum 2.0 (VC2M1N01)

Number – Level 1: Recognise, represent and order numbers to at least 120 using physical and virtual materials, numerals, number lines and charts

- **reading, writing and naming numerals and ordering two-digit numbers from zero to at least 120, using patterns within the natural number system, including numbers that look and sound similar, for example, 16, 60, 61 and 66** – *see Building numbers - changing positions cards in particular, as well as* ***Place Value Unit 13 Teen Numbers***
- using number tracks or positioning a set of numbered cards in the correct order and relative location by pegging them on an empty number line – *see also* ***Place Value Unit 14 Rounding and Estimation***
- using hundreds charts to build understanding and fluency with numbers; for example, collaboratively building a hundreds chart using cards numbered from zero to 99, or colour-coding the count of tens in a hundreds chart using one colour to represent the number of tens and another to represent the number of ones
- recognising that numbers are used in all languages and cultures but may be represented differently in words and symbols (for example, through kanji numbers in Japanese and characters in Chinese) and that there are alternative numeration systems (for example, using special characters for 10 and 100 and other multiples of 10 in Japanese and Chinese numeration)

Australian Curriculum V9 AC9M1A02 and Victorian Curriculum 2.0 (VC2M1A02)

Algebra – Level 1: Recognise, continue and create repeating patterns with numbers, symbols, shapes and objects, identifying the repeating unit and recognising the importance of repetition in solving problems

- **recognising within the sequencing of natural numbers that 0–9 digits are repeated both in and between the decades and using this pattern to continue the sequence and name two-digit numbers beyond 20**

Australian Curriculum V9 AC9M2N01 and Victorian Curriculum 2.0 (VC2M2N01)

Number – Level 2: Recognise, represent and order numbers to at least 1000 using physical and virtual materials, numerals and number lines

- **recognising and locating the position of pieces within hundreds chart puzzles using knowledge of the order of natural numbers**
- **collecting large quantities of materials for recycling (for example, ring pulls, bottle tops and bread tags) and grouping them into ones, tens and hundreds, and using the materials to show different representations of two- and three-digit numbers**

Western Australian Curriculum Number and Place Value – Year 1: Recognise, model, read, write and order numbers to at least 100. Locate these numbers on a number line **(ACMNA013)**

- modelling numbers with a range of material and images
- identifying numbers that are represented on a number line and placing numbers on a prepared number line.

Western Australian Curriculum Number and Place Value – Year 1: Count collections to 100 by **partitioning numbers using place value (ACMNA014)**

- understanding partitioning of numbers and the importance of grouping in tens
- understanding two-digit numbers as being comprised of tens and ones/units.

New NSW Maths Syllabus – Stage 1 (A)
Representing whole numbers A – Represent the structure of groups of ten in whole numbers

- recognise that ten ones is the same as one ten.
- use 10 as a reference in forming numbers from 11 to 20.
- count large sets of objects by systematically grouping in tens.
- partition two-digit numbers to show quantity values.
- use number lines and number charts to assist with locating the nearest ten to a number.
- estimate, to the nearest ten, the number of objects in a collection and check by counting in groups of ten (Reasons about quantity).

New NSW Maths Syllabus – Stage 1 (B)

Representing whole numbers B – Use counting sequences of ones and tens flexibly

- identify the number before and after a given three-digit number, *particularly Lesson 18 Extension 3 of this unit plan.*
- count forwards and backwards by tens, on and off the decade, with two- and three-digit numbers, *particularly pages 103-108 of this unit plan.*
- identify how many more to the next multiple of ten within two- and three-digit numbers: *Throughout this unit (Lesson 1, Lesson 2, Lesson 6 Extension 1, Lesson 7 Extension 1, Lesson 12 Extension 1, Lesson 12 Variation 4, Lesson 16 Extension).*

New NSW Maths Syllabus – Stage 1 (B)

Combining and separating quantities B – Form multiples of ten when adding and subtracting two-digit numbers

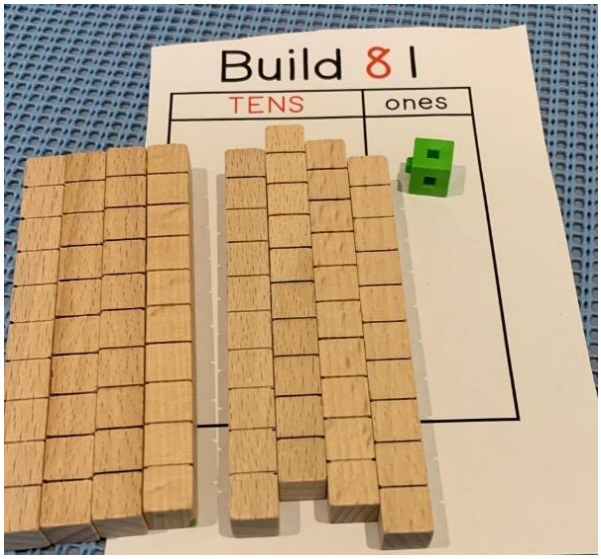
- add two-digit numbers by building to multiples of ten. *Throughout this unit plan (Lesson 1, Lesson 2, Lesson 6 Extension 1, Lesson 7 Extension 1, Lesson 12 Extension 1, Lesson 12 Variation 4, Lesson 16 Extension).*
- add and subtract from a two-digit number and record on an empty number line: *Throughout this unit plan (Lesson 1, Lesson 2, Lesson 6 Extension 1, Lesson 7 Extension 1, Lesson 12 Extension 1, Lesson 12 Variation 4, Lesson 16 Extension).*

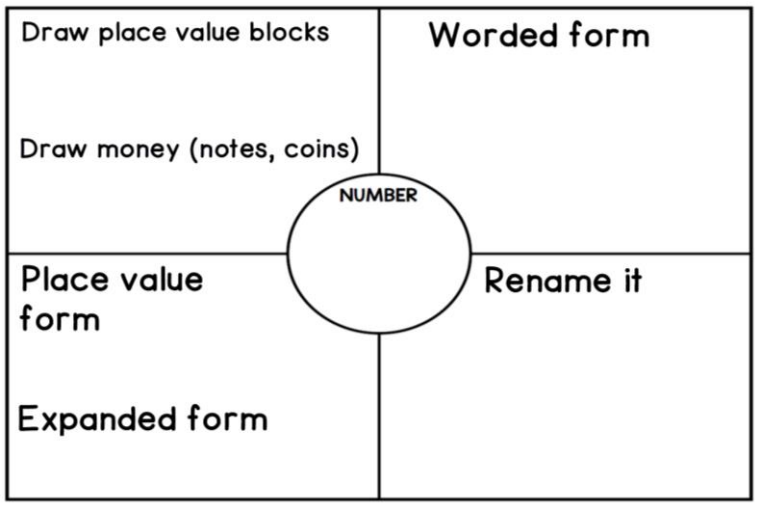
Formative Assessment

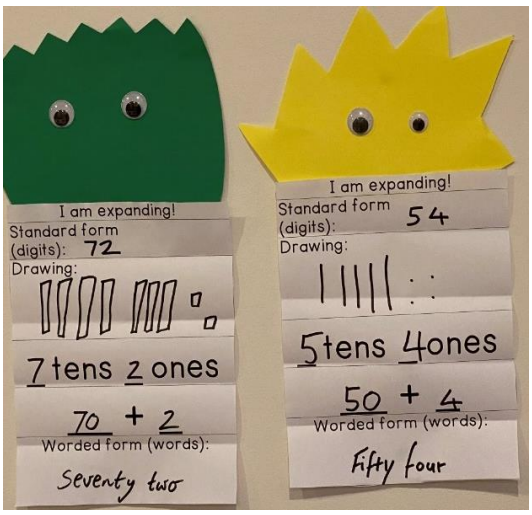
A formative assessment cross-check is available in this unit's folder with progressive learning goals and specific success criteria for this unit. This includes a grid template or a section template for notes, whichever the teacher prefers to use.

There is a place value think board, which mentions base-ten blocks, but can be used earlier with students making their number using popsicle stick bundles or cubes for this part of the template.

Throughout this unit, there are several exit tickets and formative assessment options. On pages 43-45, there are three rich formative assessment options outlined, which can be used as exit tickets or mini assessment tasks. There are also building tens and ones mini exit tickets, as explained on page 59 and 63. On pages 78-80, there is also a place value scavenger hunt exit ticket. The place value monsters from pages 133-135 are also ideally used as an exit ticket.





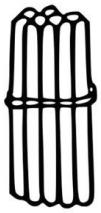


Teaching Tips

The ideal progression of materials for teaching tens and ones is as follows:

1. Ten frames and connectable cubes (unifix cubes 2cm^3 variety)
2. Bundled popsicle sticks
3. The abacus
4. Place value blocks – tens and ones.



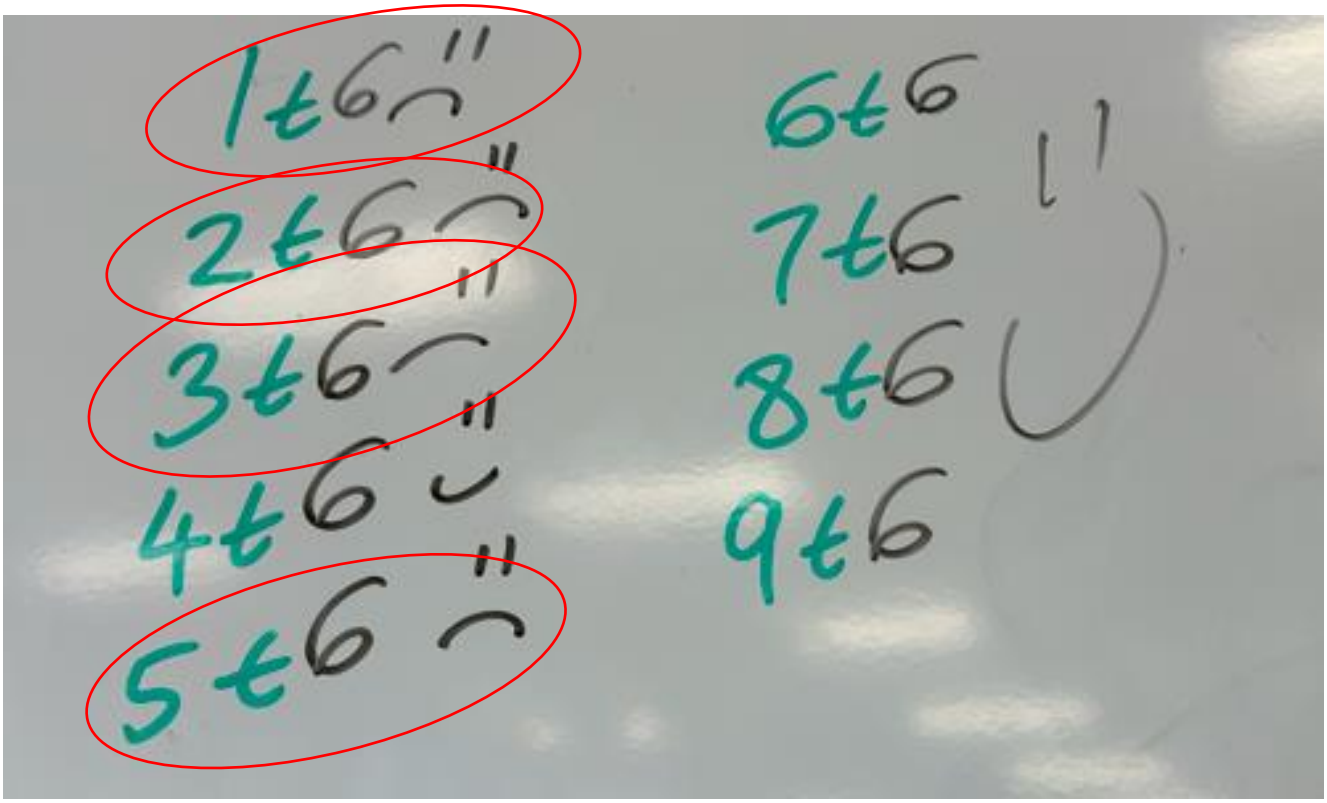


Place value blocks (MAB) should only be used once students have had multiple experiences with all the bundling materials (unifix cubes, popsicle sticks, abaci), in order to develop a strong trust in the big idea that 10 ones makes 1 ten.

'Ty' or 't' stands for ten. Encourage students to count their tens as '1 ten, 2 tens, 3 tens, 4 tens,' then count ones, and finally say the number altogether as '4ty5' or '4t5.' This is preferable to students counting '10, 20, 30, 40,' as **saying '1 ten, 2 tens' encourages students to see ten as its own unit (unitising).** Would you prefer students to be scaffolded to visualise 40 as '4 tens' (**place value form**), or as '40 little ones' (as expanded form encourages)? The difference between these two forms (place value form versus expanded form) is particularly evident when students attempt to add or take away a ten. Students who can visualise 45 as 4 tens 5 ones can far more easily add or subtract tens by thinking (4 tens 5 ones – 3 tens, so 1 ten 5 ones are left). Students stuck in 'expanded form mode' are attempting to do this (40 + 5 – 30), which is far more challenging. When students record tens and ones numbers in their **place value form** as '4t5' or '4ty5', it will literally sound like 'forty-five' when read out loud ("4***ty***5!").

As the English language is not ideal for mathematical teaching, only some of our tens numbers follow a regular pattern in terms of their worded form:

Follows the ty pattern	**Does not follow 'ty' pattern for worded form**
Forty – 4t5 or 4ty5 is literally said as "forty-six." This way of recording two-digit numbers, using place value form to show 4***ty***5 or 4***t***5 (with ***ty/t*** signifying 'ten'), supports the oral and written language. It highlights the composition of 45 as 4 tens and 5 ones, which our language does not do as seamlessly as most others.	Teen – 14, which says the ones first, then the ten. 'Fourteen' with the 'teen' standing for 'ten,' so it basically says 'four and ten.' This is the reason the Teen Numbers unit is after the Two-Digit Number unit in the Early Years Package, as teens are the most problematic, due to the structure of the English language.
	Twenty – **should be 'twoty (two tens).'**
Sixty – 6t3 or 6ty3 is said as sixty-three	**Follows the pattern but uses ordinal form**
Seventy – 7t5 or 7ty5 said as seventy-five	Thirty – 3t2 thirty-two (should be threety-two)
Eighty – 8t7 or 8ty7 is said as eighty-seven	Fifty – 5t4 fifty-four (should be fivety-four)
Ninety – 9t2 or 9ty2 is said as ninety-two	This is the reason the Ordinal Number unit precedes this unit in our sequence.



If we are counting from 6 and adding ten, let's think about how it should sound. We should ideally say: 1t6 as in 1 ten six ones, like most Asian languages which follow a 'tens_ones' pattern in the way the numbers are actually said and written. Our language does not follow this pattern until forty, and then skips fifty, finally following a pattern from sixty to ninety.

1t6 = 1 ten 6, but we say sixteen instead, with the ones at the front and ten on the end as 'teen'!

2t6 = 2 tens 6, but we say twenty-six (not twoty-six as it should be)

3t6 = should be three-ty six, but is thirty-six, using the ordinal form of 'thir' as in 'third.'

4t6 = forty-six, it makes sense (apart from the spelling)!

5t6 = should be five-ty six, but is fifty-six, using the ordinal form of 'fif' as in 'fifth.'

6t6 = sixty-six!

7t6 = seventy-six!

8t6 = eighty-six!

9t6 = ninety-six!

In stark contrast, most Asian languages make far more sense than English. For example, in Chinese, the teen numbers are said literally as 'ten-one' (11) and 'ten-two' (12), while forty-five is said as 'four ten five,' **making the place value form (tens) entirely explicit within the language itself.** This is why using place value form is so important, because it emphasises how the numbers should actually be understood, which most Asian languages do automatically.

As a class, read about other languages and the way these languages make learning the value of the tens place much easier for students: https://www.clozemaster.com/blog/chinese-numbers/ (Chinese), https://www.fluentin3months.com/japanese-numbers/ (Japanese) and learnentry.com/english-malay/vocabulary/numbers-in-malay/ (Malaysian).

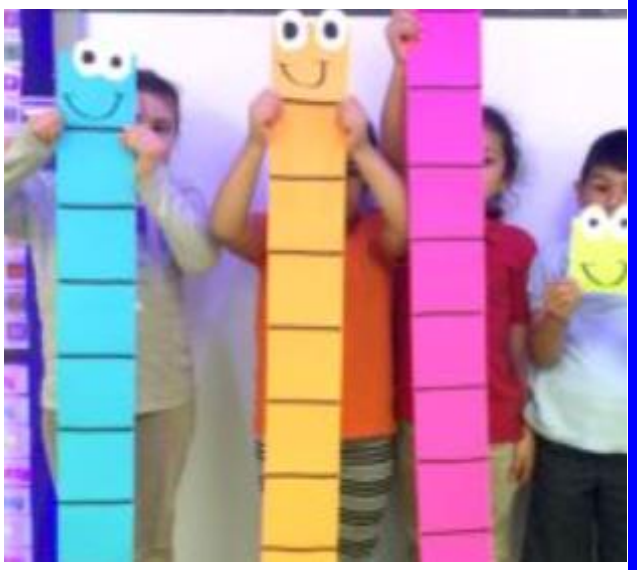
Problem-solving challenge for students: Imagine you are the Prime Minister of Australia and have decided to pass a law to change the names of the two-digit numbers, so that the tens numbers make more sense in how we say, read and write them. What would you call each ten? *Further prompt:* If English did follow a pattern, so all two-digit numbers were said/written consistently to show their tens and ones values, what *should* each tens number actually be called? *Potential answers:* Onety, twoty, threety, fourty, fivety, sixty, seventy, eighty, ninety! Or, 'two tens three' for 23;' '6 tens 4' for 64'; and so on, mirroring the Asian languages above.

Definitions of the forms in which students may be requested to represent numbers

- **Standard form:** The number is written in digits, for example, 45.
- **Worded form:** The number is written in words, for example, forty-five. Two-digit numbers should follow the grammatical convention of being recorded with a hyphen between the tens and ones, such as 'twenty-four.' **Support tools for worded form:**
  - **Google translate** (with both languages set to English) will read numbers out loud for students (use headphones to reduce classroom noise levels).
  - **lingojam.com/NumbersToWords:** This website converts numbers from digits (standard form) to words for students, as a check for immediate feedback.
  - **Top Ten spelling assistance charts** available in cursive and stick and ball font.
- **CRITICAL TIP! Place value form:** The number is written in a way that highlights its place value composition, for example, '56' would be read out loud as, "5 of the tens, 6 of the ones," or "5 tens, 6 ones." Students record using mathematical shorthand, such as 5t 6 ones, or in short '5t 6u' or '5ty 6u' as 'ty' connects to the worded form **but should always be read back as "5 tens 6 ones" out loud by students to conceptualise each place.** Avoid writing 'o' for 'ones,' as this could be confused with 0 – instead write 'u' for units, which is also language that appears in the curriculum (ones/units are used interchangeably, but 'units' avoids the risk of the 'o' from 'ones' being confused with 0).
- **Expanded form:** 526 as 500 + 20 + 6. Avoid over-emphasising (mostly only lesson 16).

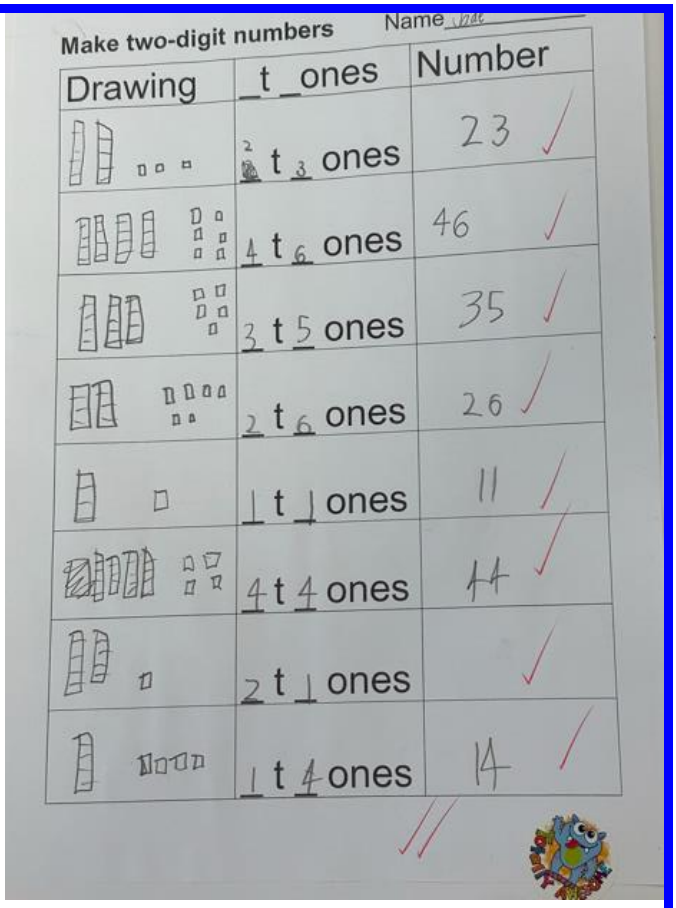
CRITICAL TIP! Australian numeracy coaches recommend focusing on place value form, and to avoid over-emphasising expanded form. **Expanded form encourages students to see numbers as large sets of ones, rather than thinking in place values and seeing each place as a unit in itself.** This leads to a student seeing 526 as 500 ones + 20 ones + 6 ones, rather than as '5 hundreds, 2 tens and 6 ones.' If the student needed to add 100 to 526, with a place value form understanding she could use the strategy 5h + 1h makes 6h (5 hundreds + 1 more hundred, visualising the place value blocks), but with an expanded form understanding they would be more inclined to start counting on, by ones, from 526.

Warm-up Games

Game	Warm-ups for two-digit numbers
Counting by tens songs	It is critical that students know the names of the tens (twenty, thirty, forty, fifty, sixty, and so on), particularly for twenty, thirty and fifty, which do not follow the regular pattern. Play these counting by 10s songs as warm-ups: youtube.com/watch?v=Ftati8iGQcs youtube.com/watch?v=-gmEe0-_ex8 youtube.com/watch?v=yQSdKlNvrmw
Giant circle modelling	Use A3 paper and students at the front of the room to make two-digit numbers, with the rest of the class working out the number: “3 tens and 1 one – 31!” As a real-life link, tens could be the ‘adults’ and ones could be the ‘kids.’  Also use pool noodles to model tens and ones, again with students working out the number that was made. These essentially become giant Cuisenaire rods, emphasising that ten of the blue make a green.  Students can then use this Cuisenaire-style model on a smaller scale with drinking straws in a tens-ones chart.

Place Value Handfuls and Place Value Gallery Walks

Place Value Circles:
Students sit around a whole-class circle. Give a different number of connectable cubes to each student. Ask the student to arrange these on a mini whiteboard or black piece of paper, so that the total would be easy for other students to see, without them having to come up close and count each item one-by-one.



Students then walk around the circle and take note of the arrangements that were easiest to see.

- How did the student bundle the items?
- Did they use tens and ones?
- Did they leave their ones all jumbled around and messy? Or did they arrange the ones like a dice so you could see how many there were straight away with your superhero (subitising) eyes?

The next day, change the nature of the materials you use – beads, popsicle sticks, and so on. However, students will gradually see that (no matter what type of material is involved) it is a consistently excellent strategy to bundle it into tens and ones.

Place Value Gallery Walks: Students all choose a different material, using as much variety as possible (popsicle sticks, cubes, beads, Lego). Students create a name for their gallery on a post-it note, “The Lego Exhibit.” Students then roam around to different galleries, bundling them into tens-ones and recording the number. After students finish each gallery, they ‘mix up’ and unbundle all the materials again, fresh for the next student. Students report the totals back to the class in a whole-class circle, “The Lego Exhibit was 3 tens and 4 ones, thirty-four,” receiving immediate feedback on their count. Students discuss their bundling strategies – which materials were best to bundle into tens? Were any better as fives or twos, or another way?

Road Signs

Each student uses a popsicle stick and coloured paper to set up a mini speed limit sign on their desk. Students then drive cars around the room, saying each speed limit out loud as they reach it. This session is intended to be continued for home learning, with students playing the ‘spot the speed limit game’ in the car to see how common two-digit numbers are in everyday life and one of their important uses. Once students can say the tens numbers correctly (which are very common as speed limits), they have mastered the hardest element of saying two-digit numbers as words. Link to shapes – make the signs as hexagons (6-sided) and octagons (8-sided), emphasising and chorusing this vocabulary with students.

Place Value Dance

Students make different actions for each place value, creating a number using dance. For example, side-step for ones, jump for tens.
Make 58: 5 jumps and 8 side-steps.
Invite student volunteers to the front of the room to perform a dance while the others keep count, working out the number they made.
Students could record each number in standard, worded and place value form. For example, using 4 columns, students write:

Dance	Standard form (digits)	Worded form (words)	Place value form (h + t + u)
5 spins 2 jumps 4 side-steps	524	Five hundred and twenty-four	5h + 2t + 4u

Place Value War

Students flip over cards and rearrange the place values, aiming to create the highest number. Students also use place value blocks to prove it.

On alternate days, you could ask students to aim for the lowest number possible.
If students end up with the same number, they go to war: play another round that's worth double points.
Students can also record all their numbers, in words and numbers, then organise them into ascending or descending order at the game's end.

Extension:

- Make the lowest possible even number
- Make the highest possible odd number
- Make the highest possible multiple of 2
- Make the highest possible multiple of 5 (first person to be able to create one wins; unless both students can, then the highest multiple of 5 wins)

Tens-ones Lesson 1

Towers of Ten

Learning intention: Make bundles of ten and say two-digit numbers using the language of tens-ones, and the 't' or 'ty' pattern (6t3 six<u>t</u>y-three)
Maths vocabulary: ten (10 ones), 't' and 'ty' for tens, cube

Real-life link: Show students these images of 29 stunning castles around the world: buzzfeed.com/ariellecalderon/gorgeous-castles-from-around-the-world?utm_term=.veMA3jkBj#.amG6BkAP

Link to students' interests: Link to Minecraft, where players aim to create towers and castles to defend their empires from other players. Students could watch this time lapse of the creation of a majestic Minecraft castle:

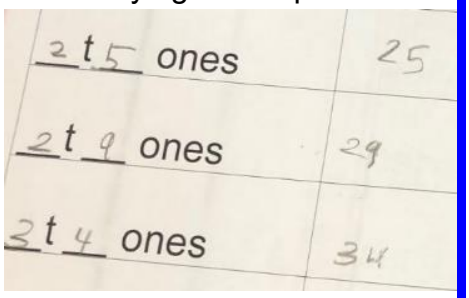
Lesson summary: Students use cubes to make towers of ten. Students then join a whole-class circle for practice at reading tens numbers as tens and ones (7 tens 5 ones), as well as using the 'ty' language pattern, such as '7t5.' When a number does not follow the pattern, such as 5t3 (said as 'fifty-three,' instead of 'fivety-three'), students make a crazy face to show that number refuses to follow the normal pattern.

Materials:

- Connectable cubes – as many as possible from throughout the school for this session. Distribute in tubs to the middle of students' group desks. Keep about 50 cubes spare for the whole-class circle part.
- Tens and ones recording template from this unit's folder

Best set-up: Students work independently, then join the whole-class circle.

Modelling: Ask students why they think ten was chosen the most important number in our place value system? Provide 5 minutes think time. Most historians think it was because of our fingers – we have ten fingers, so every time we reach ten, our numbers reset and count from a new ten.
Teach students the rules to saying tens numbers and the exceptions:
If you have 4t5 (4 tens and 5 ones), we say 4t5 **'t' or 'ty' stands for tens**
If you have 6t5 (6 tens and 5 ones), we say 6t5
If you have 7t5 (7 tens and 5 ones), we say 7t5
If you have 8t5 (8 tens and 5 ones), we say 8t5
If you have 9t5 (9 tens and 5 ones), we say 9t5
Exceptions: We say twenty not 'two-ty.' We say 'thirty' not 'three-ty,' like 3 in a race – third. We say 'fifty-ty' (like coming five in a race), not 'five-ty' but it

youtube.com/watch?v=tm0p_bBq5o0	sounds very similar. Teen numbers say ten at the end as 'teen' – they may be the smallest, but they are the trickiest! **Next, students go to their desks and build towers of ten using the cubes.** **Link to 3D shape vocabulary:** Instead of calling them blocks, call the unifix 'cubes.' Chorus this language with the class. What shape is on each face of a cube? How many squares does it take to make a cube? **Link to skip-counting:** Students can also use this opportunity to practise counting by twos to ten as they build their towers – practise as a class first, and play a counting by twos song as the pre-warm-up for this lesson: youtube.com/watch?v=GvTcpfSnOMQ&ab_channel=ScratchGarden Stop students every 2-3 minutes with the catchphrase 'tower check' (use a YouTube countdown or a sand timer as a reminder). Students need to write down how many towers they have, recording this in tens and ones as, "6 t 2, I have 62." This literally sounds like 'sixty-two' when saying 't' to represent tens (6 tens 2 ones = 6**t**2 or 6**ty**2). Encourage students to count their tens as "1 ten, 2 tens, 3 tens, 4 tens," then count their ones and say the number altogether: "6t2". This is preferable to students counting '10, 20, 30, 40,' since it instead encourages students to see ten as its own unit, rather than as lots of ones. Students can record using the tens and ones recording template from this unit's folder.  **Whole-class circle when all blocks run out:** When the class runs out of cubes, come together in a circle. Go around the circle and invite each student to read out and write down (on a mini whiteboard in 't' format) their final total. Check it for accuracy against the blocks they have laid out in front of them and ask the student to count the tens out loud, saying these as, "1 ten, 2 tens, 3 tens, 4 tens, 5 tens, 6 tens and 3 ones, I have 6t3." The whole-class then checks the count together in chorus, "1 ten, 2 tens, 3 tens, 4 tens, 5 tens, 6 tens, 3 ones, we have 6t3." When the number is crazy, such as twenty, thirty and fifty (which do not follow the 't' pattern because 3t2 is said as 'thirty-two' not 'threety-two'), students all make a crazy face in the circle. Reveal to students that you have a leftover delivery of building cubes. Give the students two minutes to try to work out how many more cubes they need to complete their final tower. Link this to their 10 facts, if your final tower only had 4 in it, 4 *and what* makes 10? Go around the circle with students politely requesting their extra cubes to complete their final tower of ten. "I have 4. May I have 6 more please?" Finally, use all the completed towers of ten to build a class castle as a team (linking back to the hook about castles). Asl students to estimate its total. Then work it out as a whole-class.

Questioning:

- What do you have at the moment? Can you read it to me in 'tens and ones,' for example, "I have 5 tens and 3 ones, I have 5t3 or 53."
- If I gave you this extra tower of ten, what do you have now?
- What if one of these towers of ten was lost in battle (take away one of their towers as you ask this), what do you have now?

Support 1: These students may forget to stop at 10, continuing to build a very long tower that does not reset at ten like our place value system. To avoid this, use ten frames to support them to build tens, placing each cube in a square, then connecting the cubes to make ten when the frame is full. Another ten cubes template is also available, which has the outline of a tower of ten cubes in a straight line.

Support 2: Practise counting, 1 ten, 2 tens, 3 tens, 4 tens in a small group at the start of the build, assisting students to then figure out the total using the tens and ones, as opposed to counting 10, 20, 30, 40. This shows support students that the tens are just like the ones – they mostly already know how to count up to and say 10-99 from their knowledge of 1-10.

Extension: During the independent work time, when the sand timer goes off to record their current total, work out how many more they would need to make 100. Write this in red in their second column of the recording template, "4 tens 3 ones = 43 57 to go!"

When you bring back students to the whole-class circle, start with these students so that they can provide extra modelling for the rest of the class. When they have finished their part, ask them to stay in the circle but quietly work out how many more cubes they would have need to make 100, then 200, then 500, then 1000 from their final total.

Once they figure this out, they could then combine their set with a fellow extension student and solve the two-digit addition by adding their two sets of cubes together. Emphasise for them to combine the tens first, then the ones, using a split strategy to solve the addition, for example,
45 + 56
4t and 5t = 9t
5 ones + 6 ones makes 1t and 1 one (extra ten from the ones we combined), so it's 10t1 or 101.

Tens-ones Lesson 2

Race to 120

Learning intention: Make tens and record your numbers in place value form
Maths vocabulary: ten (10 ones), place (ones place, tens place), place value form ("__tens ___ ones", 't' to represent 'tens'), rename (10 ones is 1 ten)

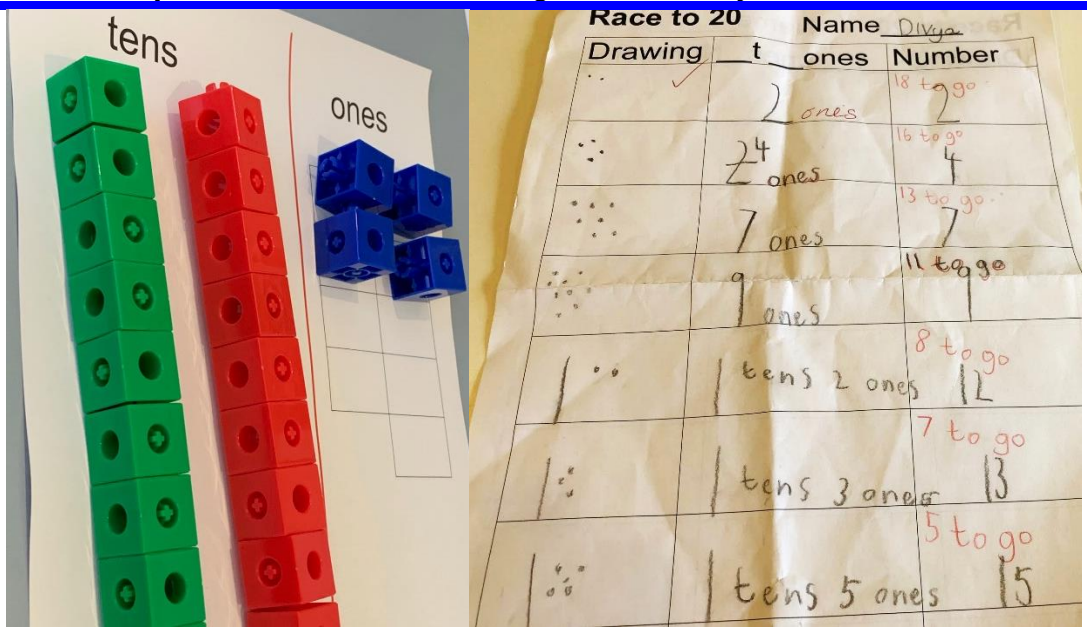
Real-life racing link*:* Since this lesson is a race between partners, link it to formula 1 car racing using this clip youtube.com/watch?v=0lj6Q9gN4RQ This clip is also full of dramatic racing moments: youtube.com/watch?v=SBi92AOSW2E. Now, get your number engines ready, set, go! The teacher could even make a mini racing flag, like the one they wave at the Grand Prix, for extra engagement!

Lesson summary: Students race to reach 120 cubes before their partner, rolling a 10-sided die to add to their ones, bundling and renaming their cubes into tens whenever they have more than 9 in the ones. Each turn, students say and record their running total in tens and ones language (*place value form*: 4 of the tens, 2 of the ones = 4t 2).

Materials:

- 10-sided dice.
- Connectable cubes.
- Nine-frame T-O chart on following pages or from this unit's folder. Each student plays on their own chart, then exchanges dialogue with a partner who is racing against them on a separate chart.
- Race to 120 recording template from this unit's folder.

Best set-up: Fishbowl model, then regular like-ability maths buddies.

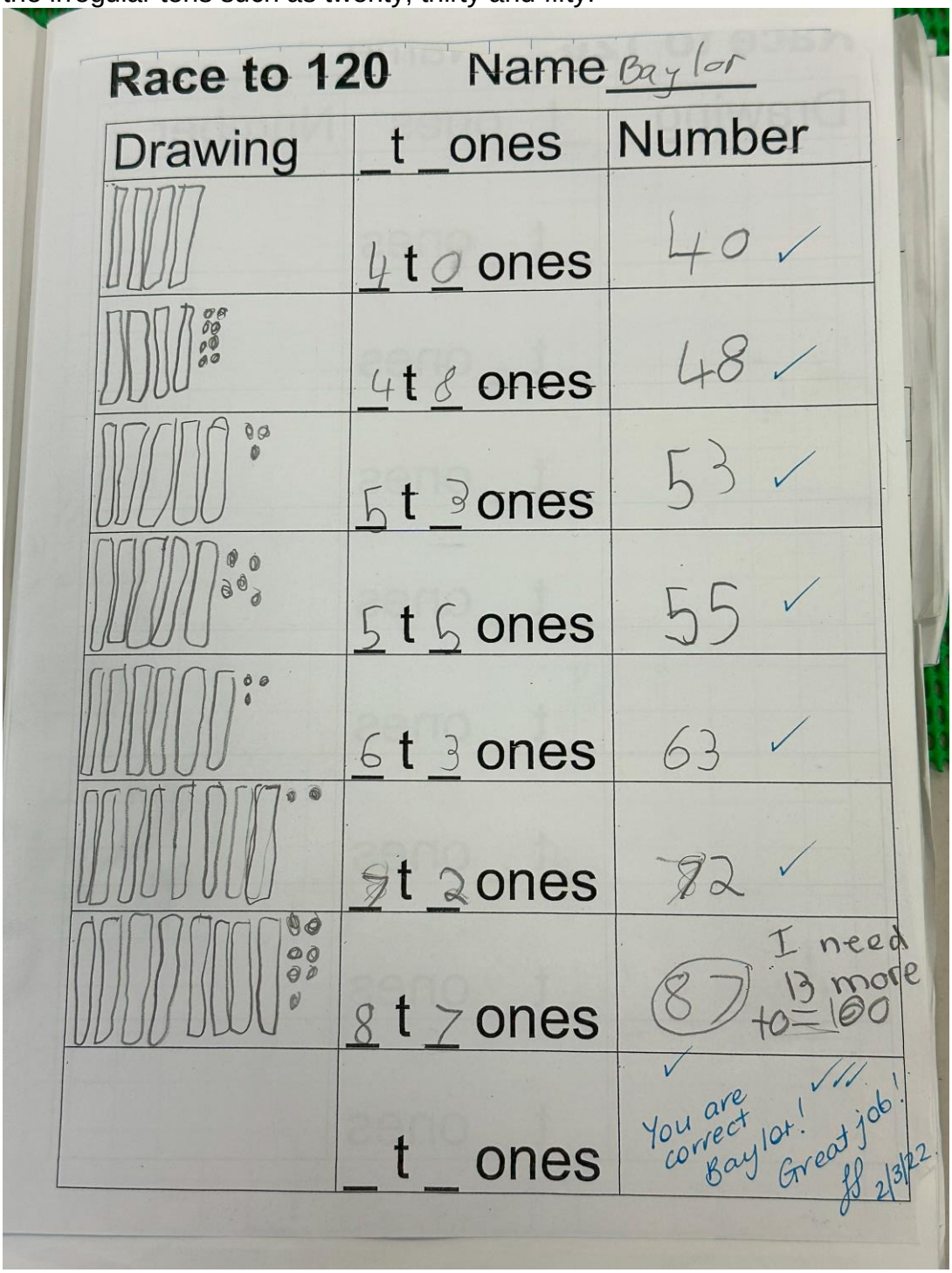


Students record as they play using 'tens' or 't' (place value form), 1t 6 = 16.

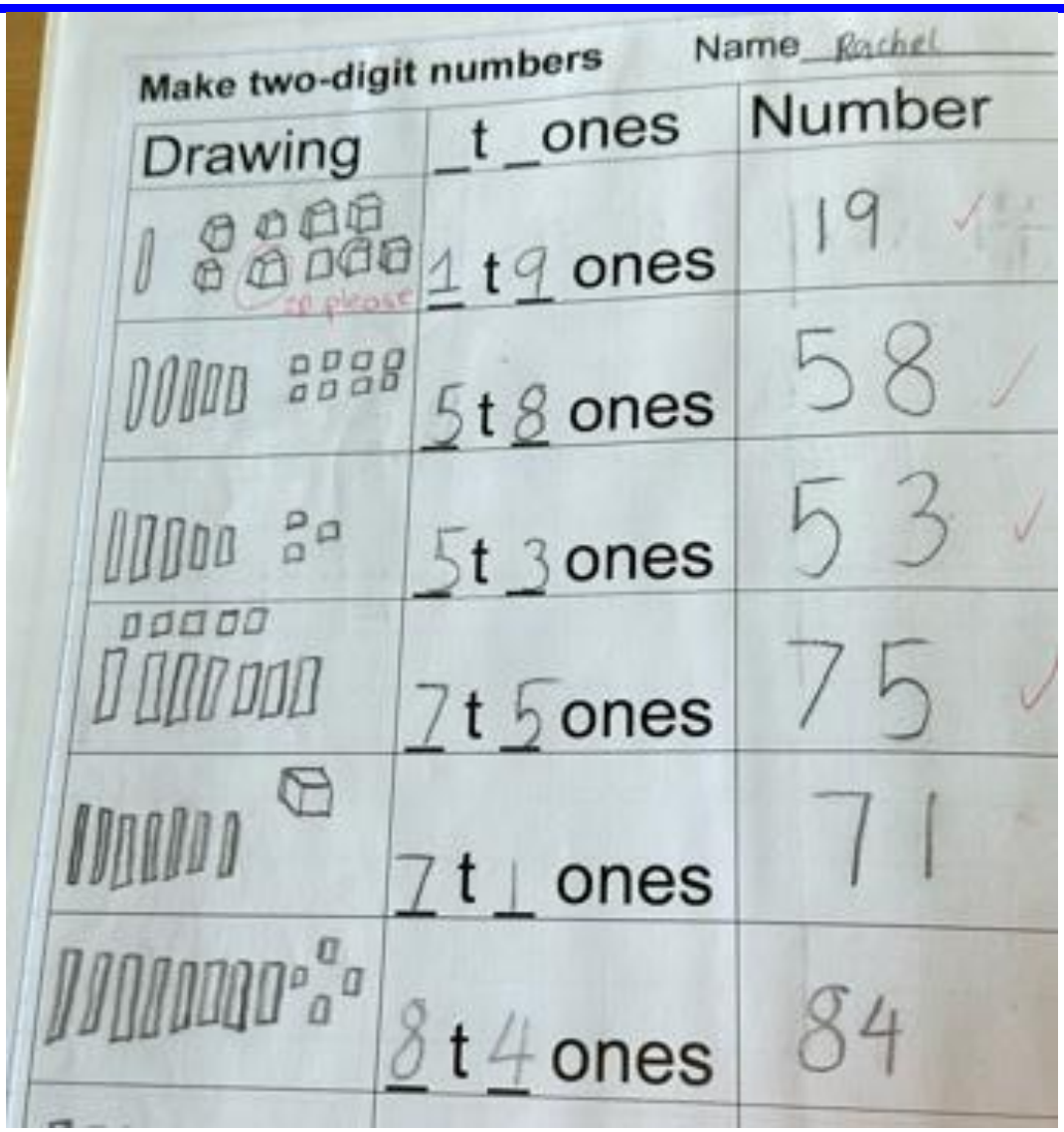
This Race to 20 recording template is also in this unit's folder, although students generally use the Race to 120 recording template for this session.

The year 1 (term 1) student sample in the right-hand side photograph shows the same game but with a 'race to 20' context for the first session. Extension students were also asked to record, using red pencil, how many more blocks they need to make 20 (finish the race).

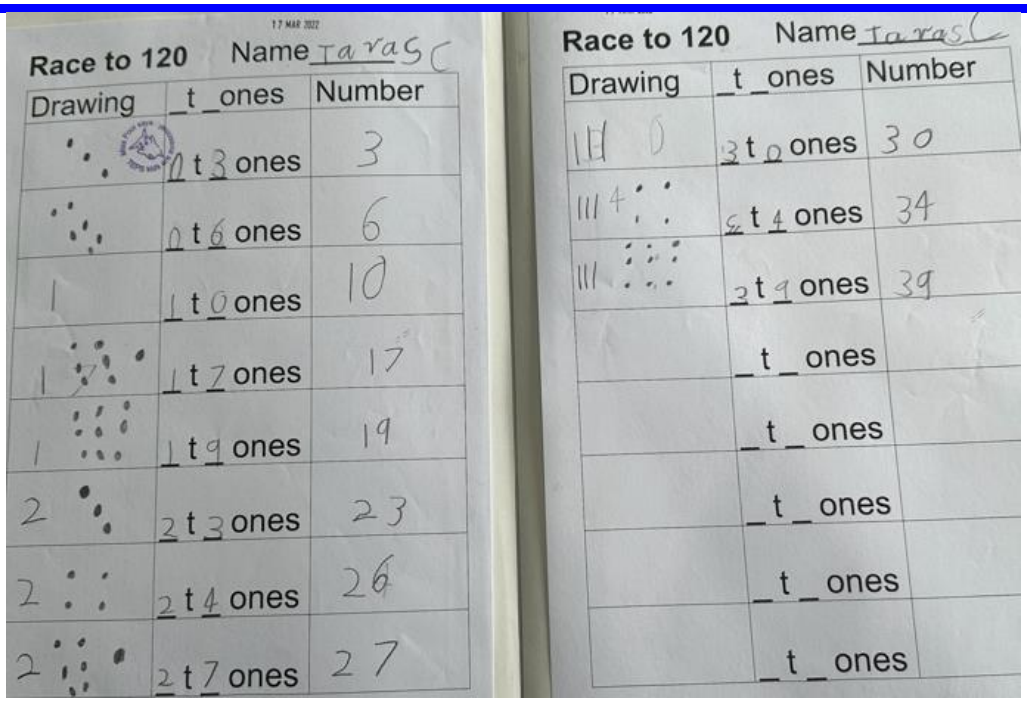
For the first session, consider asking the class or support students to start at 60 (with 6 complete tens built into the tens place before they start rolling their dice) and race to 100, or starting at 40. This consolidates and focuses on the two-digit numbers that follow the language pattern (6t2, 7t5, 8t9), avoiding the irregular tens such as twenty, thirty and fifty.



Student work sample from Thomastown East PS



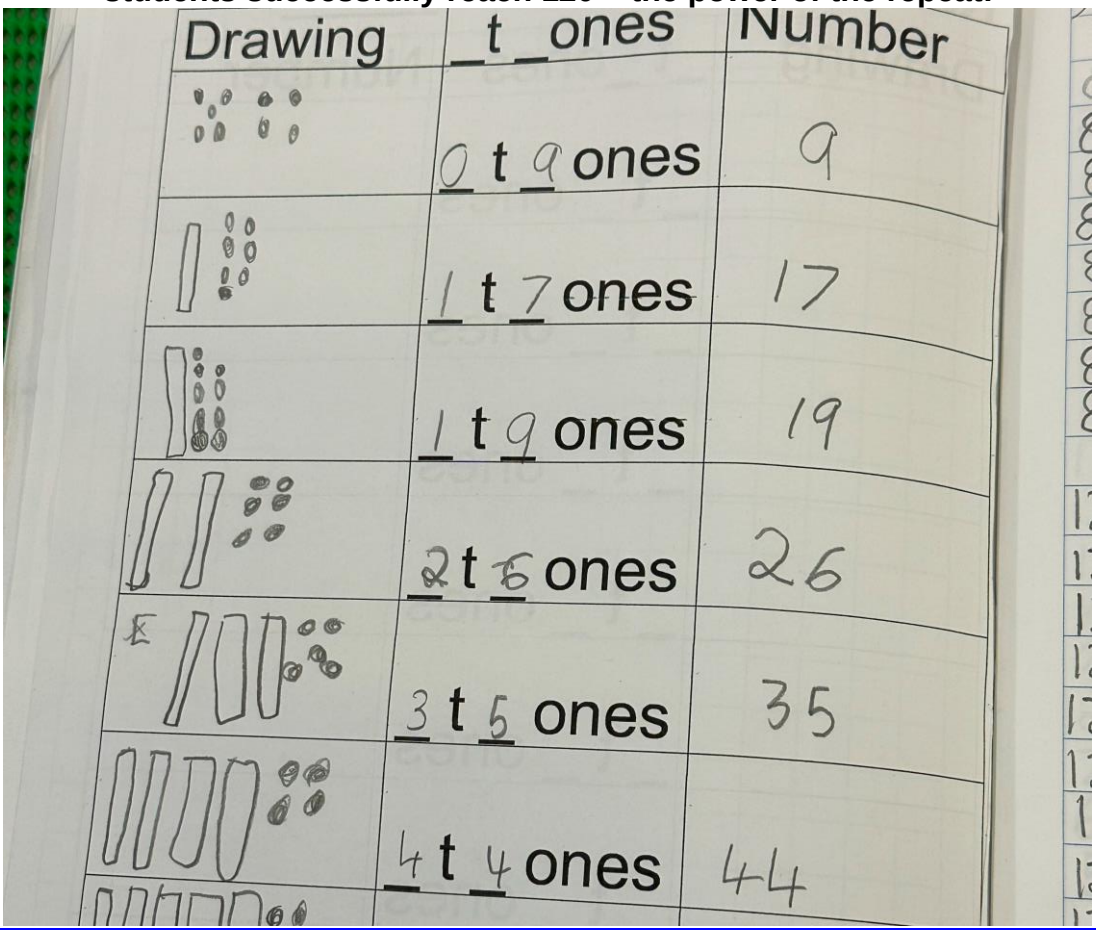
Student work sample



Race to 120 Name Tarasc		
Drawing	_t_ones	Number
	0 t 3 ones	3
	0 t 6 ones	6
1	1 t 0 ones	10
1	1 t 7 ones	17
1	1 t 9 ones	19
2	2 t 3 ones	23
2	2 t 4 ones	26
2	2 t 7 ones	27

Race to 120 Name Tarasc		
Drawing	_t_ones	Number
IIII 0	3 t 0 ones	30
IIII 4	3 t 4 ones	34
III	3 t 9 ones	39
	_t_ones	
	_t_ones	
	_t_ones	
	_t_ones	
	_t_ones	

Continue from your running total during a repeat session, until most students successfully reach 120 – the power of the repeat!



Drawing	_t_ones	Number
	0 t 9 ones	9
	1 t 7 ones	17
	1 t 9 ones	19
	2 t 6 ones	26
	3 t 5 ones	35
	4 t 4 ones	44

	Modelling: Model for students to roll their die, then collect that number and put it into the ones. Finally, combine the ones into ten if they have enough to make ten. If students start making their ten before they collect the full number they rolled, they often forget how many to collect. Encourage students to collect a new colour for each roll, which also helps avoid confusion. There are 9 spots in the ones place – when you reach ten or more (so the cubes can't fit in the ones), you need to rename them, since 10 ones is worth 1 ten. The 10 ones cubes that have been bundled together then belong in the tens place as 1 ten. Use the word 'renaming' to explain this – you have 10 ones, but you can just call it by its nickname: '1 ten.' That doesn't change the number that it is – we have nicknames, but we are still the same person! We call these 'two-digit numbers,' the first digit shows how many tens you have, the second shows how many ones. Which place is worth more? If you were trying to get more than your partner to win the race, which digit would you want to be larger, the tens or the ones place? Point out that students must watch their partner very closely to ensure they only collect the number of cubes they rolled on the die. Each turn, student A *must* also read their current number to student B in tens and ones place value form, "I have 2 tens and 8 ones – I have 28," otherwise they must give the number they rolled over to their partner. If there is a disagreement over the tens and ones total, players can call across the umpire (teacher) to adjudicate. **Misconception alert:** Avoid races to 100 (use 120 instead) because some students then encounter difficulties bridging over 100 and think that 200 or 1000 comes straight after 100 or 110.
	Questioning: • What do you have at the moment? Can you read it to me in 'tens and ones,' for example, "I have 7 tens and 4 ones, I have 7t4 or 74." • If I gave you this extra tower of ten, what do you have now? • What if one of these towers of ten was lost (take away one of their towers as you ask this), what do you have now?
	Support: Roll a 3-dot or 6-sided dice instead, which reduces the number of cubes to add each turn and makes it less likely to cause confusion. Start at 60 and race to 100 to focus on the easier two-digit numbers that follow the language pattern of 't-ones,' such as 6t4, 7t8, 8t9, 9t2.
	Support: Use the Race to 40 templates from this unit's folder, which use ten frames rather than the t-ones chart set-up. This provides students with more support to visualise each ten and name their running total, 'I have 3 tens and 2 ones, I have 32.'

Extension 1: After each turn, figure out how many more they need to reach their next ten. This builds the 10 facts.

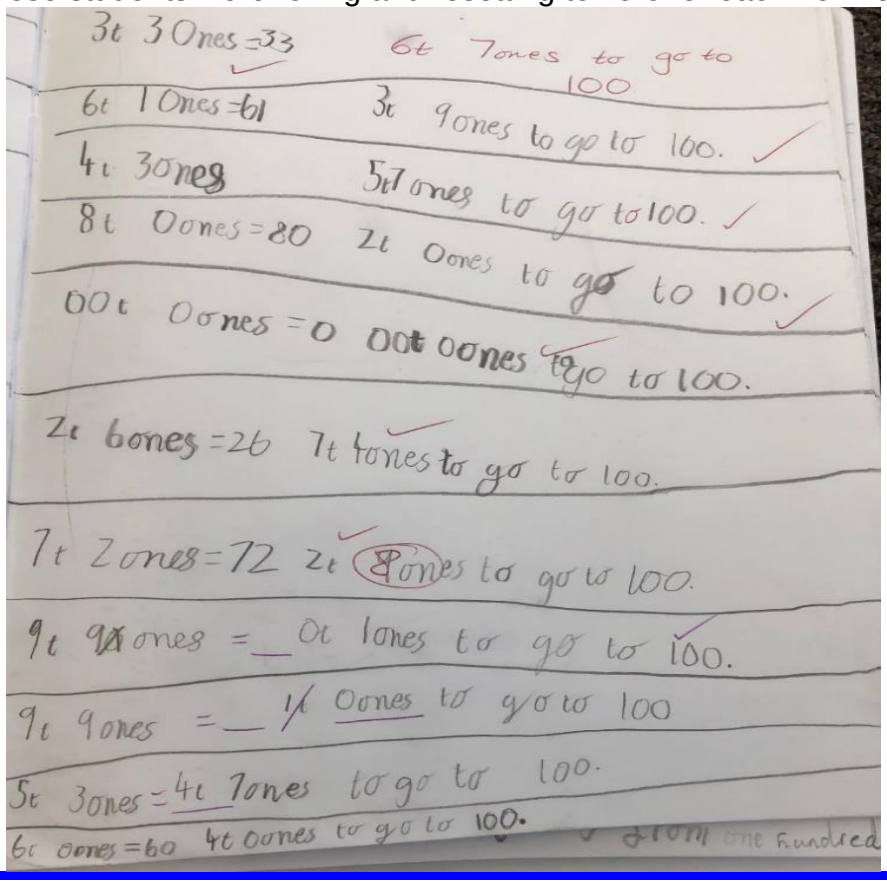
For example, the student ends that turn at 46.

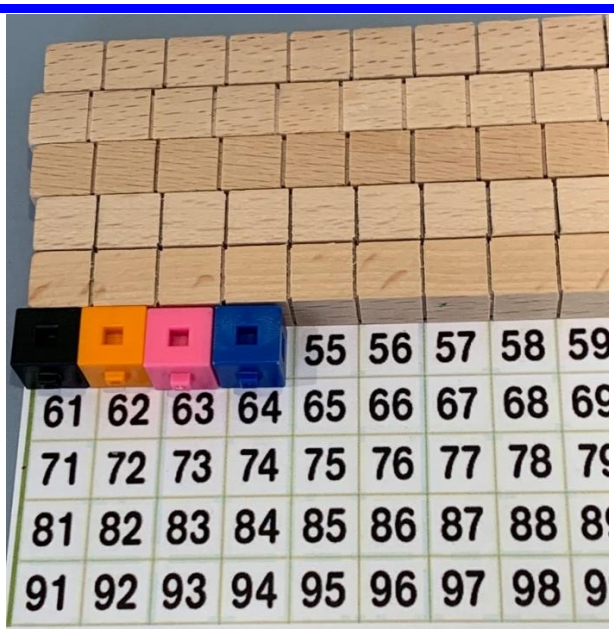
They write: 4t6 = 46
(I need 4 more to make 5t = 50).

Extension 2: Race to 100 instead of 120, using place value blocks (MAB) on top of the mini place value charts from this unit's folder (photo on next page). Each turn, work out how many more they need to reach 100 and finish the race. In their head, work out the extra ones they need to finish their current ten (building to the next ten), then count the tens (rows). For example, if the student currently has 54, first work out how many more ones they would need to get to 60 – 6 more. Then work out how many more tens to 100, you need 4 more tens, so you need 4t6! Write this down in red pencil as an extra challenge.

Student work sample of the extension

(these students were rolling and resetting to zero for each new roll)

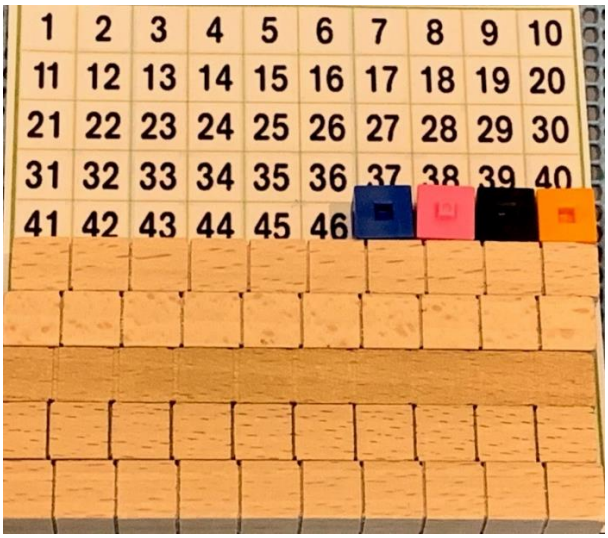




= 5 tens 4 ones = 54

Lift the last ones block to read the total, “Peek-a-boo, what number are you?”

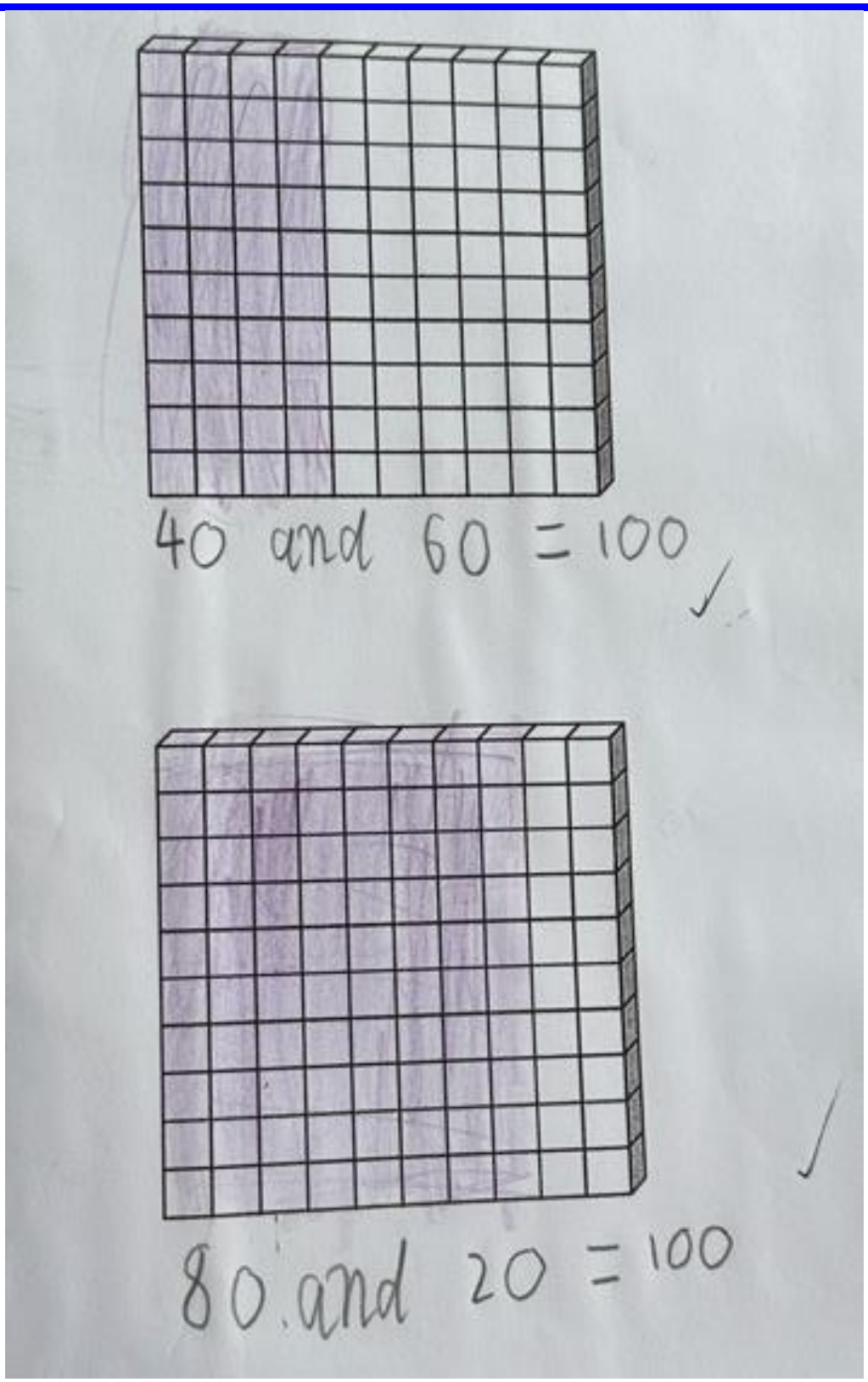
Students then push all blocks to the bottom right-hand side of the chart to see that this matches their answer to ‘how many more to make 100’:



= 46 to go

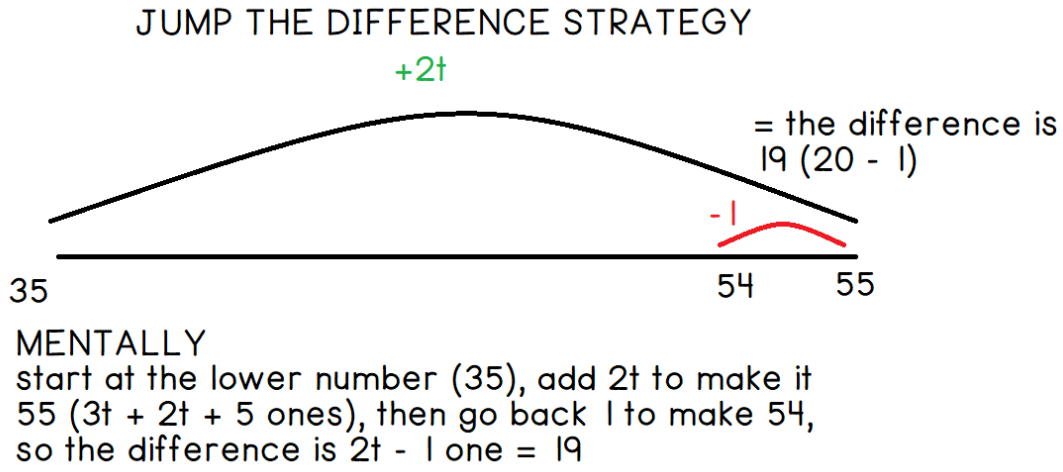
54 + 46 makes 100 (as shown by making the blocks from the top at first for the running total, then pushing them down to check their answer to ‘how many more to make 100’). **Misconception alert:** Students will often say 54 + 56 makes 100, forgetting to account for the ones combining to make another ten. Alert students to this common misconception.

Once they reach 100, race to 200 using place value blocks, using 2 hundreds MAB blocks as their gameboard (each student has 2 hundreds blocks and rolls to collect ones to fill it, renaming tens as needed). Work out how many more they need to reach 200 each turn.

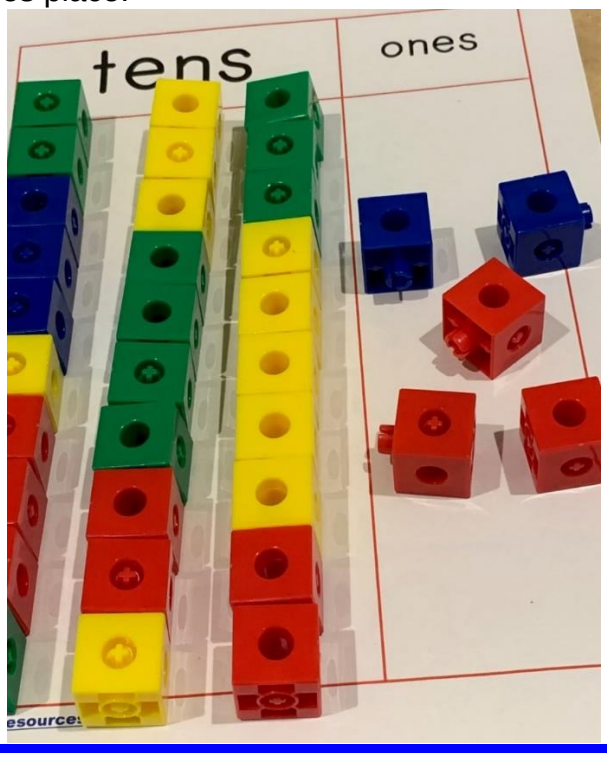


Template 1 or Template 2: Starting with tens at first, and later use ones too, working out how to make 100

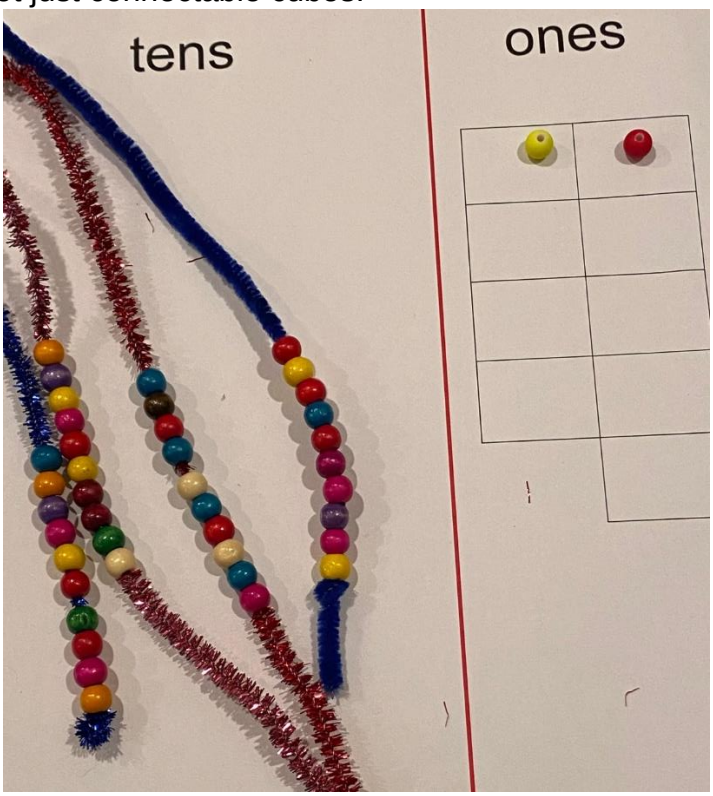
Extension 3: Each turn, figure out the difference between their total and their partner's current number. For example, I have 54 and my partner has 35. The difference is 20 take away 1, so I am winning by 19. Record this in red pencil. Use a 'jump the difference' strategy to work this out mentally if possible, then check using number line recording in their books:



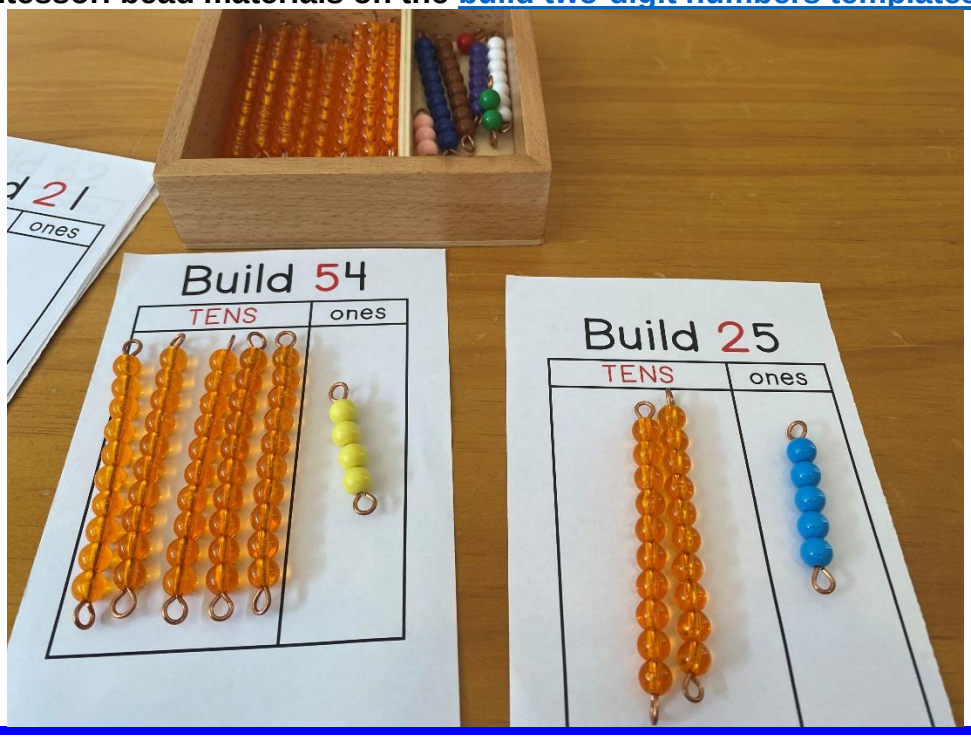
Variation 1: For a repeat session, use an unsupported tens-ones chart without the 9 frame (just an A4 page folded in half with tens ones written as the headings). A printable T-O chart template without the 9-frame is available from this unit's folder. Encourage students to arrange their ones so they are easy to see, for example, 8 as 4 and 4 on the dice. This challenges students to remember to rename ten ones into ten, without the supportive cue of the 9-frame in the ones place.



Variation 2: Use beads and pipe cleaners, instead of connectable cubes, to ensure students can flexibly apply their understanding of tens and ones to all materials – not just connectable cubes.

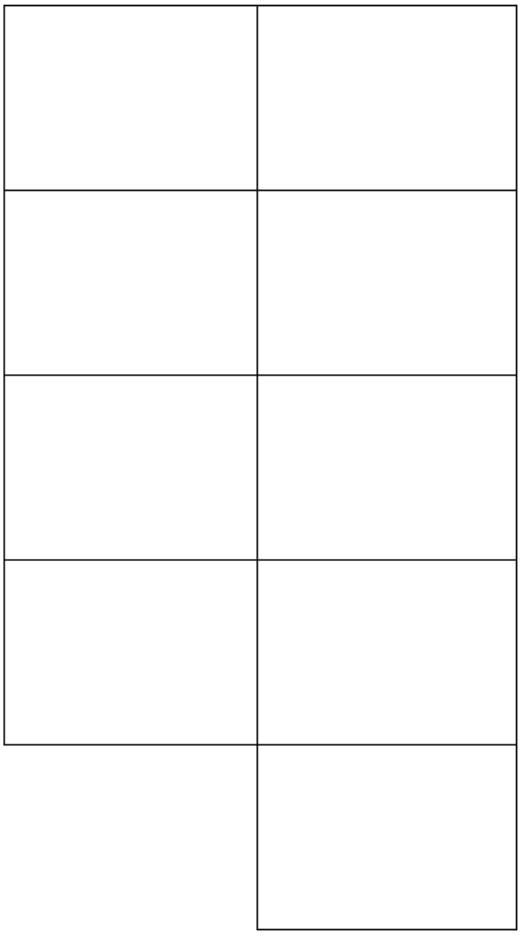


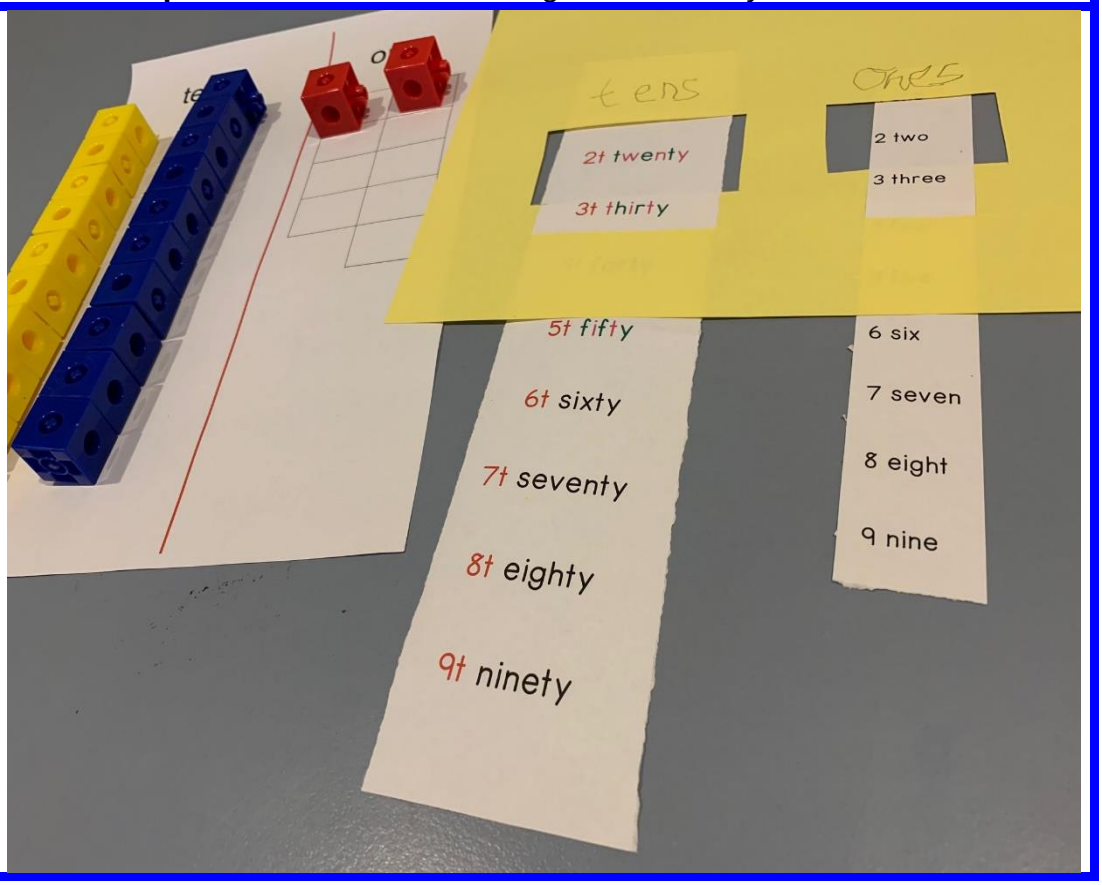
Montessori bead materials on the [build two-digit numbers templates]:

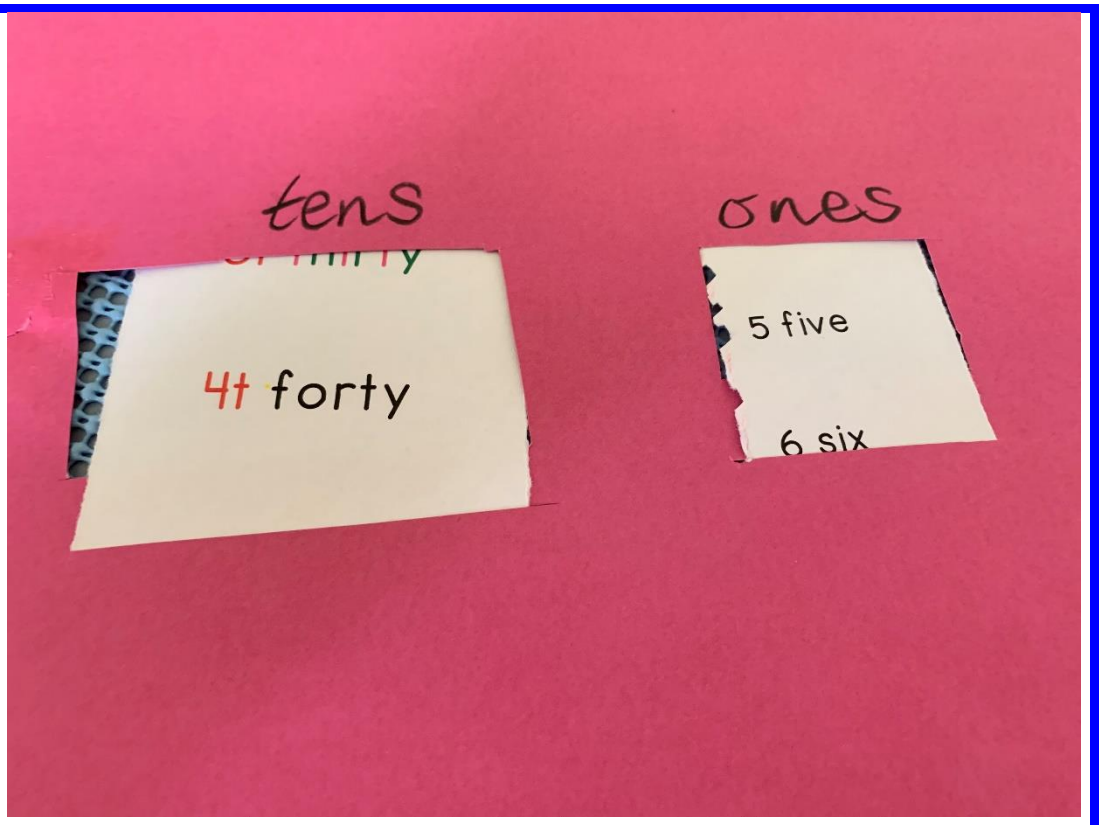


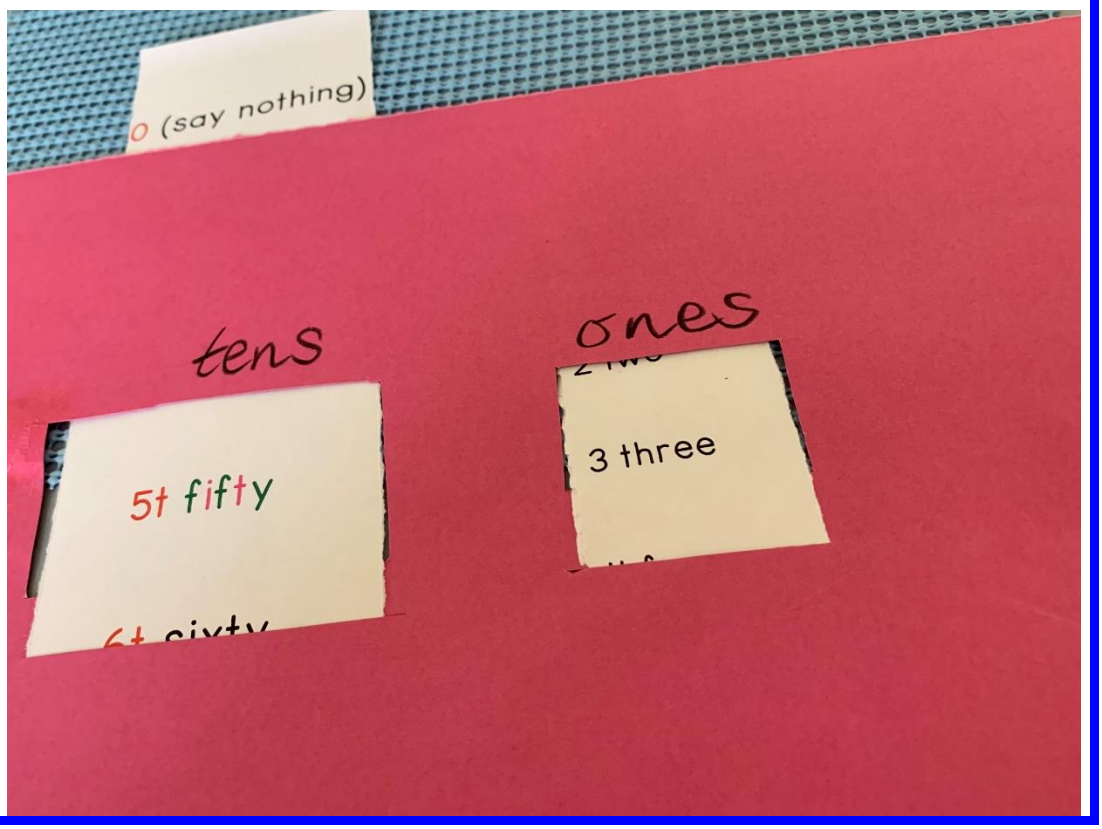
tens

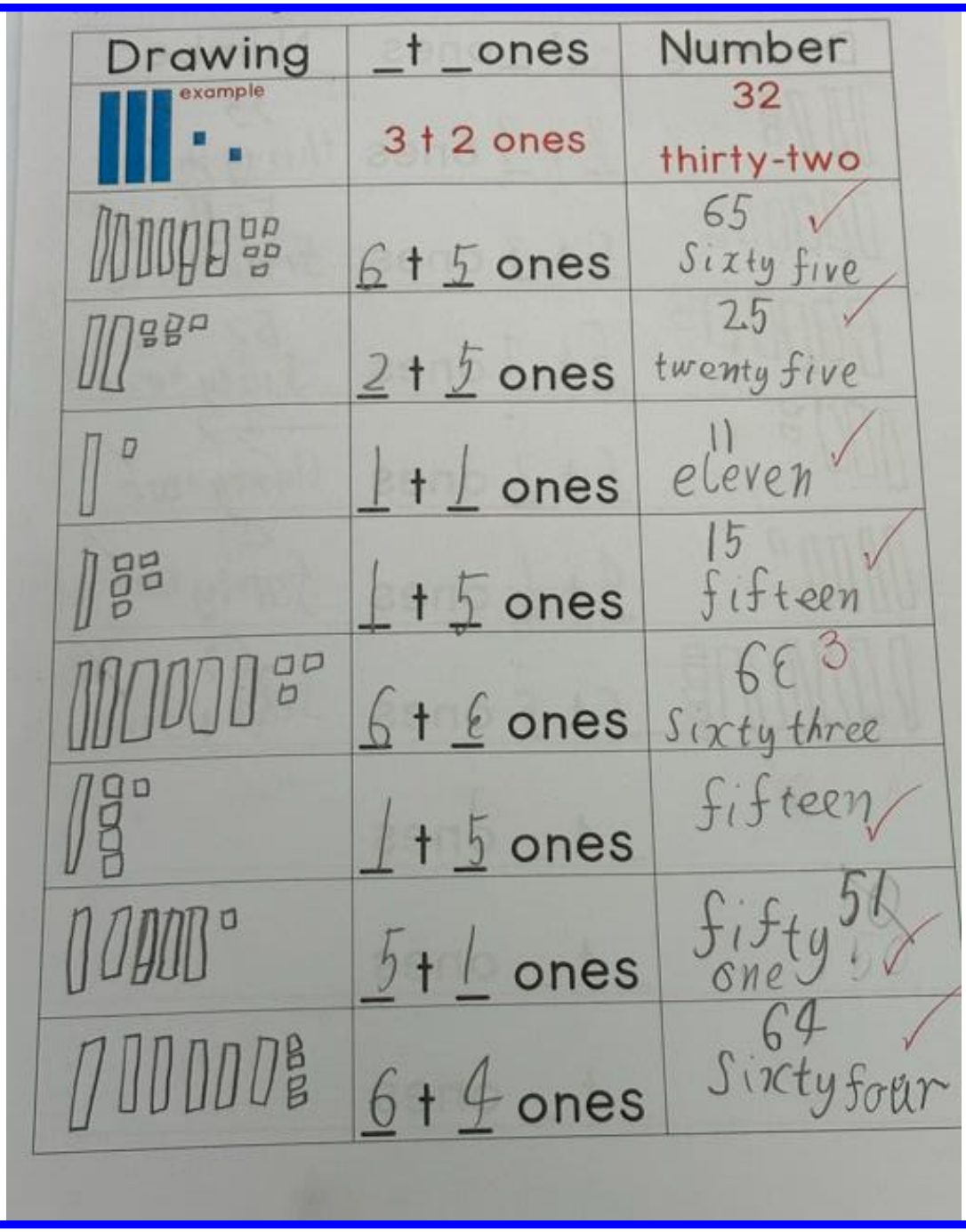
ones



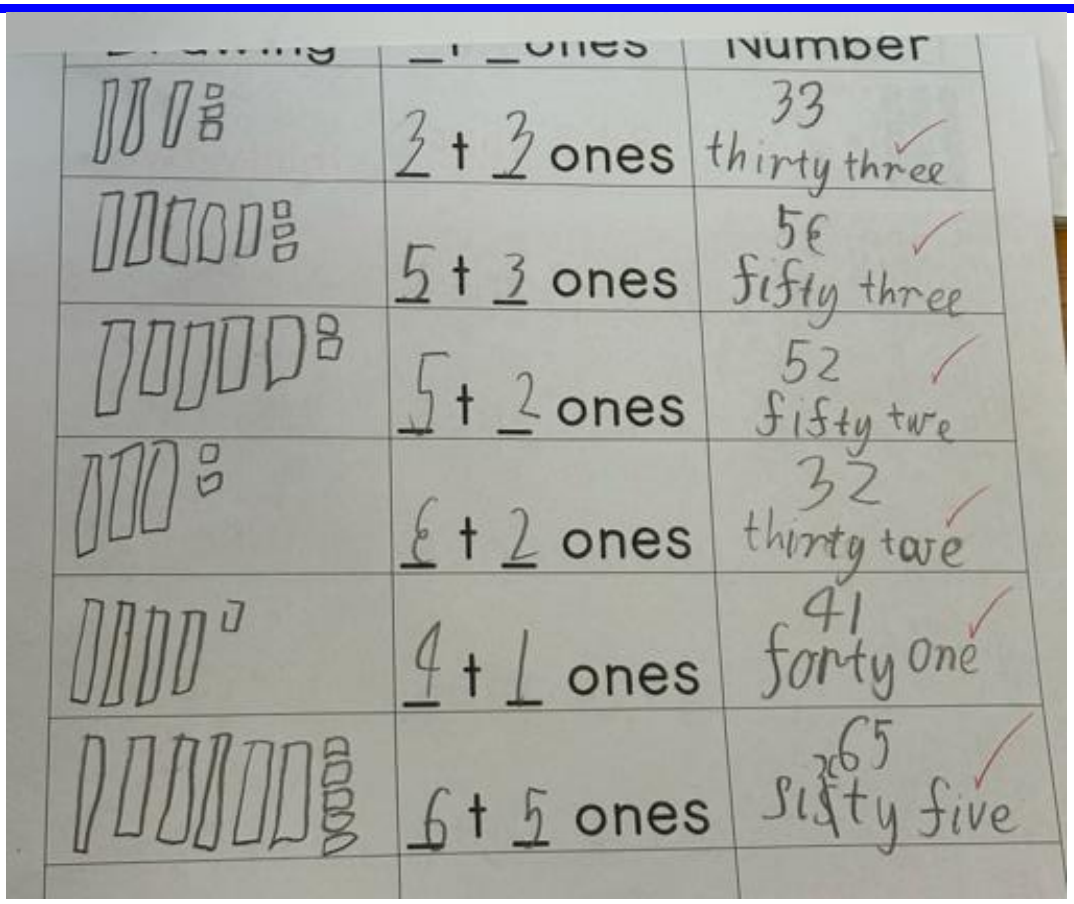
Tens-ones Lesson 3	**Worded Form Sliders** **Learning intention: Correctly say and write two-digit numbers** **Maths vocabulary: 'ty' meaning how many tens, worded form**
YouTube hook: If one big step is roughly one metre, guess how many metres long the longest waterslide in the world is? Lay out a 1m measuring tape for students to visualise the size of one metre before locking in their guess. It is 1111m in length! That is over 1km (1000m)! Watch someone ride the longest waterslide in the world: youtube.com/watch?v=A05XO183NVs&ab_channel=GezenAdam	**Lesson summary: Students use supportive sliders to write the worded form of two-digit numbers (excluding teen numbers), while also making these with materials alongside the slider.** **Materials:** • Worded form sliders templates from this unit's folder. The crazy colours of this template highlight the numbers that do not follow our regular language pattern (fifty instead of 'fivety'). • A4 paper with 2 small rectangles and 2 slits below these, cut using a Stanley knife. • T-O chart or Nine frame T-O chart from this unit's folder. • Connectable cubes. **Best set-up:** Fishbowl model, then regular like-ability maths buddies. 







Drawing	_t _ones	Number
example	3 t 2 ones	32 thirty-two
	6 t 5 ones	65 Sixty five
	2 t 5 ones	25 twenty five
	1 t 1 ones	11 eleven
	1 t 5 ones	15 fifteen
	6 t 3 ones	63 Sixty three
	1 t 5 ones	fifteen
	5 t 1 ones	51 fifty one
	6 t 4 ones	64 Sixty four



Student work sample from Thomastown East PS

Modelling: Student A makes a two-digit number in the chart as tens and ones using connectable cubes, or a similar material. Set the rule that there must be at least two tens (this avoids teens numbers). Tell students that this is because teens are tricky, as they do not follow our normal language pattern (a unit specifically focused on teens follows this unit – Place Value Unit 13).

Student B says the number that student A made with the cubes:
"3 tens 2 ones, 3t2."
Student B then uses the worded form slider to make 3 tens and two ones on the slider, which provides support to then say, "thirty-two."

Both students record using three columns:

Tens and ones	T-ones	Worded form
3 tens 2 ones	3t2	thirty-two (hyphen in the middle)

Student B now makes a different number and the process repeats.

So that both students can check their worded form for immediate feedback, students could access this very user-friendly website, which even includes the hyphen in the middle: lingojam.com/NumbersToWords

lingojam.com/NumbersToWords

Questioning:

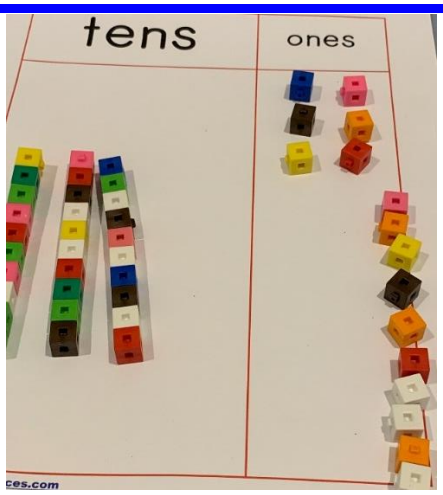
- Which tens numbers sound normal? Which tens numbers sound a little crazy? Like, 'thirty-two,' it should be 'threety-two!'
- What is the highest tens number you can make?
- Can you ever have more than 9 in the ones? How/why not? If I make a number like this (put 3 tens in the tens place and 12 ones in the ones place), what is that number really?

Whole-class circle: Students sit in a circle. Go around and ask students to say a two-digit number, for example, 8t4. The teacher writes this number on the board as '8t4.' Students keep their faces normal if the number follows the normal pattern, 8t4 sounds like eighty-four. BUT, if the number does not follow the normal pattern, like 2t2 'twoty-two' instead of twenty-two, they all make a crazy face! For crazy numbers, the teacher says, 'twoty-two' and the class chorus back, "twenty-two" (crazy faces).

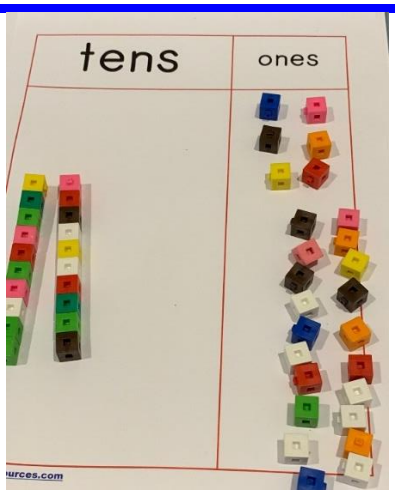
Support: Use mixed-ability pairs (mid-range students with support students) to ensure support students hear the two-digit numbers correctly many times as part of the partner exchange of dialogue.

Extension: Use the T-O chart without the 9-frame and connectable cubes to practise renaming the two-digit numbers. For example, let's say student A makes 4t6. Both students record the place value and worded form like the rest of the class (4 tens 6 ones forty-six). However, student B also breaks one ten apart, placing these 10 ones in the ones columns, then recording: 3t 16 ones. Break another ten, record, 2t 26 ones. Break another ten: 1t 36 ones. Break the final ten: 46 ones. Numbers have heaps of different names (nicknames); this is how you rename numbers.

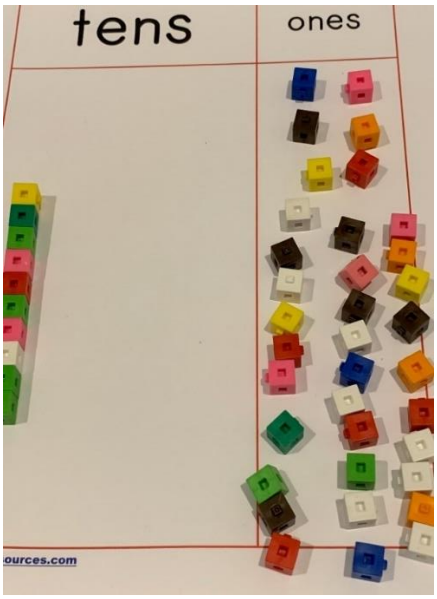
Start with the regular way to make 46 (the name on its birth certificate): 4 tens 6 ones:



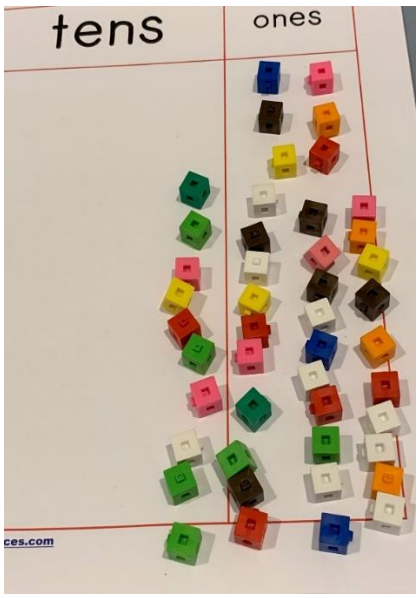
3 tens and 16 ones



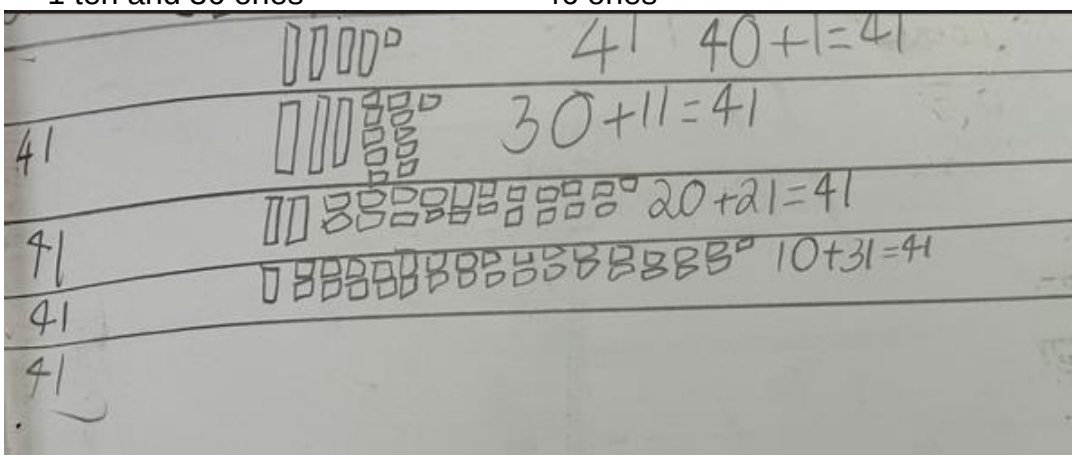
2 tens and 26 ones



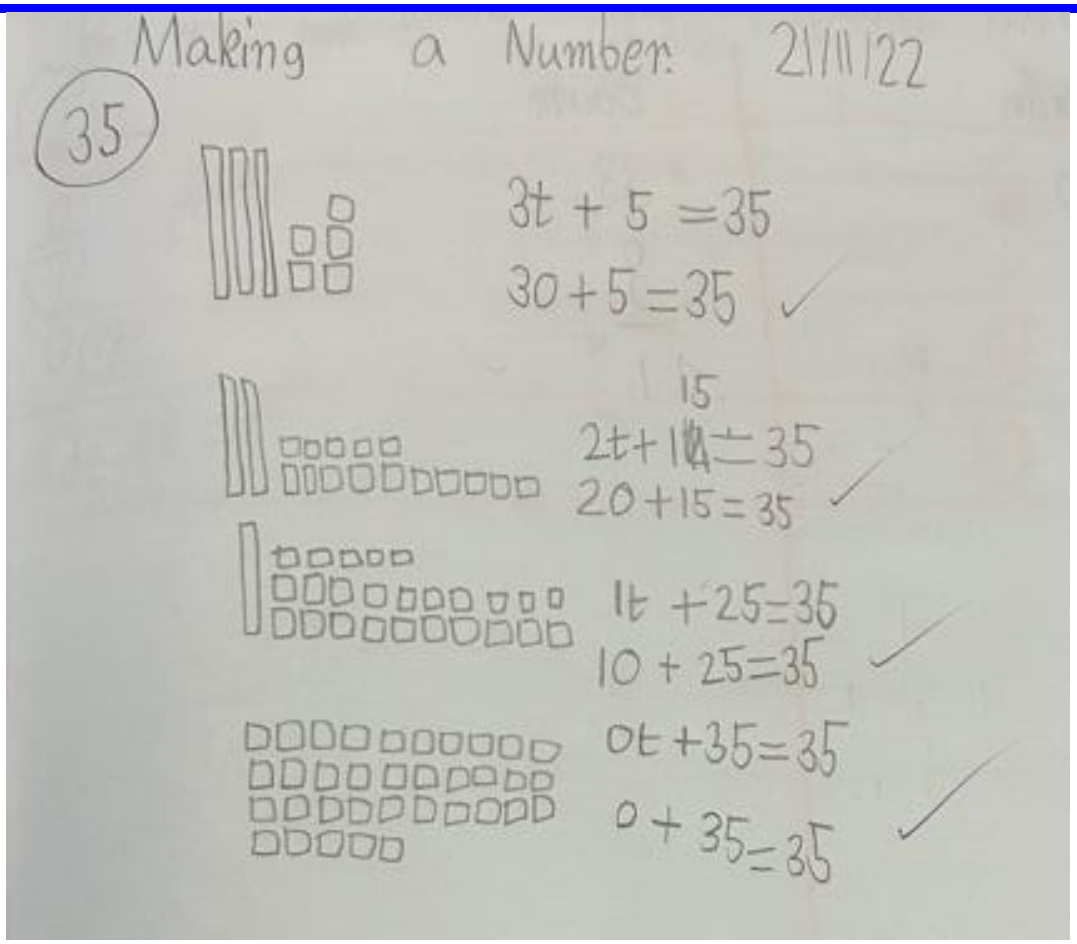
1 ten and 36 ones



46 ones

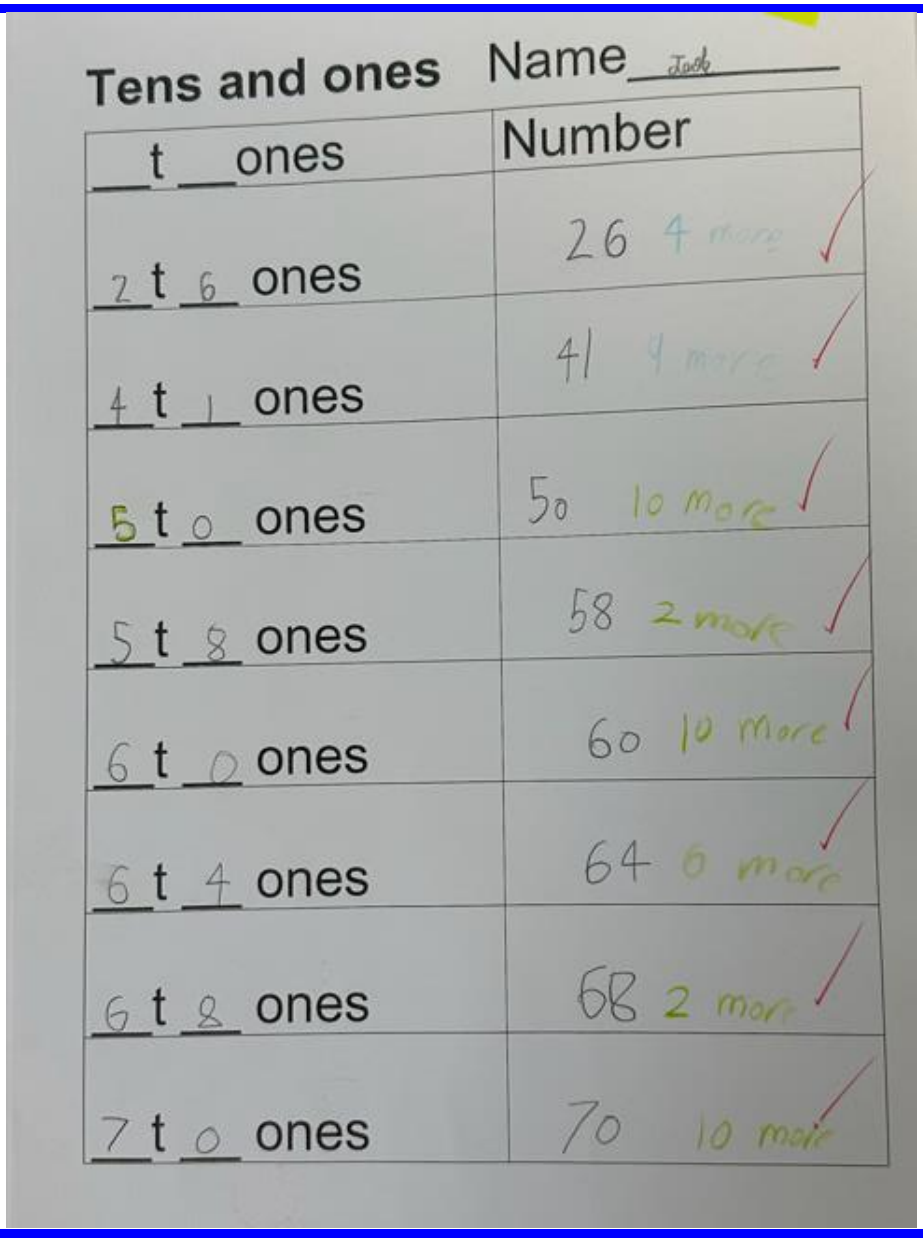


Student work sample of renaming 41 by breaking tens into ones physically with materials that can break (unifix cubes)



Renaming 35 by breaking each ten, one at a time, into ones

Tens-ones Lesson 4	**Abacus Tens and Ones** **Learning intention: Make two-digit numbers and record them in place value form** **Maths vocabulary: ten (10 ones), 't' and 'ty' for tens, left, diagonal, across**
Maths history*:* Introduce students to abacuses. Before phones and calculators were invented, people used abacuses like this (show an abacus to the class) to count and work out how much they needed to pay for food and other items they would buy at the local markets.	**Lesson summary: Students make two-digit numbers using an abacus, saying the number using tens and ones language and worded form.** **Materials:** • Abacuses – 1 per pair of students. • Worded form sliders made during the previous lesson. • Tens and ones recording template from this unit's folder. **Best set-up:** Fishbowl model, then regular like-ability maths buddies. **Modelling:** Build on the previous lesson's work by emphasising that the abacuses are just like the connectable cubes, except they have already been connected for you on a rod. Model making a number by pushing across full rows, starting from the top of the abacus, then finally only pushing across a few on the last row you touch. Practise counting in tens, saying, 1 ten (touching the right-hand side of the pushed across row of beads), then 2 tens, 3 tens, 4 tens, 5 tens. Write down 5t to show 5 tens or 5 full rows. Model the pattern that many of the tens numbers can literally be said as '9 ***t*** 2.' The 't' stands for tens, that is why it is said as nine***ty***-two. **Partner work:** Start all beads from the left-hand side by tipping your entire abacus diagonally to the left. **Link to positional language:** left, diagonal, across. Student A pushes beads across, full rows at first then a few more from the last row of their choice. Student B then work out the number that student A made by counting, 1 ten, 2 tens, 3 tens, 4 tens, then how many ones are on the partly pushed across row, 4 tens and 5 ones, 4t 5, forty-five! Also record in words, using the worded form sliders for support as needed. Emphasise holding the abacus diagonally to make all the beads slide back to their starting point, before switching roles with their partner. 



Tens and ones Name Jack

__t__ ones	Number
2 t 6 ones	26 4 more
4 t 1 ones	41 9 more
5 t 0 ones	50 10 more
5 t 8 ones	58 2 more
6 t 0 ones	60 10 more
6 t 4 ones	64 6 more
6 t 8 ones	68 2 more
7 t 0 ones	70 10 more

Questioning:

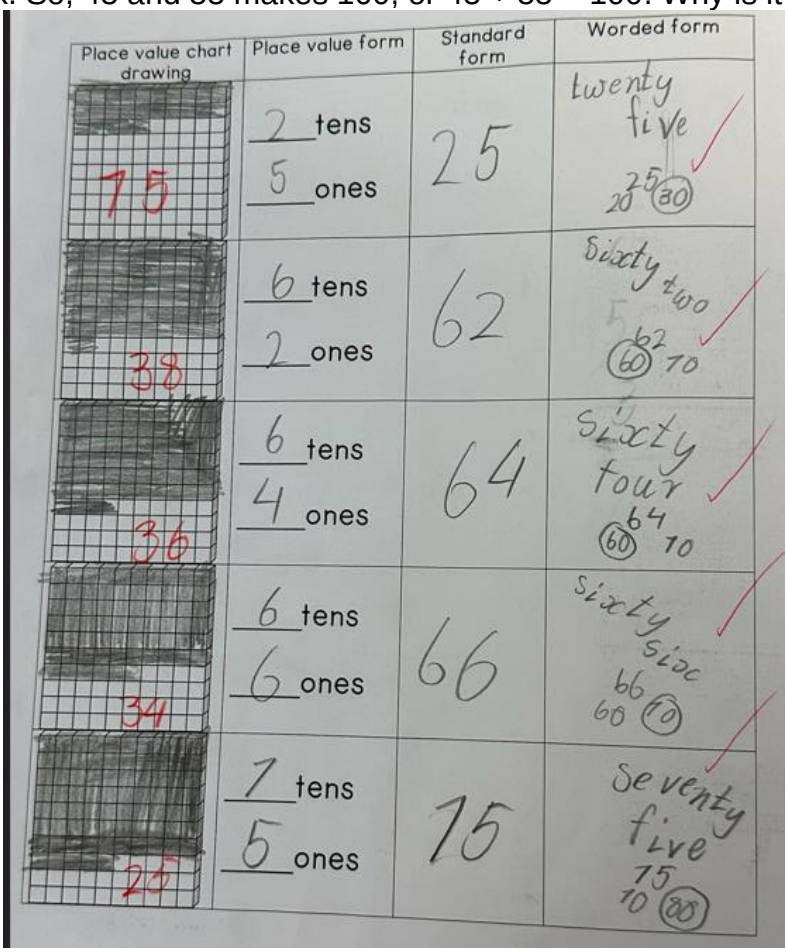
- How many beads are in each row?
- Why do we count by 10s, not 8s or 7s? Why is 10 the number we bundle things into most of the time when we want to count large collections? (Counting by 10s is easier than other numbers, because it follows an easy pattern. It is also the same as the number of fingers we have, so that is probably why 10 was chosen as our renaming number).
- What if you did not push across any single beads, just full rows, like this? What would the number be? What does the zero show? That there are no ones, or zero of the ones, just tens in the number. What if you didn't write the 0? Without the zero, the number would look like '6' instead of '60' or '6 tens' and we definitely do not have just 6 beads, we have 6 tens!

Support: Make an abacus that just has 2 or 3 rows. Students can then focus on making numbers in a few of the tens, such as 20, 30 and 40 only.

25 is 2 full rows or 2 tens and 5 ones, twenty-five

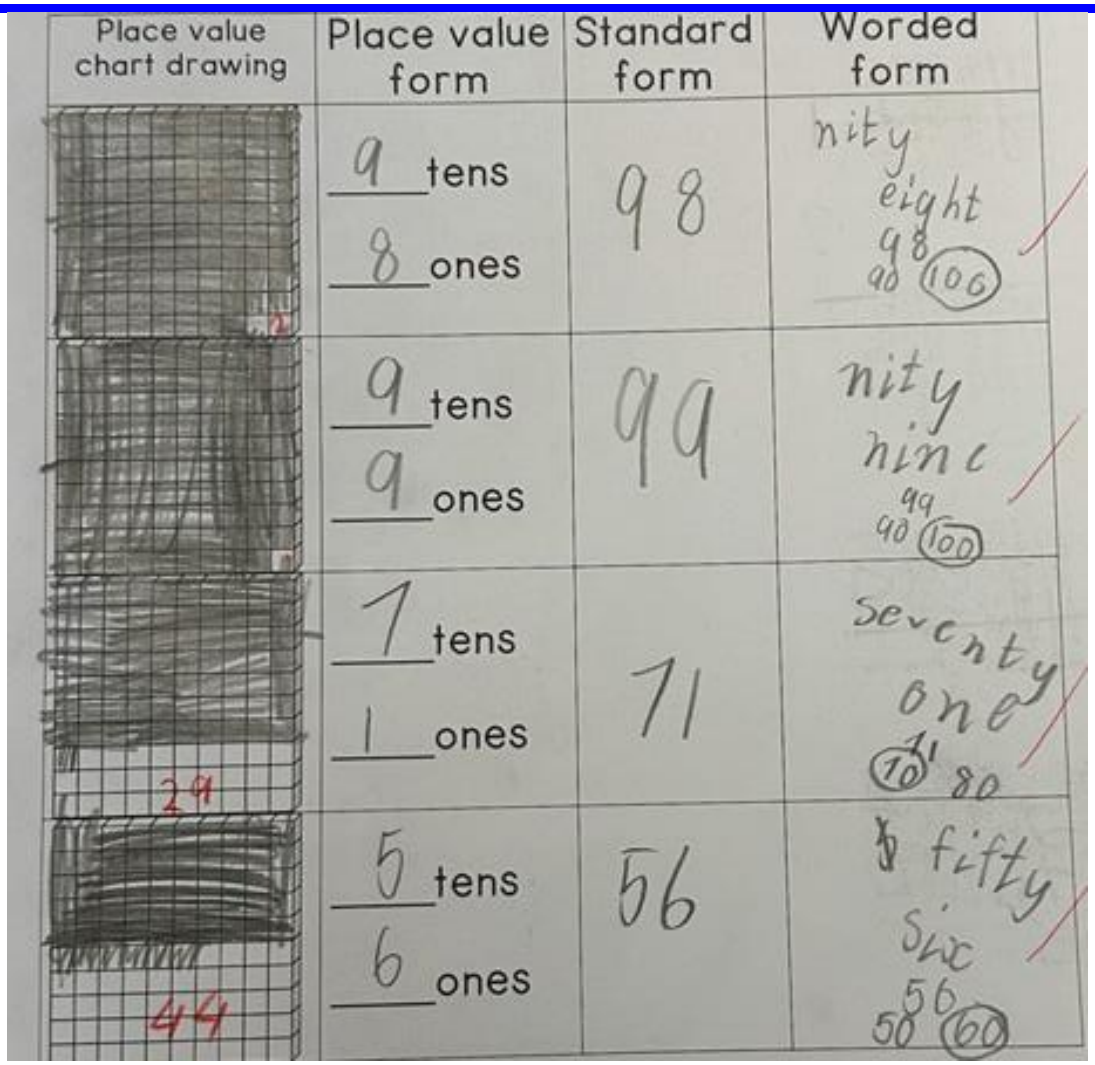
Extension 1: Rename each number they make in as many ways as possible. For example, 35 is 3 tens and 5 ones. It is also 35 ones. It could also be 2 full rows (2 tens) and 15 ones. Or 1 ten and 25 ones.

Extension 2: Work out ways to make 100 by using the abacus. For example, if student A made 45, what number will be on the other side of the abacus (how many beads were not pushed across)? Ask students to try to mentally work out what they think will be on the other side (hiding the abacus under the desk). Many students will say 45 **+ 65**, not accounting for the ten made from the ones. Now count what is on the other side in tens and ones to check. So, 45 and 55 makes 100, or 45 + 55 = 100. Why is it not 45 + 65?



Place value chart drawing	Place value form	Standard form	Worded form
75	2 tens 5 ones	25	twenty five
38	6 tens 2 ones	62	Sixty two
36	6 tens 4 ones	64	Sixty four
34	6 tens 6 ones	66	Sixty six
25	1 tens 5 ones	15	Seventy five

Template



The student is recording the way to make 100 in red (56 and 44 is 100), as well as recording place value form, standard form (digits) and worded form, in addition to rounding to the nearest ten. This is a fantastic example of the extending prompt (record it more ways/using more and different representations) in action.

Extension 3: Make a 3-row abacus using beads and pipe clears. Each row represents a different place value, i.e. ones, tens and hundreds. Make each place value a different colour. Create and record 3-digit numbers in all forms:

Place value form (rows of the abacus)	Standard form (numbers)	Worded form (words)
3h + 2t + 4 ones or 3h + 2t + 4u	324	Three hundred and twenty-four (use Google Translate, or lingojam.com/NumbersToWords, or Worded Form Sliders to provide support)

Variation: Particularly if abacuses are not available in the quantities you need, students can make their own using beads, pipe cleaners and 3 popsicle sticks for the frame (the teacher could superglue or glue gun the frames beforehand to make the process very quick – 1 at the top, 2 on the side, as shown below).

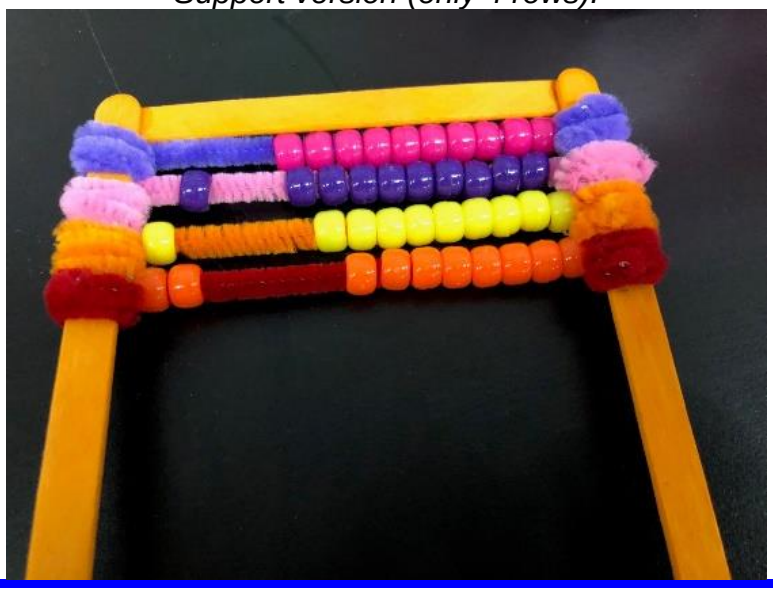
1. Bead the pipe cleaners – 10 on each.

2. Ask a partner to check there are 10 on each row.

3. Wrap each pipe cleaner around two popsicle sticks on either side.

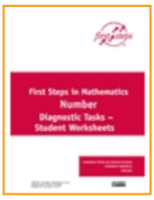
Student-made abacuses:

Support version (only 4 rows):



Follow-on: Students can also play ‘counting challenges’ with like-ability partners, continuing to count on an abacus, saying one number each until one student cannot count any further. Support students could simply count by ones; mid-level students by 10s, 5s or 2s; while extension students could count by 4s, 3s or 6s, pushing across that many beads and saying the running total each time. Students could double-check each turn using the constant function on the calculator for immediate feedback (+5 = = = = =).

Formative assessment – option 1:
myresources.education.wa.edu.au/programs/first-steps-mathematics/number
From this website page, download the free Number Diagnostic Tasks booklet from the WA Department of Education First Steps resources (available as a



Number Diagnostic Tasks
The Diagnostic Tasks for Number are designed to explicitly assess the student's understanding on the principles of counting.
Download file [10 MB]

free download)**:**
Use page 50 (refer to page numbers at the bottom – not PDF viewer pages) for most students, which relates to partitioning two-digit numbers into tens and ones for efficient counting. Use page 61 for extension students, which uses the same context but relates to renaming.

Lollies/Candies/Sweets

Name _____ Year/Grade _____ Date _____

Lollies can be bought as single lollies or in rolls of ten as shown here.

How many lollies are shown here? _____

Task based on Ross, S., 1989, Parts and Wholes and Place Value: A Developmental View, *Arithmetic Teacher*, 36 (6), p 47-51

FIRST042 | First steps in Mathematics: Number - Diagnostic tasks - Student worksheets
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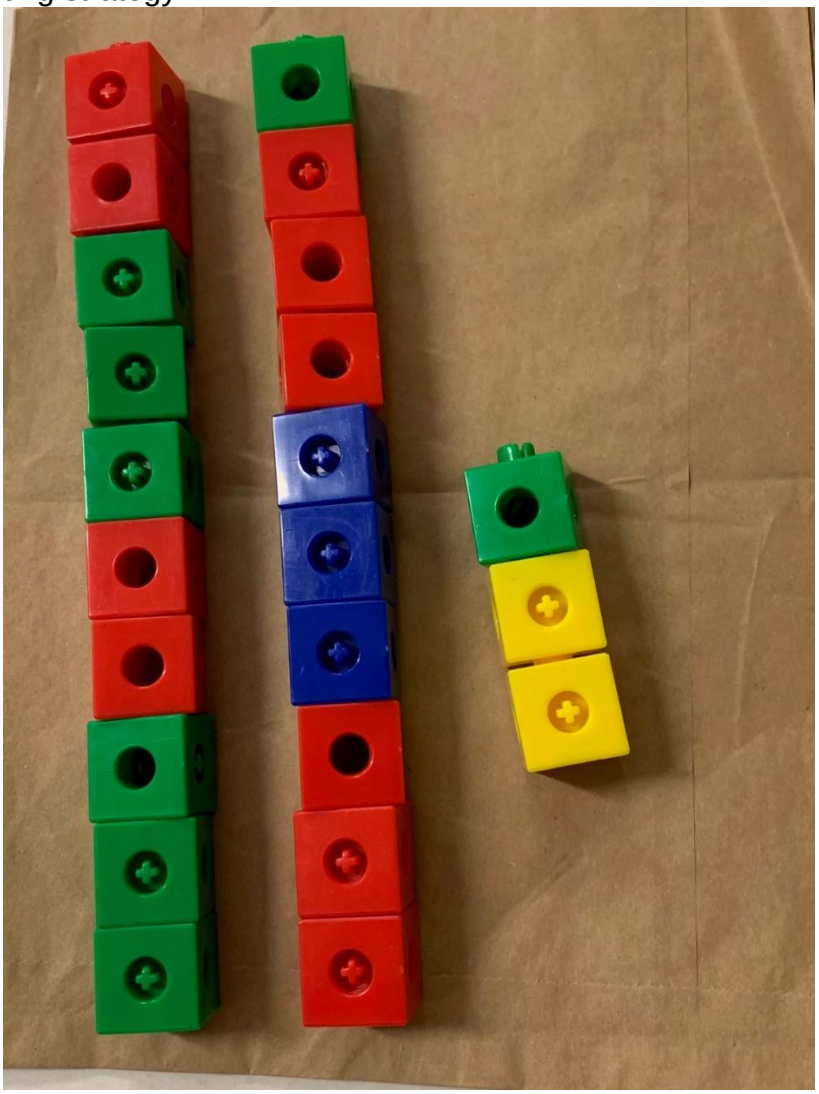
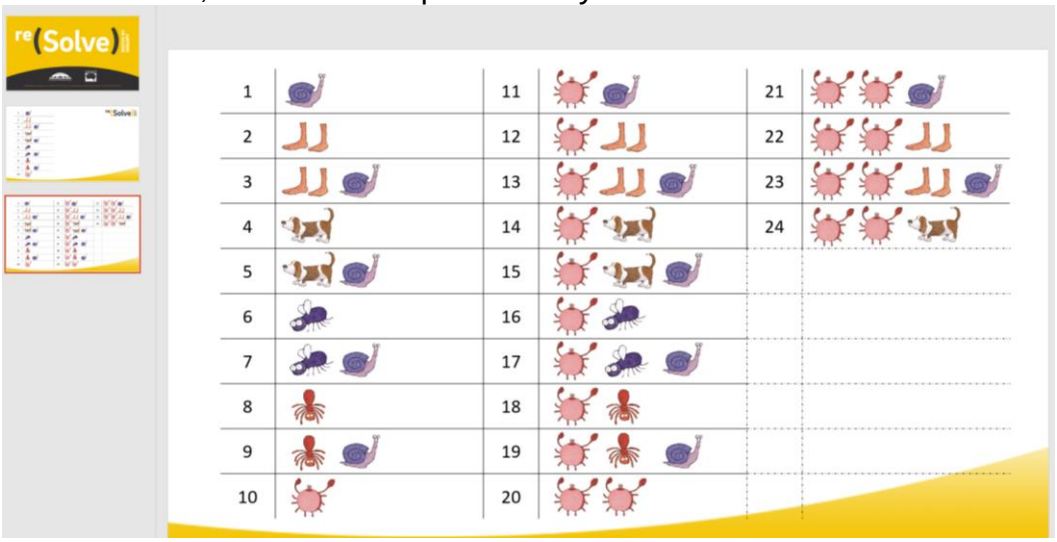
Formative assessment – option 2: Fill some lunch order bags (non-transparent paper bags) with connectable cubes. Make sure there are more than 10 cubes per bag and each bag (labelled A-Z) has a different number. The number of cubes in each should range between 20 and 99. Students go to each bag, tip out the cubes and try to count them. The teacher can then assess, using a cross-check, whether each student is counting by grouping the cubes into tens, or by some other method. Instruct students to use their best counting strategy.



Students can record using the making two-digit numbers recording template from this unit's folder, recording the gallery they solved in column 1 (bag A, 7 tens 5 ones, 75). After finishing a bag, students break up all the cubes into ones or random amounts (not tens), return them back into the bag, then move to a new gallery to solve a different bag.

The teacher can record how many they put in each bag (A-Z) to enable assessment and immediate feedback throughout that session ("Let's go back to bag P. Show me how you solved it").

Formative assessment – option 3: Use the reSolve website to download the *One Crab + Some More* resource. Click 'download all resources' through this website page: resolve.edu.au/lesson-2-one-crab-some-more?resource=380
Ask students to continue to make two-digit numbers using the context of the *One is a Snail, Ten is a Crab* picture story.



Printable beach animal templates are available in this unit's folder as this lesson was originally designed by Top Ten as part of our Numeracy Picture Book Libraries.

Support: Use the animals to create displays for all the ways to make 8:

1 dog and 4 snails makes 8
4 + 1 + 1 + 1 + 1 = 8
or 4 + 4 x 1 = 8

8 snails makes 8
1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 8 or 8 x 1 = 8

6 snails and a person makes 8
6 + 2 = 8

4 people makes 8
2 + 2 + 2 + 2 = 8
or 4 x 2 = 8

1 person, 1 dog and 2 snails makes 8
2 + 4 + 1 + 1 = 8

2 dogs makes 8, 2 x 4 = 8

Tens-ones Lesson 5

Echidnas of 10 / Race to 100 Spikes

Learning intention: Make bundles of ten, recording each complete bundle as a ten and any extras as ones

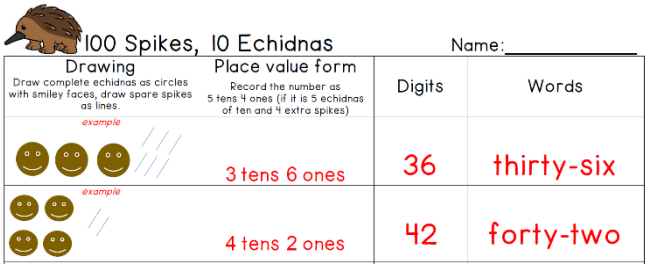
Maths vocabulary: tens (10 ones), 't' and 'ty' for tens, place value form (tens-ones), worded form, standard form (in digits)

Gratitude: If you think your life is tough, imagine this echidna. Before we watch this clip, brainstorm what could be the worst thing in the world that an echidna could be allergic to… youtube.com/watch?v=7ACW0Oh9Fkk. No matter how tough life is, we can soldier on and do our best to enjoy it, just like Matilda. Now let's make Matilda a family – a parade of echidnas (collective noun). A whole family of echidnas who are allergic to ants and native plants!

Lesson summary: Students make echidnas of ten, creating tens-ones numbers with complete echidnas (10 spikes) and spare spikes (ones).

Materials:

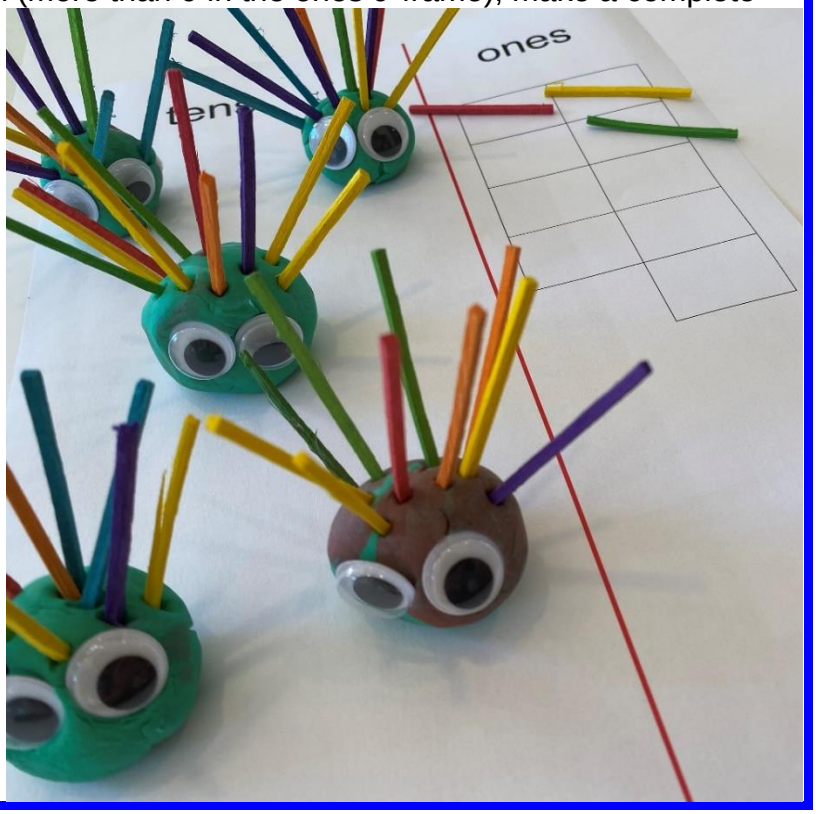
- *For Part 1:* Nine frame T-O chart.
- *For Part 2:* Measuring tape that spans up to 120cm or 150cm – one per pair of students.
- Echidna recording template from this unit's folder.
- Play-Doh.
- Craft sticks (little matchsticks or similar).
- 6-sided or 10-sided dice (depending on the pair of students). It is always preferable to use 6-sided for support students as it provides incidental practice of subitising.



Best set-up: Fishbowl model, then students work with like-ability buddies.

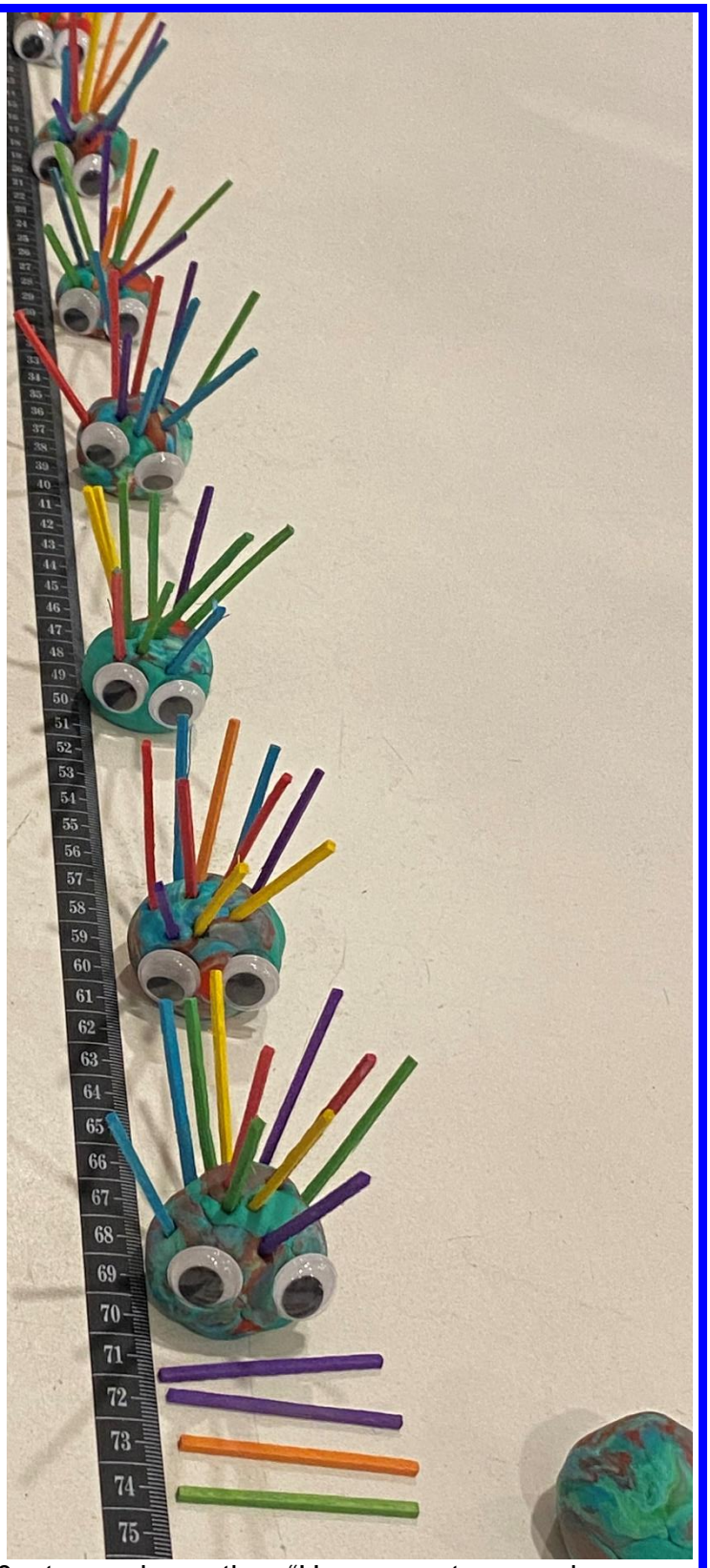
Part 1 – Tens-ones chart: Model the game with a student partner, rolling a die and placing that number of sticks on the chart in the ones column. When you reach ten (more than 9 in the ones 9-frame), make a complete echidna of 10 spikes. Rename the completed echidna into the tens place.

Before each turn, name your running total in its place value form ("5 tens and 4 ones…") and worded form ("…makes fifty-four"), emphasising that the 'ty' stands for 'tens.' Also fill in the recording template.

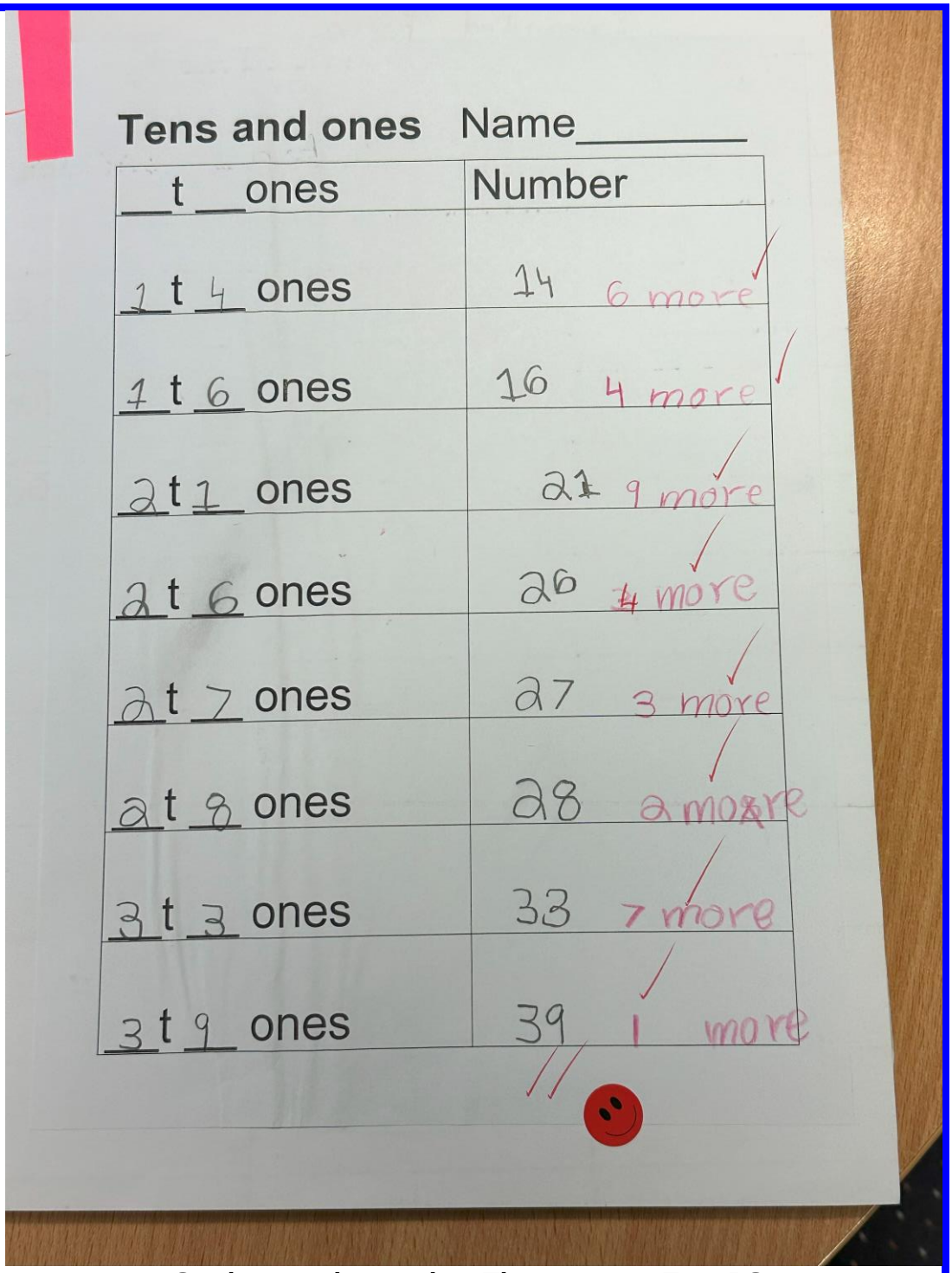


Australian animals real-life link: We are so lucky to have echidnas as part of our country's native wildlife. Learn some extraordinary facts and watch some adaptions that the echidna uses to survive in the Australian bush: youtube.com/watch?v=rIGYI-34buI and how echidnas move tremendous amounts of soil to improve the quality of the natural environment in which all the other creatures around them live: australiangeographic.com.au/topics/wildlife/2016/10/the-secret-life-of-echidnas/

Part 2 – Echidna races along a measuring tape: Students race along a measuring tape, building echidnas of ten. Firstly, students just place the craft sticks along the tape – 1 per centimetre. However, when students reach a tens number (10, 20, 30, 40), they roll a sphere out of Play-Doh and make a complete echidna of ten spikes. At first, students can work as a team, aiming to reach 100, 120 or 150 (15 complete echidnas) as soon as possible. However, later, students can race against one another, with student A building their echidna team on the north side of the measuring tape, and student B using the south side. The measuring tape will help students check their running total, as it will reveal their number each turn: "7 tens and 4 ones makes 74!" Students must say this to each other in a 'tens-ones format' and record using the echidna recording template.

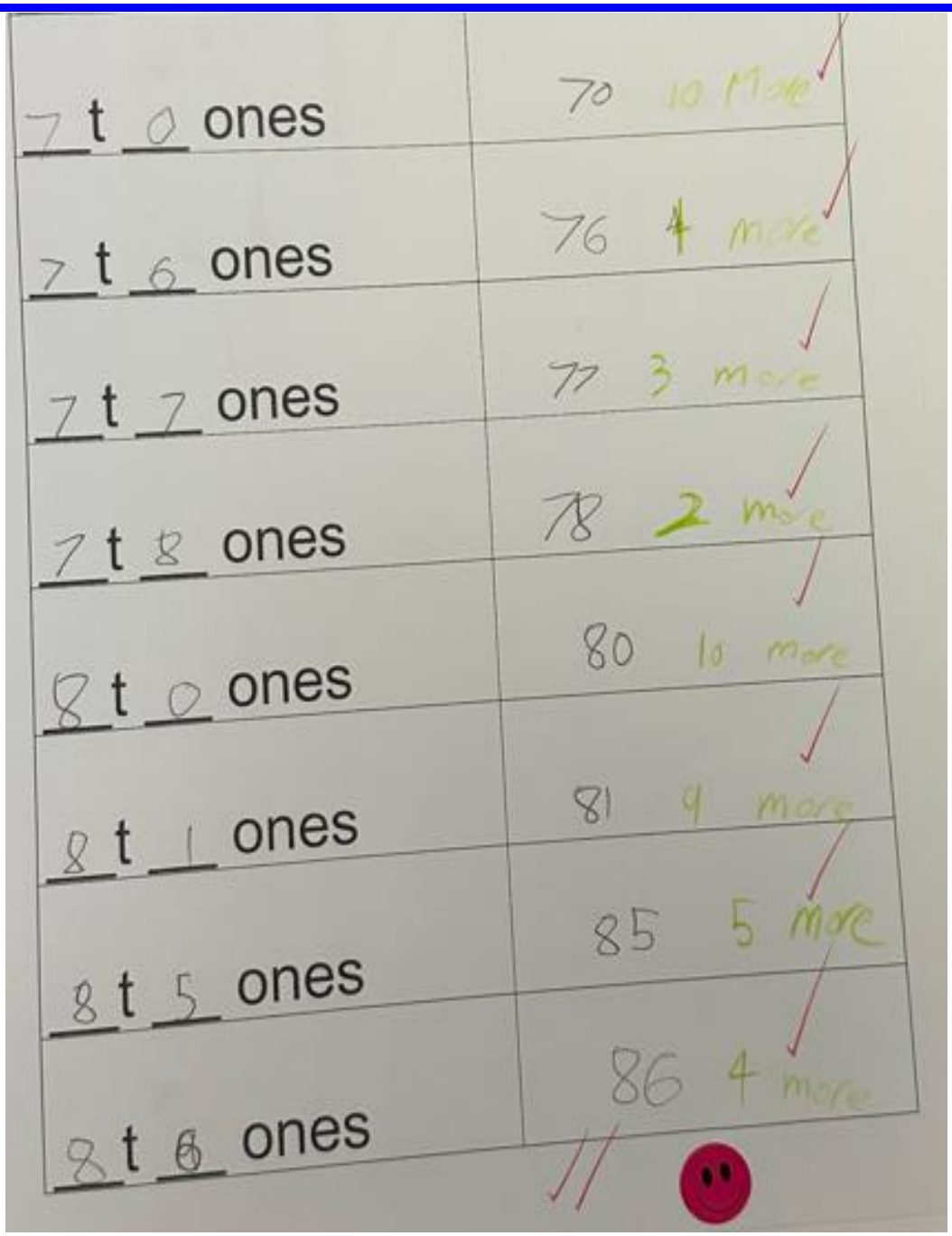


When students reach 100, stop and question: "How many tens are in one hundred? How many tens are in 110/120/150?"



Student work sample – Thomastown East PS

This student was also recording 'how many more till I have another adult echidna' in red pencil (how many more to the next ten).

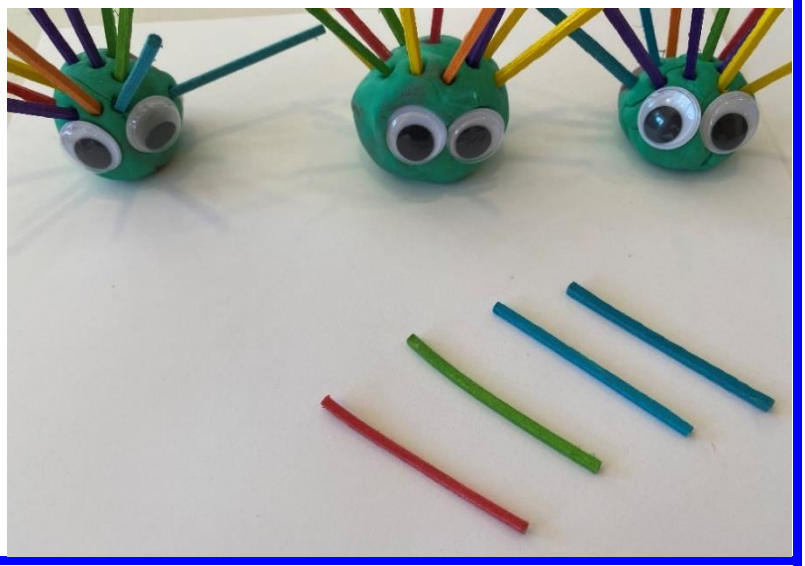


Student work sample

Exit variation – renaming and building flexibility with two-digit numbers: For the last 10 minutes of the session, stop students at their current total, for example, 74. Record this as 7 tens, 4 ones. Now take apart one echidna. It is 6 tens and 14 ones. Take apart another echidna: 5 tens, 24 ones. Dismantle another echidna: 4 tens, 34 ones. Continue until the whole number has been renamed (given a nickname) up to 74 ones.

Support: Race from 60 to 100 (using the 'ty' pattern in that 6t, 7t, 8t and 9t are said the same as 'six**ty**, seven**ty**, eigh**ty** and nine**ty**), and avoiding twenty, thirty and fifty, which do not follow the regular language pattern. Therefore, start their game with 6 complete echidnas already on the board.

Extension 1: Take away the support of the tens-ones T-chart and the measuring tape. Without these supports, challenge the student to describe a number made by their partner in its place value form (t-ones), standard (digits) and worded form.



Extension 2: Try to rename the number <u>without physically taking apart the echidnas.</u> For example, for 34 shown above, it is:

- 3 tens, 4 ones

But it is also:

- 2 tens, 14 ones
- 1 ten, 24 ones
- 34 ones

The challenge is to visualise this without actually touching the materials. If students cannot do this at first, use the materials, until they are ready to attempt it without manipulating the spikes.

Formative Assessment – exit ticket challenge: Create four lots of Play-Doh spike echidnas in the centre of a class circle on a mini whiteboard. For example, the first lot may be 8 tens, 3 ones (regular two-digit number that follows the standard 'ty' language pattern). The second lot, 5 tens, 7 ones (irregular – doesn't follow the language pattern because it is 'fifty' not 'fivety'). The third lot could be 1 ten 9 ones (teens number). The final lot could be 7 tens, 0 ones (0 in ones place). Ask students to record each number using the same recording template used during the lesson. Collect and assess each student's current progress in terms of using place value (tens-ones), standard and worded forms for two-digit numbers.

Tens-ones Lesson 6

The Two-Digit Birthday Party

Learning intention: Make bundles of ten, recording each digit in its place values as tens and ones

Maths vocabulary: ten (10 ones), 't' and 'ty' for tens, place value form (t-ones)

Literacy link - Numeracy Picture Book: Read *Sir Cumference and All the King's Tens* up to the end of page 13. On pages 10 and 11, emphasise that counting by 1s is not a great idea because it takes so long. It is also very difficult to keep track; so if someone interrupts and you forget what you are up to, you have to start all over again! Stop midway through the book (after page 13) to start the session, then finish the story during reflection or eating time.

Lesson summary: Students roll a 6-sided die to add guests, represented as popsicle sticks, to a tens-ones T-chart. Students bundle the guests into groups of 10 whenever there is more than 9 in the ones place. Putting guests in their places – tens and ones places – ensures the guests are easy to count as they walk into the palace for the birthday in the story (left). Guests must be in their place for the palace!

Materials:

- Popsicle or bundling sticks in tubs in the middle of group desks – approximately 100 per pair of students.
- Rubber bands in plastic cups in the middle of group desks.
- 10-sided dice per pair.
- T-O chart from this unit's folder.
- Tens and ones recording template from this unit's folder. Alternatively: Use the Race to 120 recording template with drawing space.

Best set-up: Fishbowl model, then regular like-ability maths buddies.

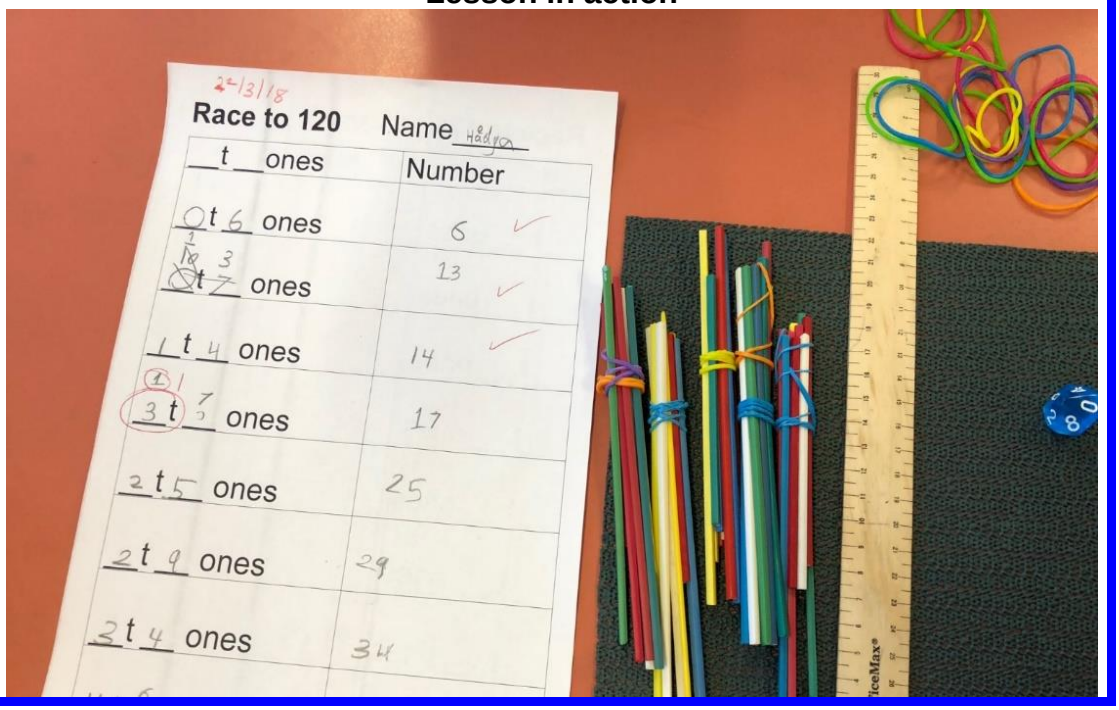
Lesson introduction

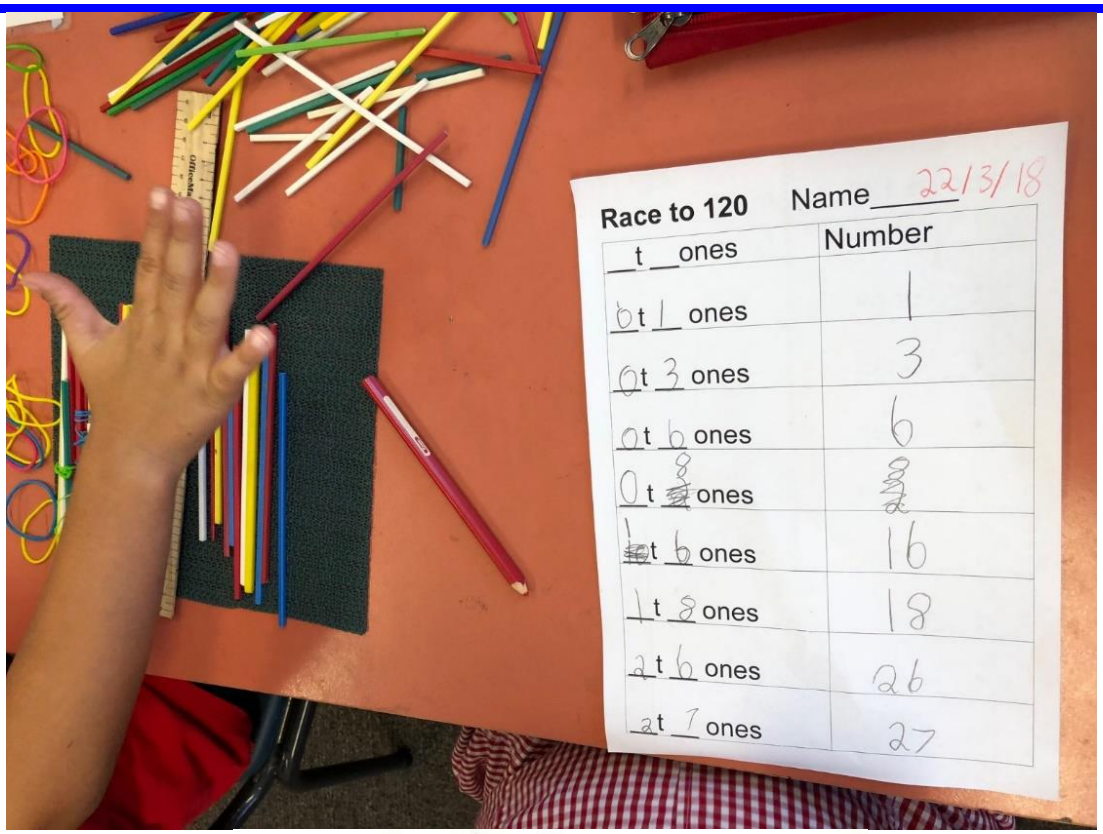
Modelling: After reading *Sir Cumference and All the King's Tens* or telling a made-up story about a huge birthday party, tip out approximately 100 popsicle sticks into the middle of a circle of students. These popsicle sticks are our people – knights, chefs, queens, soldiers and more. How could we count all these guests? If we counted by ones, we could lose count and it would take so *long*, we might not be done before lunch! If we count by 2s, that is quicker, but it will still take a *long* time, especially if we lose count and need to recheck. What is an easy number to count by? What is a large enough number so that we can create equal groups and it would not be a big deal if we needed to recount the groups?

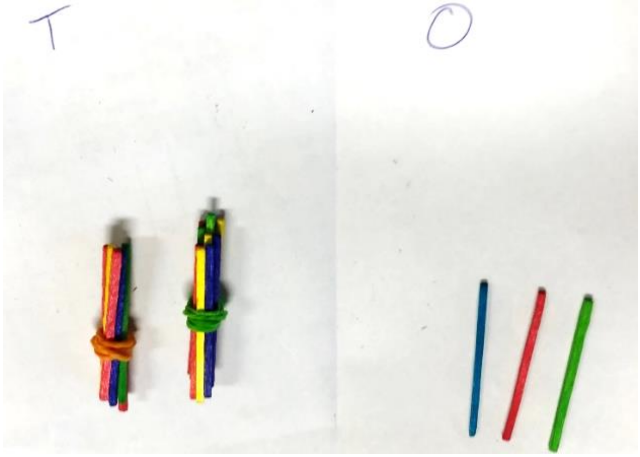
Question students and uncover the conclusion that bundling the guests into tens is the best strategy. Do this with a few student volunteers in the middle of the whole-class circle, then practise counting by tens – 1 ten, 2 tens, 3 tens, 4 tens, 5 tens and 4 more/extra guests. That makes 5t4 or fifty-four.

Students then return to their desks and, in pairs, create their own birthday party. Use the T-O chart or simply a grip mat and ruler to make tens-ones places (the ten is always on the left). Roll a 10-sided dice and add their guests to the ones place. Bundle/rename into a ten whenever there are more than 9 in the ones place. With each turn, record the number of guests in the tens and ones recording template from this unit's folder: 0 tens and 7 ones = 7. Roll again, add the number rolled to the ones, 4 more makes 11 so we will bundle the 10. Now we have 1 ten and 1 one = 11. It looks like 11 – 1 bundle in the tens place and 1 one in the ones place. Continue, aiming to invite as many guests as possible to their birthday party!

Lesson in action





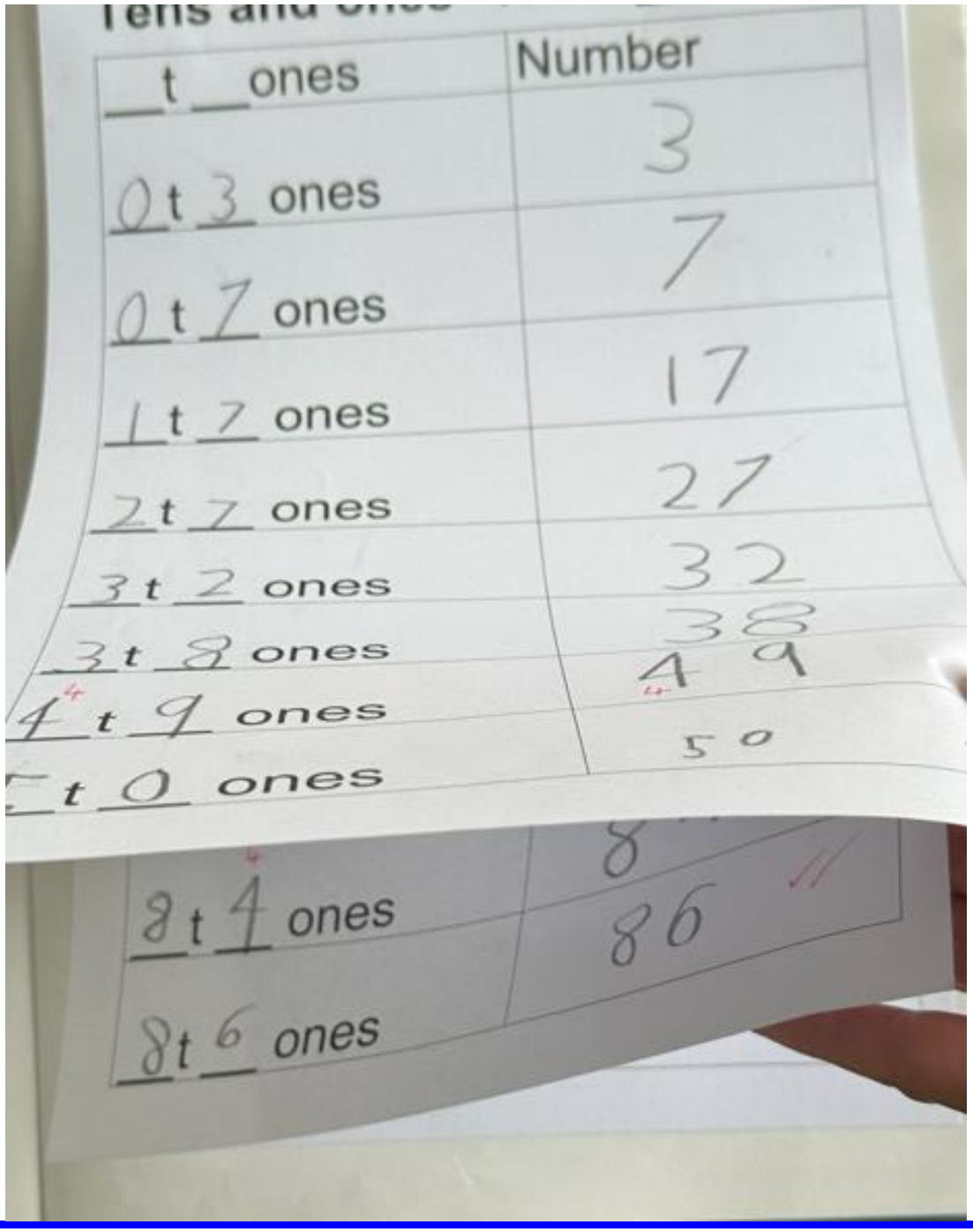


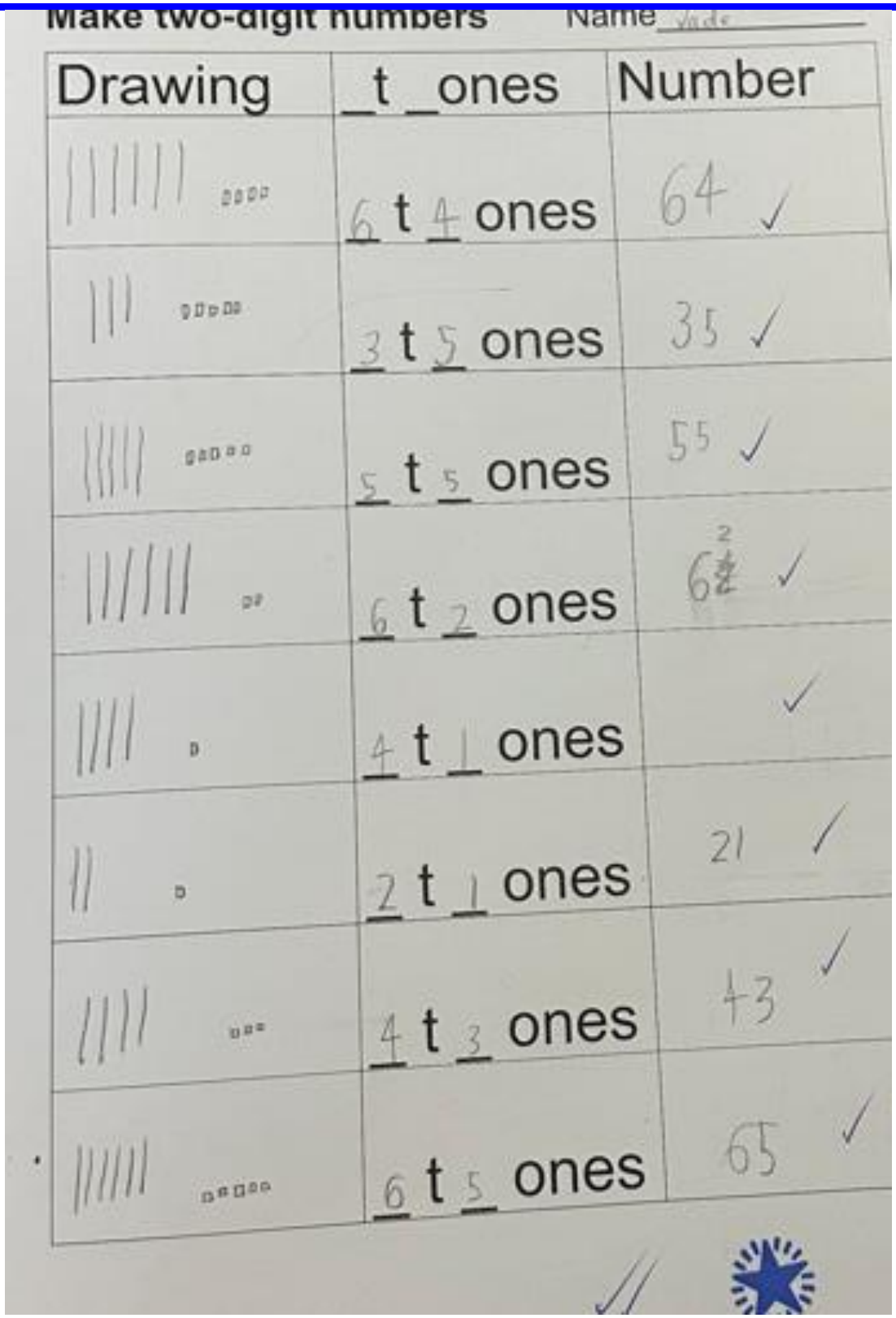
2 tens and 3 ones, keep rolling, putting extra guests in the ones and bundling them into groups of ten!

Questioning:

- Why are we grouping the guests into bundles of ten?
- How many guests do you have at the moment? How did you figure that out? Look for students who are counting 10, 20, 30, 40 and assist them to transition to counting their guests as 1 ten, 2 tens, 3 tens, 4 tens. It is even better if students can start to see a few tens at once (subitising or using their maths superhero eyes). For example, I see 3 tens and 3 tens, that is 6 tens, and 5 extra ones, we have 6t5!

Students were eager to invite as many guests as possible to their birthday party, so most year 1 students finished 2-3 pages during the session:

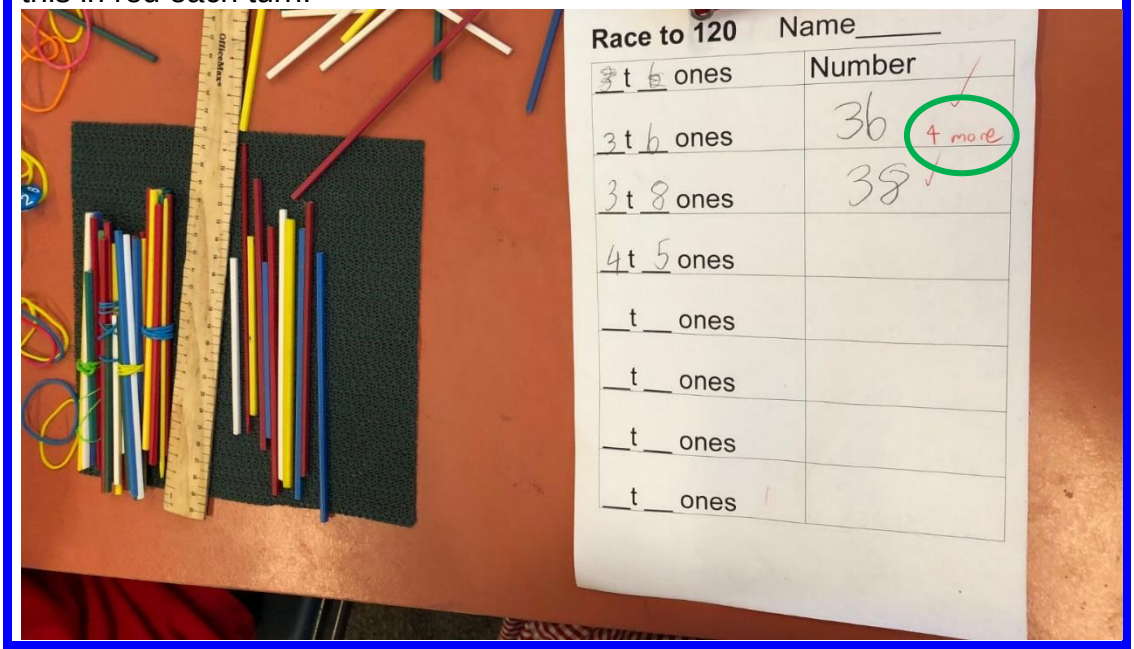




Student work sample

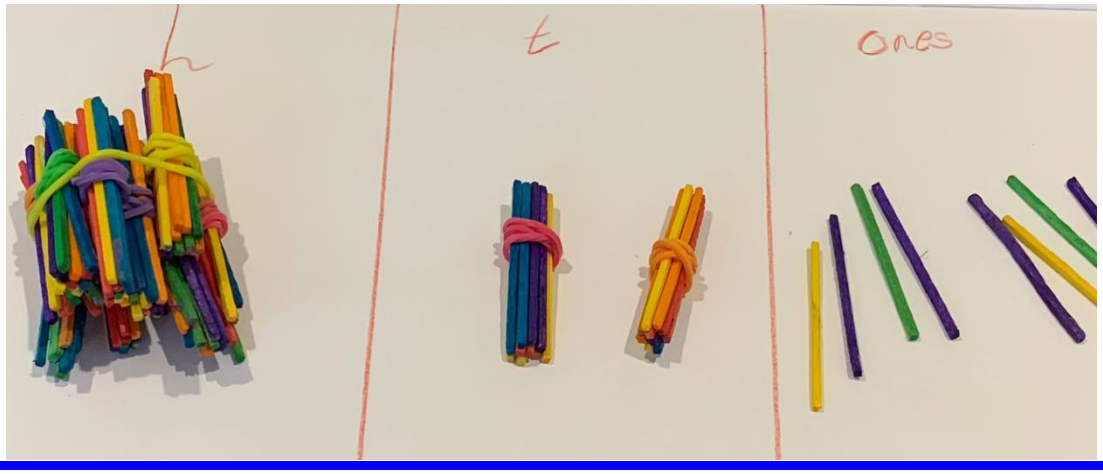
Support: Ensure that they bundle at ten – stop and before you let your partner roll, check that you don't have a full party table of 10 in the ones place. Put a ten frame in their ones column for extra support, and as a reminding cue to rename when it is full.

Extension 1: How many more do you need to make your next ten? Write this in red each turn:

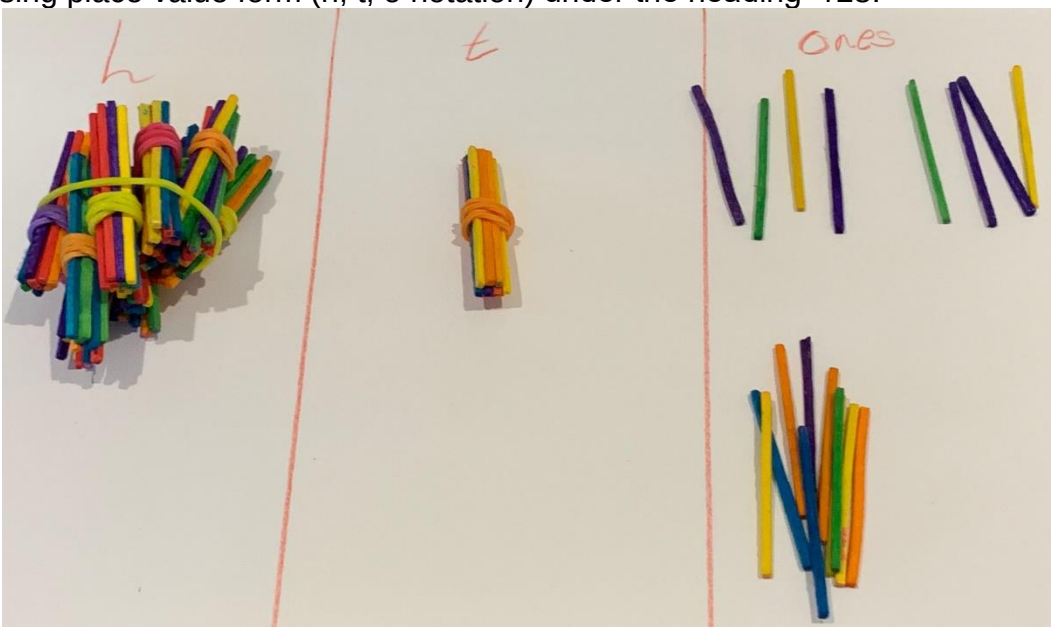


Extension 2: Start from 90 guests. 90 people are already in the palace because they live there – knights, ladies, children, cooks, page boys. So, make 9 bundles of 10 for the people living in the palace already, then roll to add more from that starting number for the birthday guests that are arriving.

When students reach over 100, you could have them continue to call this 11 tens, 12 tens, and so on at first, then start to build the understanding that connecting 10 of their tens in a large bundle makes 1 hundred. Record this as 1h 2t 8ones = 128.

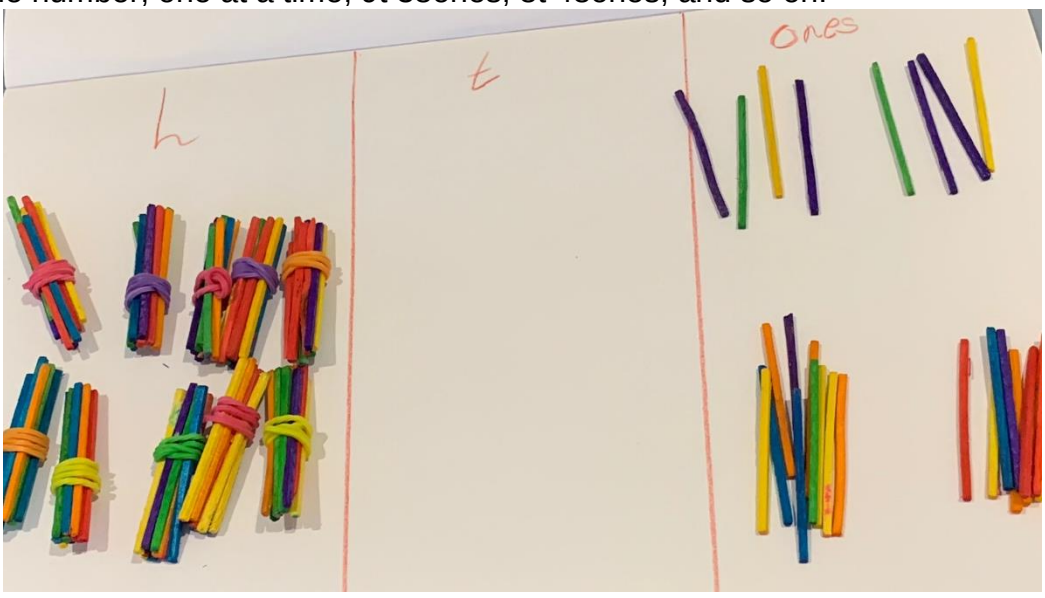


Extension 3: Once extension students reach above 120, pause there. Unbundle the number, one ten at a time, moving the bundled tens from the tens to the ones place and recording the renaming. For example, 128 is 1h 2t 8 ones (“1 of the hundreds, 2 of the tens, 8 of the ones”). But it is also 1h 1t 18 ones – move the ten into the ones, keeping the piles organised so students can still see each pile of unconnected tens in the ones. Record using place value form (h, t, o notation) under the heading ‘128.’

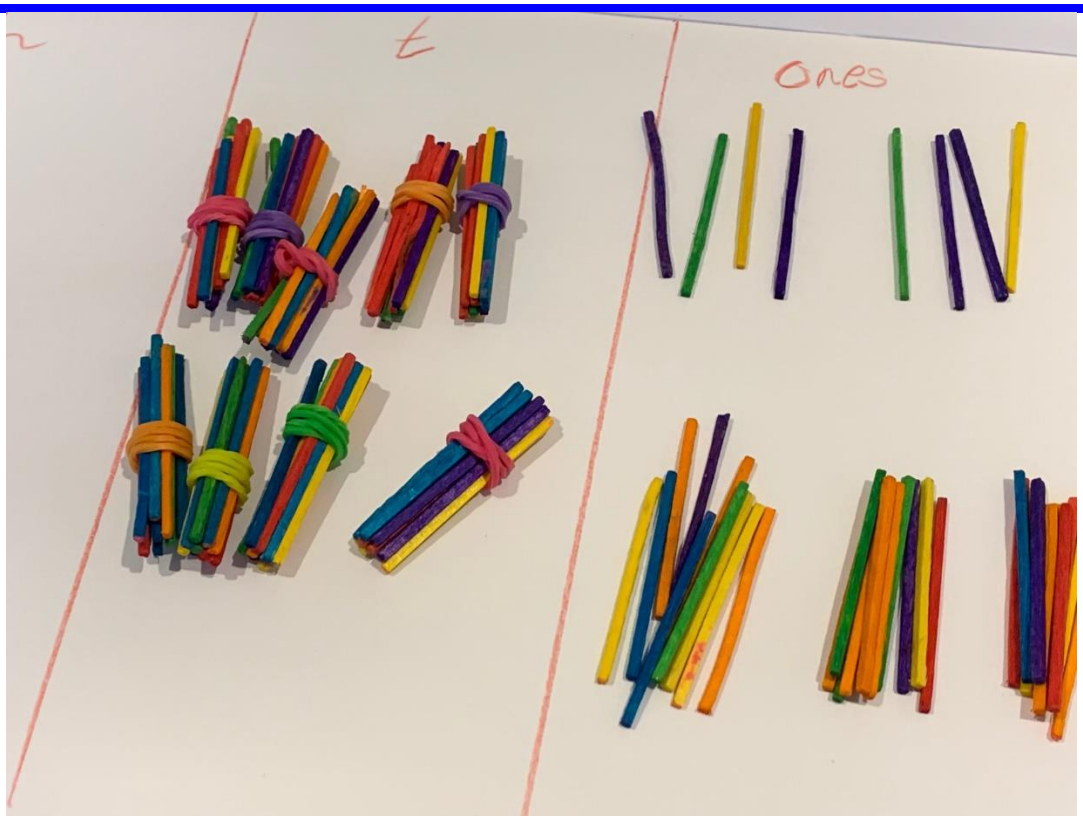


1h 1t 18 ones

Once students reach 1h 0t 28ones, unbundle the 1h. It could also be: 0h 10t 28ones. Then unbundle the tens, recording each renamed version of the number, one at a time, 9t 38ones, 8t 48ones, and so on.

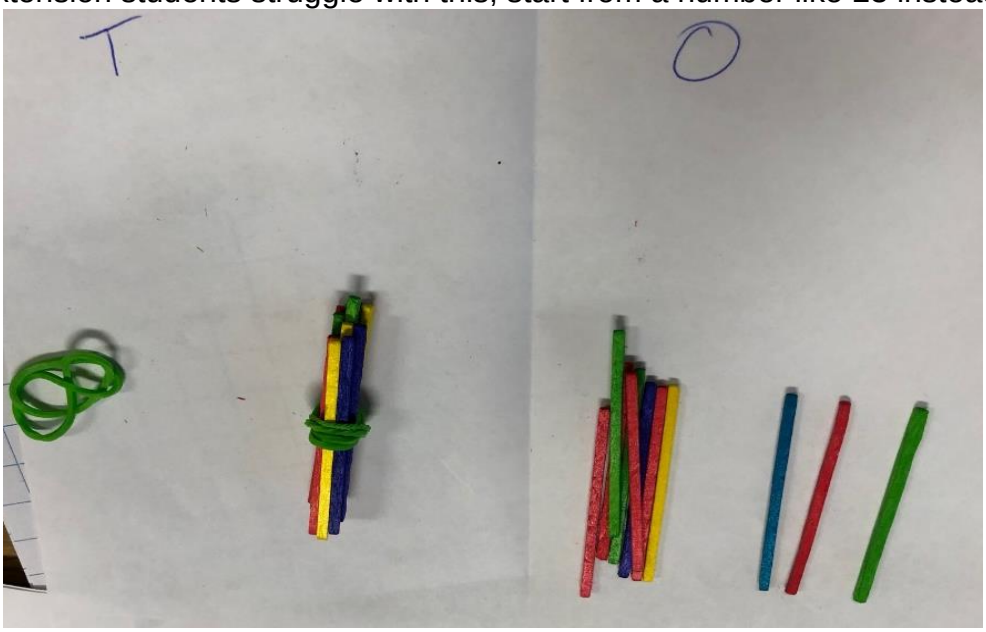


10 tens and 28 ones



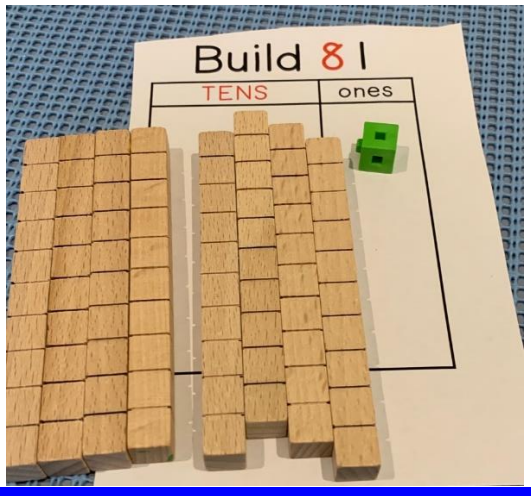
9 tens and 38 ones

If extension students struggle with this, start from a number like 23 instead:

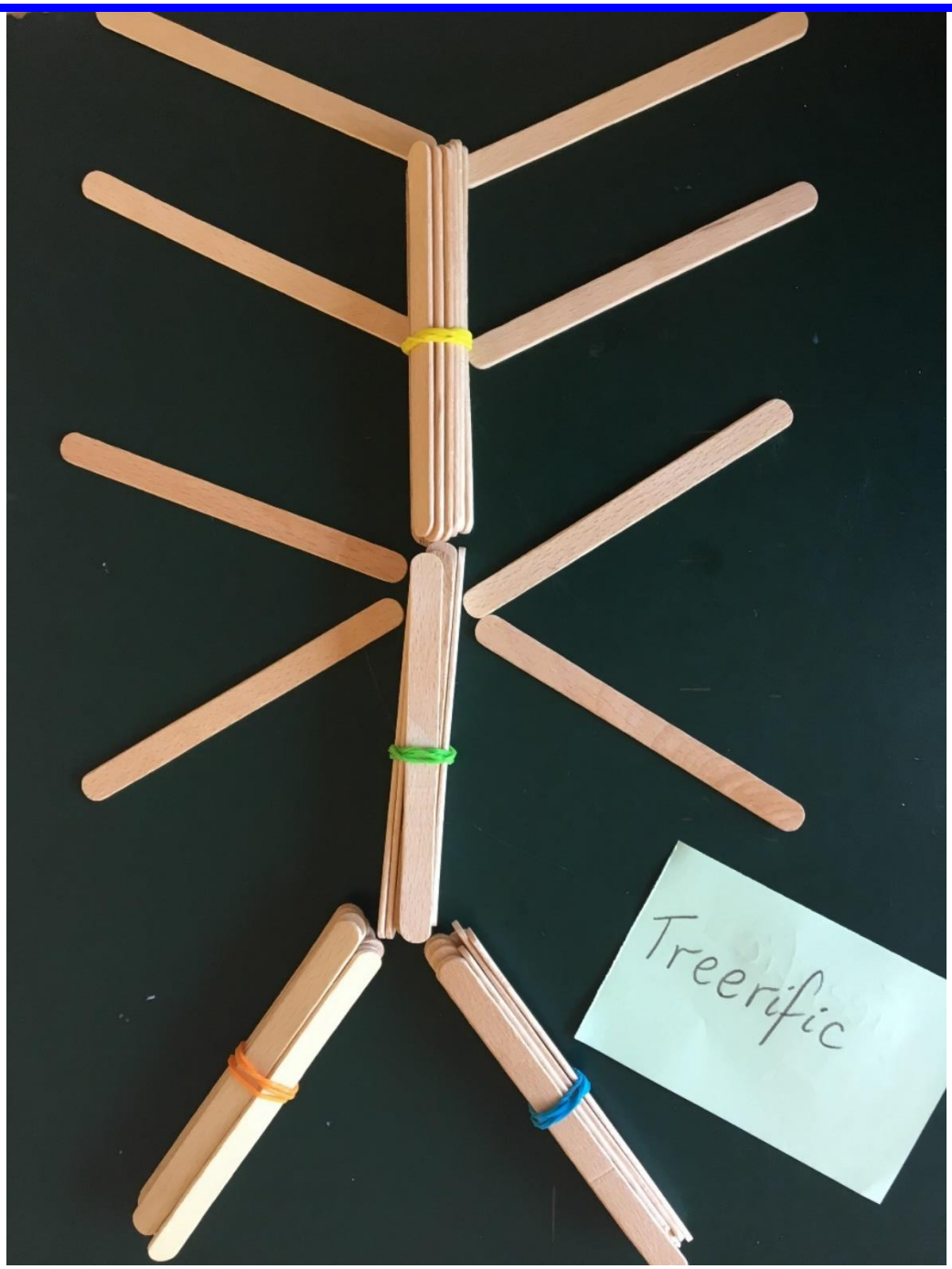


2 tens and 3 ones
1 ten and 13 ones
0 tens and 23 ones

Exit-ticket: Give students one of the Build two-digit numbers exit ticket templates from the following pages or this unit's folder. Ask them to make the number shown using their bundled popsicle sticks. Only use place value blocks (MAB) for extension students at this stage. There are also extra support versions that include colour clues for students who need assistance, where the student could bundle using red rubber bands to show tens, since the tens are displayed in red font. Also explore the black-and-white version, which is more challenging.



Variation 1: Oh no! A truck full of popsicle sticks just crashed and spilt them all onto your desks! Can please you count how many it delivered and report the total back to me? If your or any student has a model dump truck that they could bring in, you could use this as your dumping mechanism, as you go around to each desk for extra engagement. Alternatively, you could act out transforming into Godzilla, tipping out all of the popsicle sticks just like that destructive monster, then the students need to rebuild the city after a Godzilla rampage.



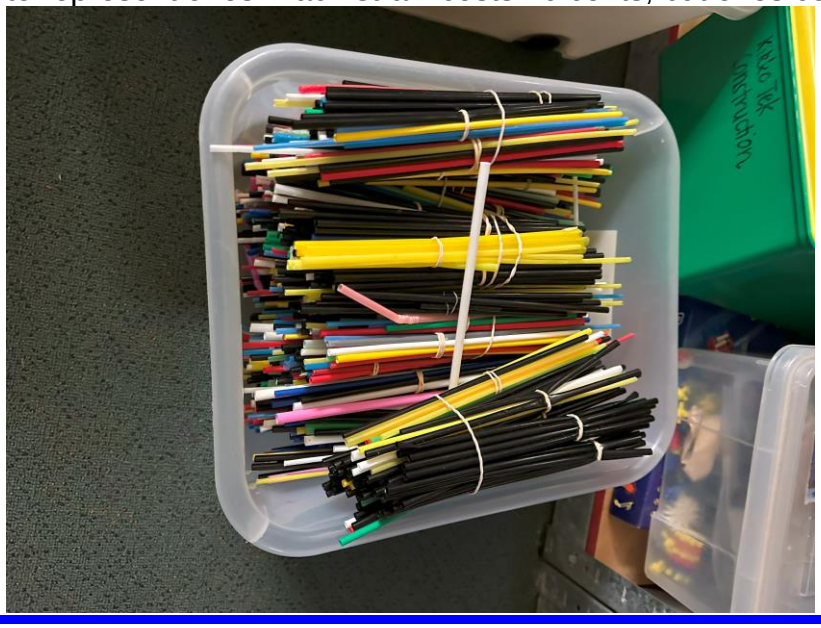
4 tens and 8 ones 4t8 = 48 forty-eight

Variation 2: Tell students that there has been a new discovery of a species of tree by a local arboriculturist. This new tree is called a 'tens tree,' because it initially grows one branch then, overnight, that branch multiplies into a branch that is ten times the thickness it was at sunset the previous day. Students use popsicle sticks in bundles to make their own 'tens trees' on mini whiteboards/grip mats/coloured paper backgrounds. Name their tree. Students then rotate around the room, as a gallery walk lesson or exit ticket, solving and recording the value of the tens trees made by their classmates.

Variation 3: Students could also use twigs or food items to represent tens and ones for extra practice, as shown in these photos:

This should be done carefully; once students are solid in their concept of 10 ones making 1 ten. However, it is a great way for students to start to see ten as a separate unit, rather than just a 10 ones – we need students to be able to unitise it as '1 ten.'

Alternative material: Bundles of straws, with some straws cut into 10 pieces to represent ones. Each straw costs 10 cents, but ones cost only 1 cent.



tens	ones

Formative assessment and exit ticket for making two-digit numbers (these can be used with students' bundled popsicle sticks from the lesson):

COMPLETE PRINTABLE TEMPLATES ALL IN THIS UNIT'S FOLDER – Enlarge to A3 on the photocopier depending on the type of bundling sticks in use.

Build 25

TENS	ones

Build 39

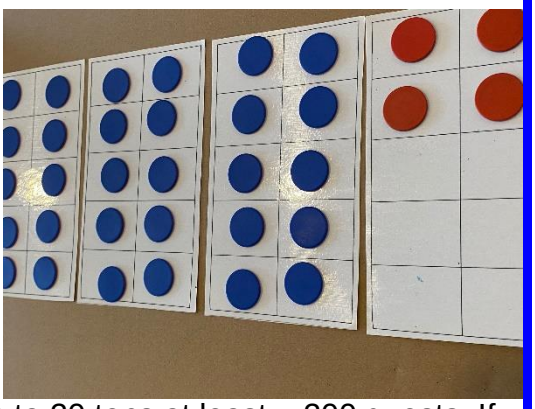
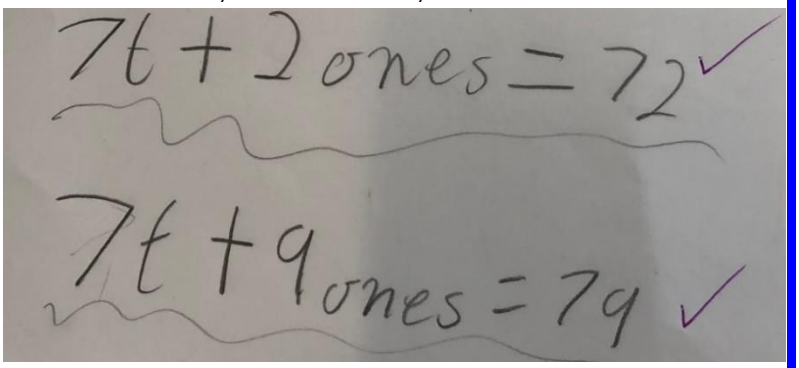
TENS	ones

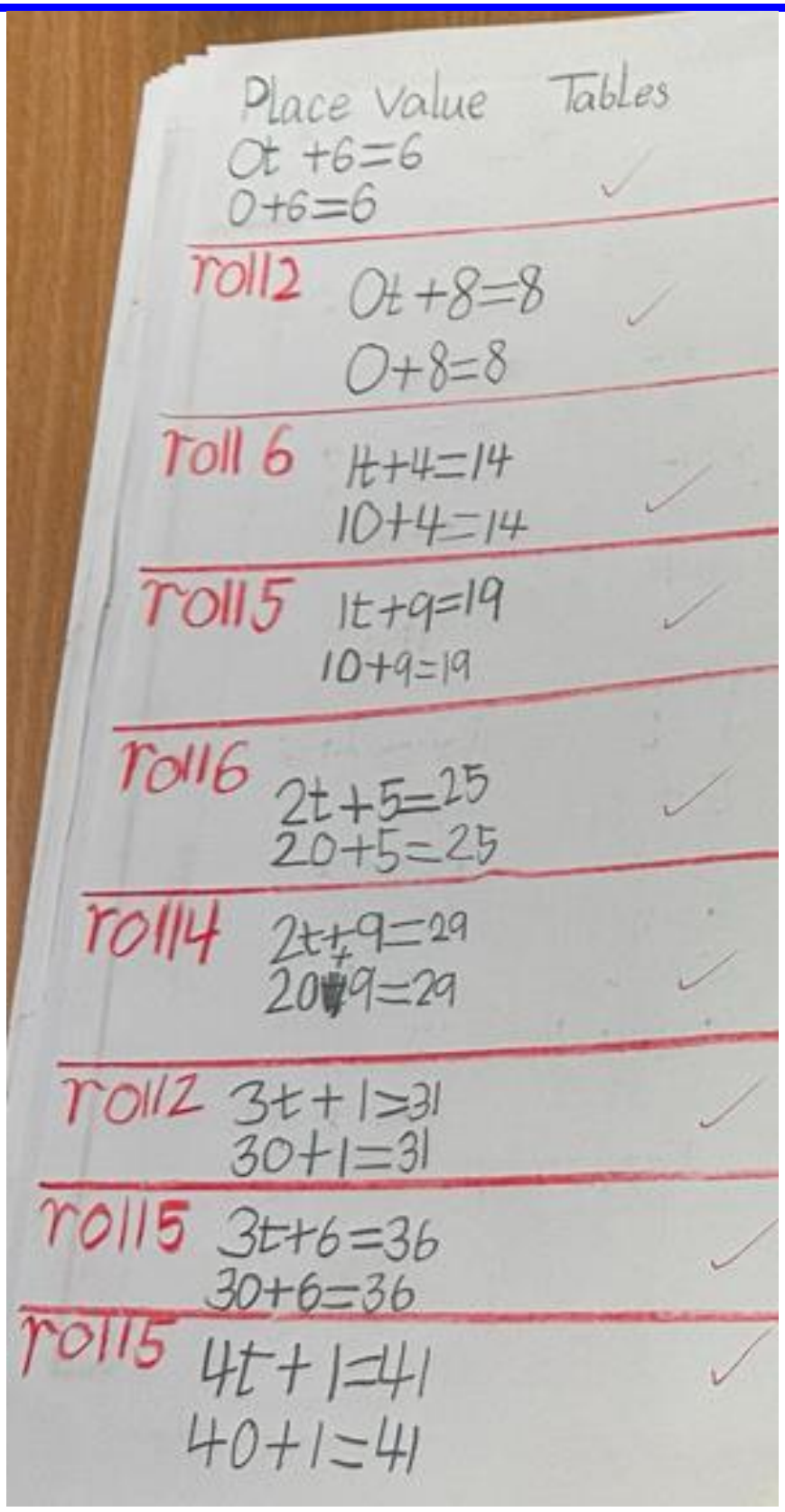
Build 62

TENS	ones

Build 54

TENS	ones

Tens-ones Lesson 7	**Birthday Party Tables** **Learning intention: Make bundles of ten to create numbers that go over 100** **Maths vocabulary: ten (10 ones), 't' and 'ty' for tens, one hundred (10 tens), even, odd**
Literacy link - Numeracy Picture Book*:* Read the remainder of *Sir Cumference and All the King's Tens*. **Real-life link:** Party planning. Link to a family wedding or birthday party that is approaching for you or a student. Ask the students to help you plan the party by organizing how many people you could invite depending on how many tables of ten are available at the restaurant.	**Lesson summary: This is a follow-on from the first lesson on *Sir Cumference and All the King's Tens* (Lesson 6). Now that your party guests have entered the palace, they need to be seated at the party tables (ten frames). The queen has decided to sit them 10 per table, to make it easy to work out how many meals the palace chef must cook.** **Materials:** • 10-sided die. • At least 20 printed ten frames per pair – pre-sliced so that students can easily add to their palace tables by collecting more as they need; keep these in a pile in the middle of group desks. • Counters – 2-sided are ideal so students can flip to the other colour when a ten is complete. Approximately 200 per pair of students. Alternatively, students can just draw dots or smiley faces using crayons or pencils on the printed ten frames. • Tens and ones recording template from this unit's folder. **Best set-up:** Fishbowl model, then regular like-ability maths buddies. **Modelling:** Start from 0 guests. Roll the die, collect that number of counters (or draw that number of dots) to fill each table, one at a time. When one table is full, that is one table of ten or one ten. Grab another ten frame and continue to add guests to your party.  Record each running total, before you roll again. 't' stands for a full table of ten. So, if you have 3 full tables and 2 extra guests, it makes 3t 2 ones = 32 Students should write: 3t 2 makes 32. Students should aim to work their way up to 20 tens at least – 200 guests. If this is not possible within one session, start from 80, or continue from their previous running total for a repeat session.  If students write 'ones' ensure they do not shorten this to 'o' which could confuse it with 0. Just write the full word 'ones' or even 'u' to represent units, which is also the vocabulary in the curriculum.



Student work sample – Thomastown East PS

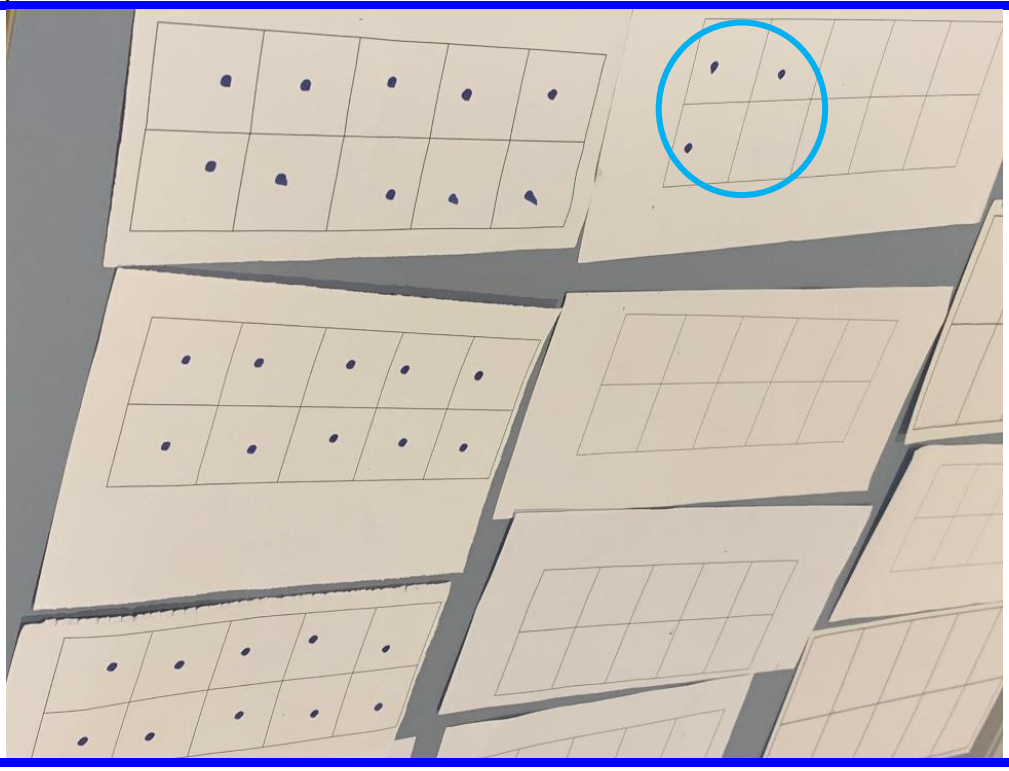
Extra recording 1: For any students who also need more practise recording two-digit numbers in words, use either the *Worded Form Sliders* from the previous lessons or the *Number Spelling Chart* from this unit's folder.

0 zero	10 ten	20 twenty	0 zero	10 ten	20 twenty
1 one	11 eleven	30 thirty	1 one	11 eleven	30 thirty
2 two	12 twelve	40 forty	2 two	12 twelve	40 forty
3 three	13 thirteen	50 fifty	3 three	13 thirteen	50 fifty
4 four	14 fourteen	60 sixty	4 four	14 fourteen	60 sixty
5 five	15 fifteen	70 seventy	5 five	15 fifteen	70 seventy
6 six	16 sixteen	80 eighty	6 six	16 sixteen	80 eighty
7 seven	17 seventeen	90 ninety	7 seven	17 seventeen	90 ninety
8 eight	18 eighteen	hundred	8 eight	18 eighteen	hundred
9 nine	19 nineteen	thousand	9 nine	19 nineteen	thousand

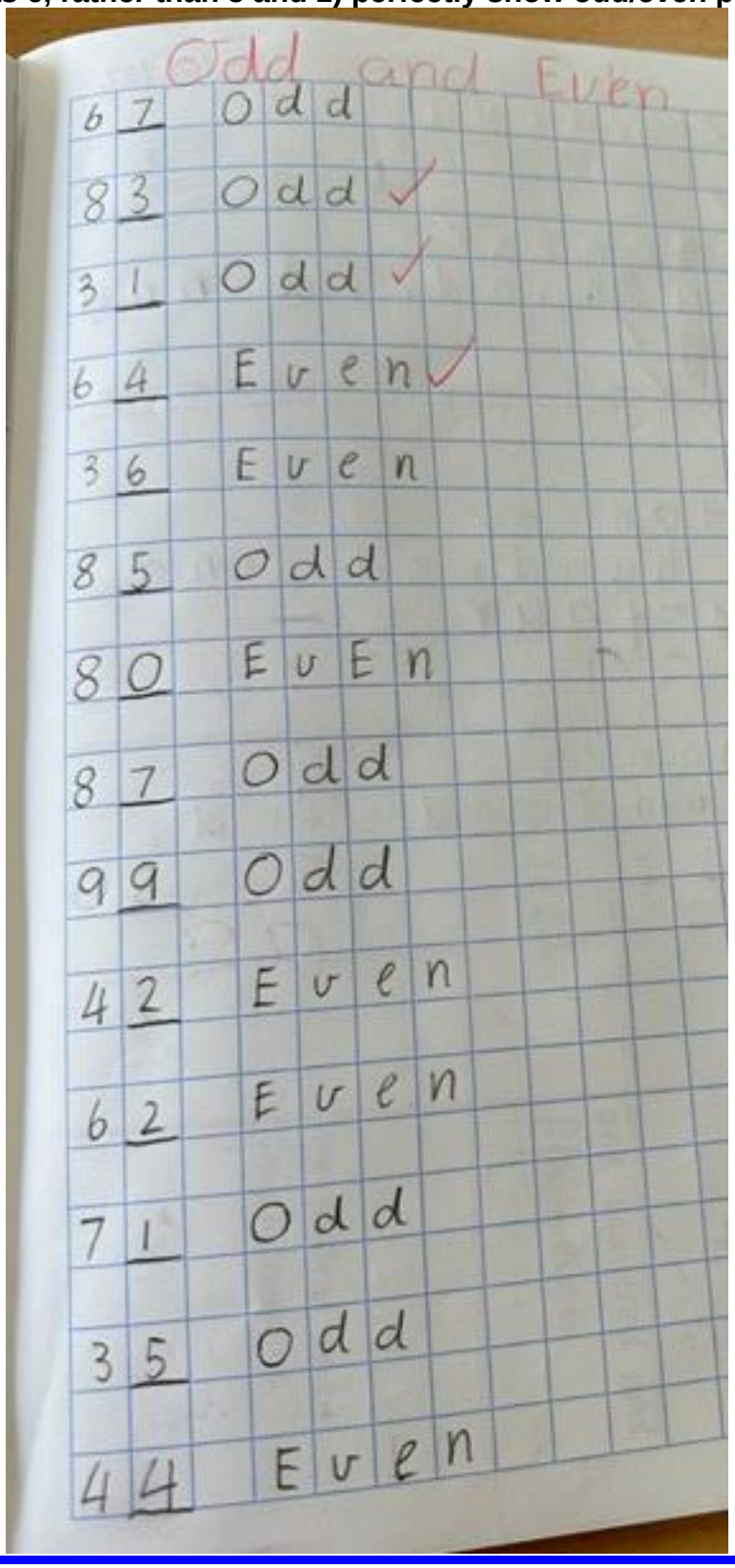
This website can also be used for support or to provide immediate feedback for students relating to worded forms: lingojam.com/NumbersToWords

Extra recording 2: Model filling the ten frame tables in pairs (rows of 2), so that guests have someone to talk to across the table as others arrive, and so that no one is lonely. This also makes it easy to see which numbers are odd and even. Record this in red as well (1t 8ones = 18 eighteen is even).

Even means that everyone has a partner opposite them when they get up to dance, odd means there will be one person left out, an odd one out who has no partner.



Recording using the ten frames, which when set-up in doubles format (3 and 3 as 6, rather than 5 and 1) perfectly show odd/even properties:



Questioning:

- If you have 10 tens, what else can you call this – rename it or give it a nickname? 1 hundred! What will 11 tens be? What will 12 tens be?
- Why did we use tables of ten? Towards the end of the session, choose another number and cut the tables to that size. Now try to count the total – is it easier to count by 7s or by 10s?
- How many guests do you have at the moment? How did you figure that out? Look for students who are counting 10, 20, 30, 40 and support them to transition to counting their tables as 1 ten, 2 tens, 3 tens, 4 tens. It is even better if students can start to see a few tens at once (subitising or using their maths superhero eyes). For example, I see 4 tens and 4 tens, that's 8 tens, and 3 extra ones, we have 8t3!

End-of-session reflection: Ask students to connect their ten frames into groups of 100 (10 tables or 10 groups of 10) using butcher's paper along your classroom floor. Figure out the total number of guests in the entire class. Students could cut out their ones to connect them to another set of ones that makes 10, using their 10 facts.

Support: Use the race to 40 template from this unit's folder, aiming to just build a party of 40 guests, recording each number they make by looking at how many full tables they have. Roll a 6-sided dice to increase their frequency of recording and increase the likelihood they will stay in the same ten for a few turns in a row.

Extension – Applied 10 facts: Each roll, figure out how many more guests they need to finish their next full table, linking this to their 10 facts:
"5t 6ones makes 56 4 more to go"
If students are fluent with this, try recording how many more they need to reach the next 100 mark of guests.

Extension 2 – Rounding: Each turn, round their number of guests to the nearest ten (writing this in red) by seeing whether their table is closer to full or closer to empty:
5t 6ones makes 56 → 60
Tip: Maths is generous so we will say 5 (exactly half full and half empty) is closer to full and can round up to the next ten.
Question to ponder: Invite the student to reflect on why 5 rounds up, even though it is in the precisely in the middle of 0 and 10. *Clue:* Think about how many digits we have in our number system.
Answer: This is because 0 is closer to empty, as is 1, 2, 3 and 4, so therefore 5, 6, 7, 8 and 9 is closer to full, so 5 digits round back and 5 round up.

Tens-ones Lesson 8

Donut Spill!

Learning intention: Experiment with using other numbers to rename, and decide which base-number is the best to use to quickly count a total
Maths vocabulary: tens (10 ones), 't' and 'ty' for tens, place value form (t-ones), worded form, estimate (thinking guess)

Link to Literacy – Arnie the Doughnut: The story of a doughnut who does not believe his life mission is to be eaten! youtube.com/watch?v=6E67n1vZZjQ

Teacher anecdote: I arrived at school very early this morning…and I was rewarded! As I got out of my car, I spotted a truck swerving around the corner. It took the corner too fast, and it tipped over! After checking for traffic, I ran across to make sure the driver was alright – thank goodness he was! But there, all over the road, were

Lesson summary: Students clean up a 'truck spill' of food, imagining the maths materials are any food they like and bundling them into tens and ones to try to salvage as much as possible.
Students experiment with using other numbers (not just ten) as their renaming/base number and, in the process, discover why ten is a great choice, compared to other options.

Materials:

- Beads or similar.
- Pipe cleaners.
- Paper plates or similar.

Best set-up: Fishbowl model, then students work with like-ability buddies.

Modelling and questioning: Tip a lot of beads onto a plate or grip mat in front of each student or pair. Give students a minute to brainstorm the type of food that was spilt at their desk. For example, the beads could be donuts and the pipe cleaners are skewers. Each truck can hold ten sticks of ten, so 100 donuts.

Before the students start beading, **estimate**. This means making a thinking guess about how many are on your plate. Every ten minutes, ask students to stop and re-estimate, based on their total so far, and how many they think are left. Model how to explain your reasoning, for example, I have 40 and I think I have beaded more than half, so I now think it will be less than 80, maybe 70 in total.

Lesson in action

Questioning: "How many beads/donuts should we put on each stick? What number will make it easy to count the total as we clean up this mess?" Student can start by doing ten on each, however, encourage

tens and tens of doughnuts. It had been a Krispy Kreme truck and the driver rewarded me handsomely for doughnuts. What's the message of this story – make sure you are at school on time in the morning, or you might miss something very, very, very important – doughnuts!

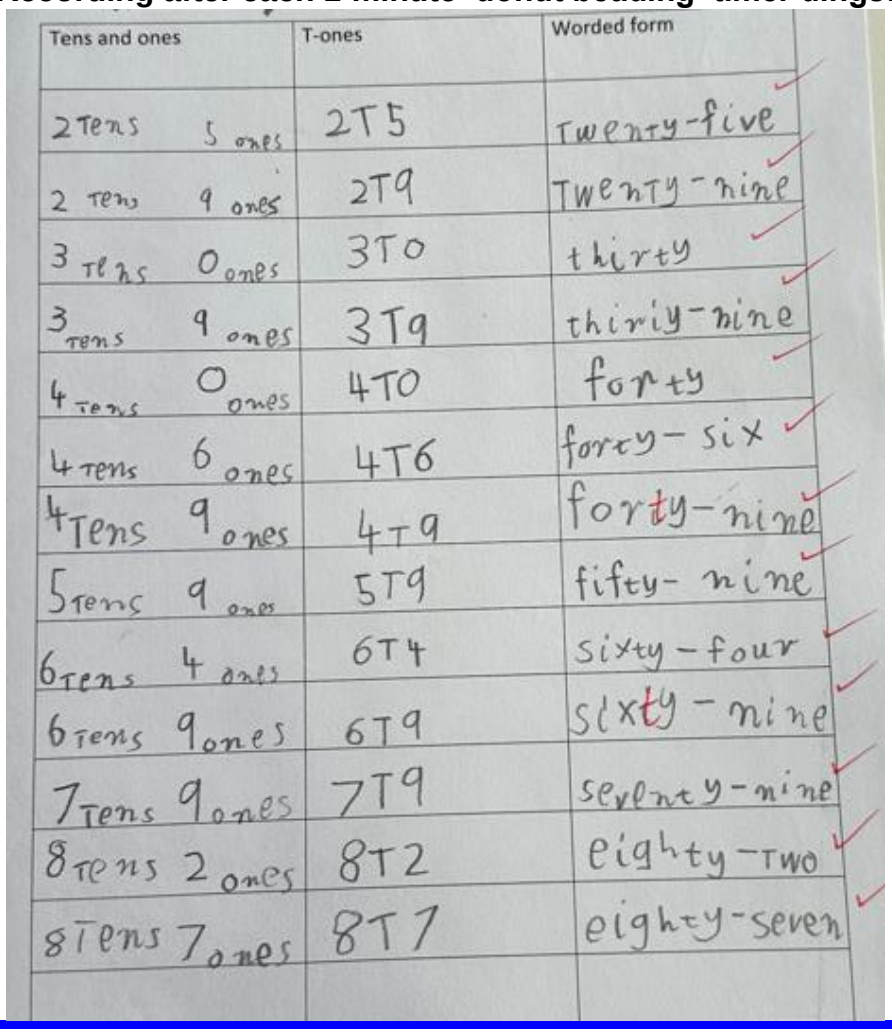
YouTube hook: Watch the results of real-life truck food spills: youtube.com/watch?v=Rax0gjh-no8 (start from the 1 minute 20 second mark of the video and watch till the end).

students to **try different numbers (not just ten),** then aim to keep a running total of how many they have on their pipe cleaners. Does this make it harder or easier than using ten as your renaming number? Experiment with lots of different numbers. For example, swap plates with a friend and try renaming at 7 (7 beads per pipe cleaner). Swap with another friend and try 8. Finally, decide which number makes it easy to work out the total.

Note: Ten is ideal because it is so easy to count by, however, students need to discover this for themselves, particularly by trying less friendly numbers and seeing the difficulties that arise from this when trying to solve a running total. This helps students understand why our place-value system is base-ten, as opposed to base-eight or base-seven, rather than simply being told to rename at ten without exploring why it is a great strategy.

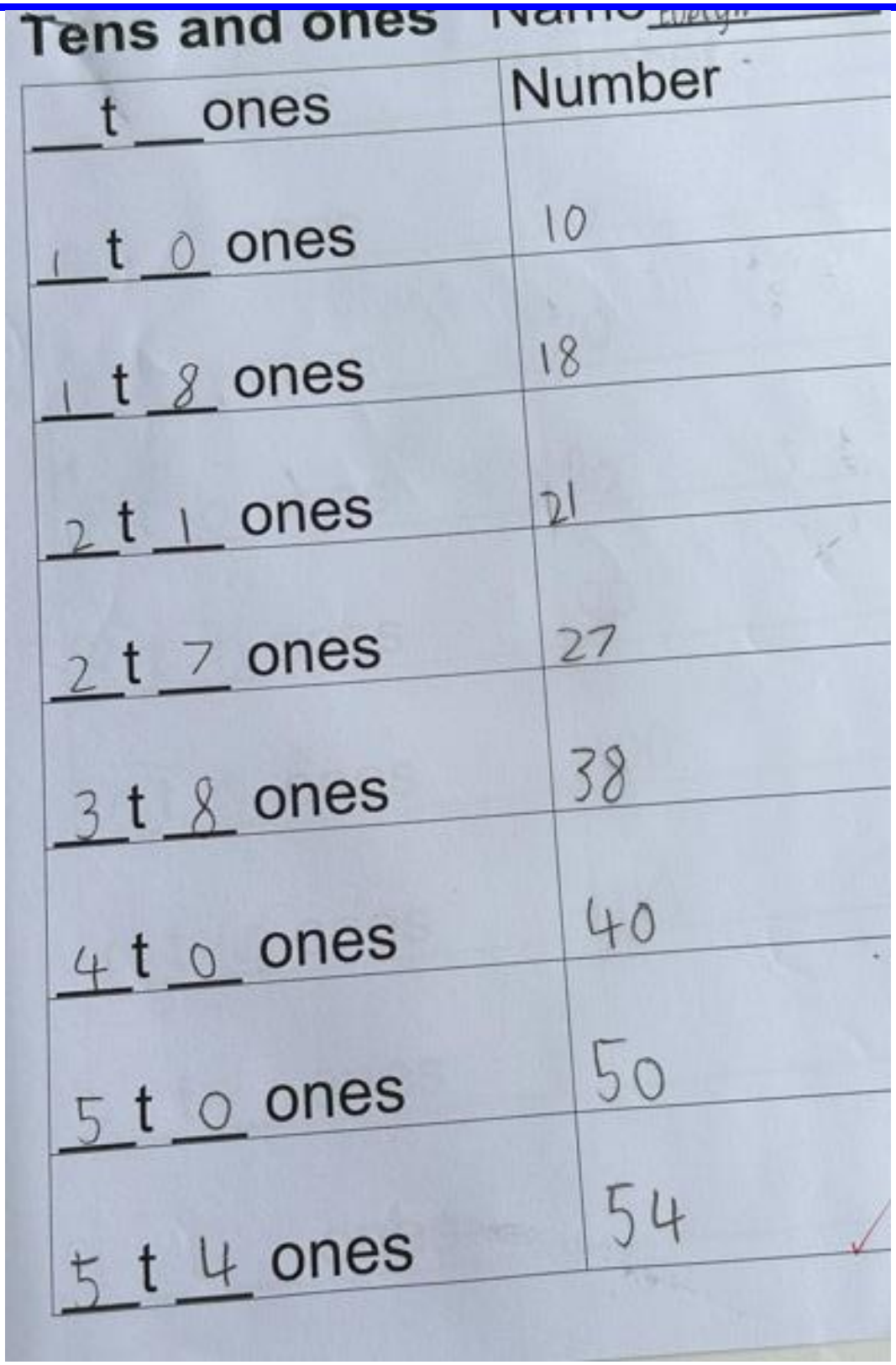
Reflection question: Why do you think our ancestors chose a base-ten place value system?

Recording after each 1-minute 'donut beading' timer dings:

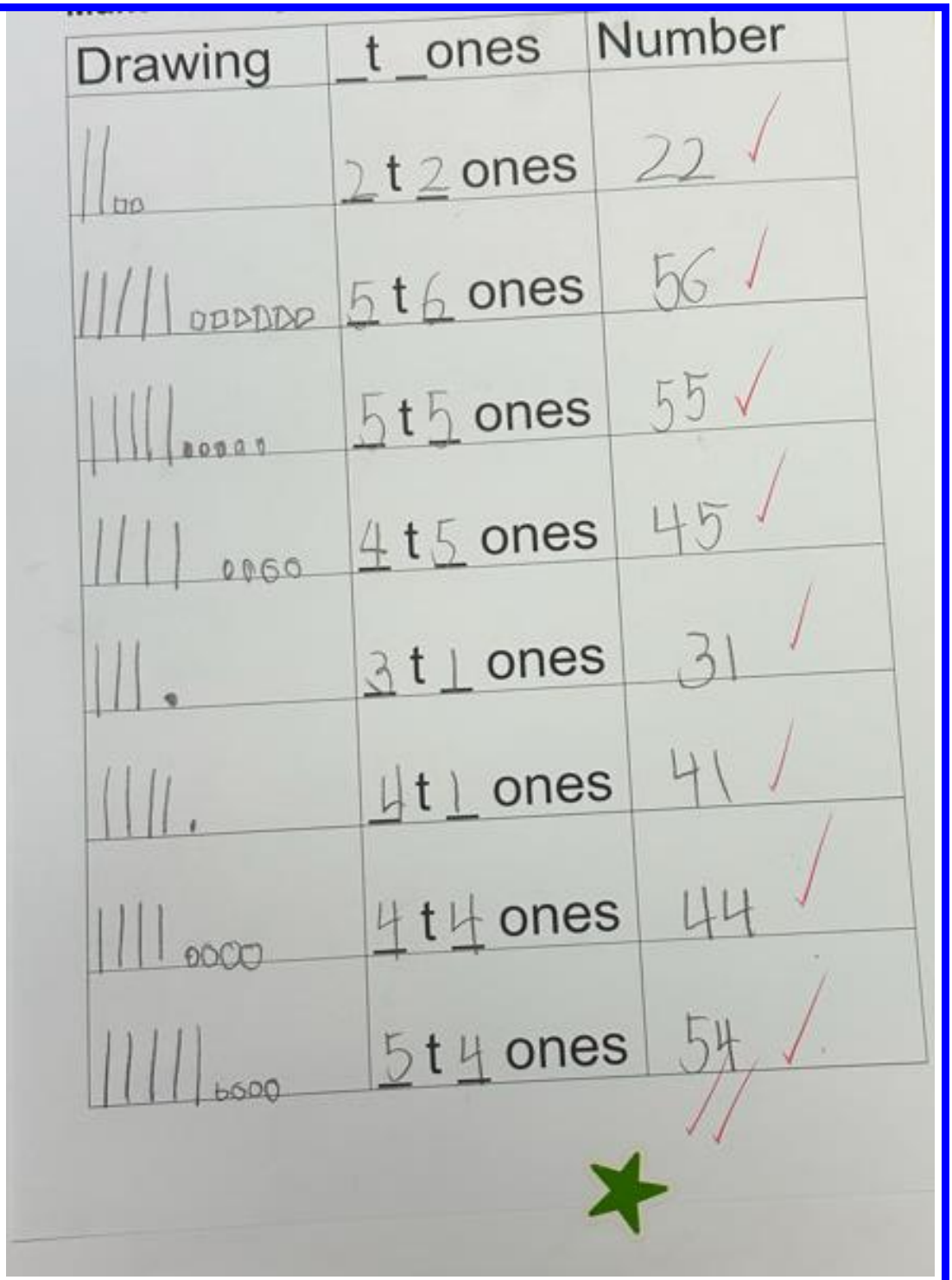


Tens and ones	T-ones	Worded form
2 Tens 5 ones	2T5	Twenty-five
2 Tens 9 ones	2T9	Twenty-nine
3 Tens 0 ones	3T0	thirty
3 Tens 9 ones	3T9	thirty-nine
4 Tens 0 ones	4T0	forty
4 Tens 6 ones	4T6	forty-six
4 Tens 9 ones	4T9	forty-nine
5 Tens 9 ones	5T9	fifty-nine
6 Tens 4 ones	6T4	sixty-four
6 Tens 9 ones	6T9	sixty-nine
7 Tens 9 ones	7T9	seventy-nine
8 Tens 2 ones	8T2	eighty-two
8 Tens 7 ones	8T7	eighty-seven

Becoming the best teacher in the world - the maths lesson students will remember for the rest of their lives!
Bring in a few doughnuts to celebrate at the end of this session, cutting them into fractions before eating them as a whole-class celebration of doughnut maths day!



Simplified template – student work sample



Drawing	_t _ones	Number
||oo	2 t 2 ones	22 ✓
||||| ooooo	5 t 6 ones	56 ✓
||||| ooooo	5 t 5 ones	55 ✓
|||| oooo	4 t 5 ones	45 ✓
||| .	3 t 1 ones	31 ✓
|||| .	4 t 1 ones	41 ✓
|||| oooo	4 t 4 ones	44 ✓
||||| oooo	5 t 4 ones	54 ✓

Student work sample

Follow-on – renaming: After all the beads are cleaned up, your truck spills again! Spill each pipe cleaner one-by-one to rename the number. For example, if your total was 105, record the total as 1h 0t 5 ones. Then spill one ten, so it becomes 9t 15 ones. Then another: 8t 25 ones, and so on until you have 105 single donuts again.

Support: Tip a smaller number of beads onto their plate, for example, 30 or 40, rather than around 100 or 200.
Encourage the use of 2 or 5 as their alternate renaming number.

Extension: Experiment with 4, 6, 7, 8 and 9 as their renaming numbers to practise the times tables at their point-of-need. For example, put 6 beads onto each pipe cleaner and use your 6 times tables to work out the total.

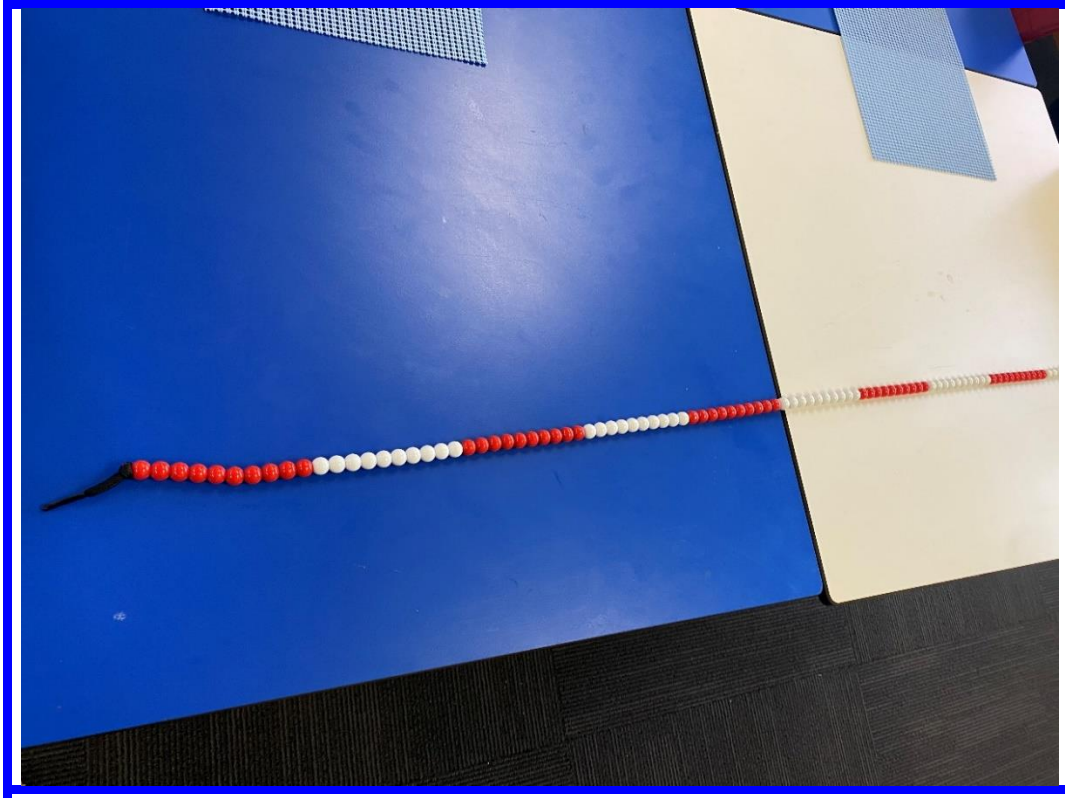
4 x 6 = 4 x 5 + 4 = 20 + 4 = 24

If the student does not know the times table, brainstorm a strategy to figure it out using the bead number lines. For example, you could pretend there are 5 beads on each pipe cleaner, then add the extra. Let's say you have 8 pipe cleaners with 6 beads on each. Pretend each pipe has 5, so 5 x 8 = 40, then add the extra 8 because there are actually 6 on each pipe, so 5 x 8 + 8 = 48. So, for any 6 times table, you can solve the 5x then add one more group of the other number (5 x other number + other number).
Likewise, for the 9 times tables, pretend it is a 10x, then take away one bead from each pipe cleaner. For example, for 5 pipes with 9 beads, pretend it is 5 pipes with 10 beads (50), then take away 5 beads (1 from each pipe cleaner), because there are actually 9 (not 10) on each pipe, so 45 in total.

For the 8s, pretend each pipe cleaner has 2 beads, then just double double double that total. For example, let's say you have 6 pipe cleaners with 8 beads. Pretend it is 6 pipes with 2 beads. Double 6 is 12. Now, if there were 4 beads, double 12 is 24. Now that it is 8 beads, double 24 is 48. So any 8 times table can be solved by thinking 'double double double' the other number in the equation.

Spill all the beads out again and repeat by putting 7 beads on each pipe cleaner. Repeat with 8 and 9. Do you get the same total each time? Finally, try 10. Which number was the easiest? Which was the most challenging? Why?

Variation – Nuts and Bolts: Instead of a donut or food truck spill, a Bunnings/local hardware store truck/tradie's ute has tipped, and all the bolts and nuts fell out! There are bolts at Bunnings that can hold precisely ten nuts. Instead of pipe cleaners, these would be a beautiful demonstration of tens and ones, since students cannot fit more than 10 on each bolt. If your school budget cannot provide sufficient materials for a class set for each pair of students, at least try to use a small set for one group each day (while others use the connectable cubes or pipe cleaners with beads), particularly for support students, as it overcomes any chance of misconception or difficulty in terms of miscounting the ten for each bundle.

Tens-ones Lesson 9	**Tug-of-War** **Learning intention: Break a number into tens and ones to record it in place value form, standard form and worded form** **Maths vocabulary: tens (10 ones), 't' and 'ty' for tens, place value form (t-ones), standard form (digits), worded form**
Link to sport: Should tug-of-war be included as an Olympic sport? youtube.com/watch?v=qYEzLL510o8 Watch a professional tug-of-war in action: youtube.com/watch?v=It9tfX8Ux2o	**Lesson summary: Students play a 100 tug-of-war game to 'win' as many beads to their side as possible, saying their total as 'tens-ones' each turn and recording it in place value, standard and worded forms. In the process, students also learn about all the ways to make and partition 100.** **Materials:** • Bead strings. These can be made yourself with two different colours of beads and long shoelace-like thread, or purchased from Dr Paul Swan's website at drpaulswan.com.au/shop/long-bead-string-100-beads/ (100 bead string – one per pair of students is ideal) and drpaulswan.com.au/shop/bead-string-1-20-10-pack/ (10 sets of 20 bead strings – one per student is ideal). • 10-sided dice – one per pair. • Tug-of-war recording template. **Best set-up:** Fishbowl model, then students work with like-ability buddies.  **Modelling and questioning:** Students each start with 50 beads on their side, with their beads pushed towards them to create a gap in the middle of the string. Students can put a popsicle stick on the gap to make it more obvious.

Student A rolls the 10-sided dice. Let's say student A rolls 9. They push 9 more beads towards their side. Student A says, "I have 5 tens and 9 ones, fifty-nine." Student B says, after using the beads to work it out, "I have 4 tens and 1 one, forty-one." 59 + 41 = 100. The colour of the beads, grouped in tens, is particularly powerful to consolidate the partitioning into tens-ones concept.

Student B then rolls the dice. Let's say student B rolls 2. They push 2 beads towards their side. Student B says, "I have 4 tens and 3, forty-three." Student A says, after looking at their side to figure it out, "I have 5 tens and 7 ones, fifty-seven." 43 + 57 = 100.

Each turn, both students record the place value form (5t 7 ones), standard form (57) and worded form (fifty-seven) of their current number using the recording template, as well as the addition number sentence that makes the total of 100. Students can use the spelling assistance chart or lingojam.com/NumbersToWords for help with the worded form.

When the teacher calls "time-up," the player who has the most beads on their side, wins the tug-of-war. The teacher can call this every 15 minutes and then rotate the pairs to create new tug-of-war contests throughout the session, maximising student engagement.

Misconception alert: Ask students to guess what would be on the other side of the string for these numbers:

36 + ?? = 100 82 + ?? = 100 54 + ?? = 100

After they have guessed without materials, asked them to prove their answers using the 100-bead line. Most students will say 36 + 74 = 100, 82 + 28 makes 100, 54 + 56 makes 100. Use the materials to reveal this misconception and for students to discover why it is in fact 36 + 64, 82 + 18, and so on. **Ask students to explain it in their own words.**

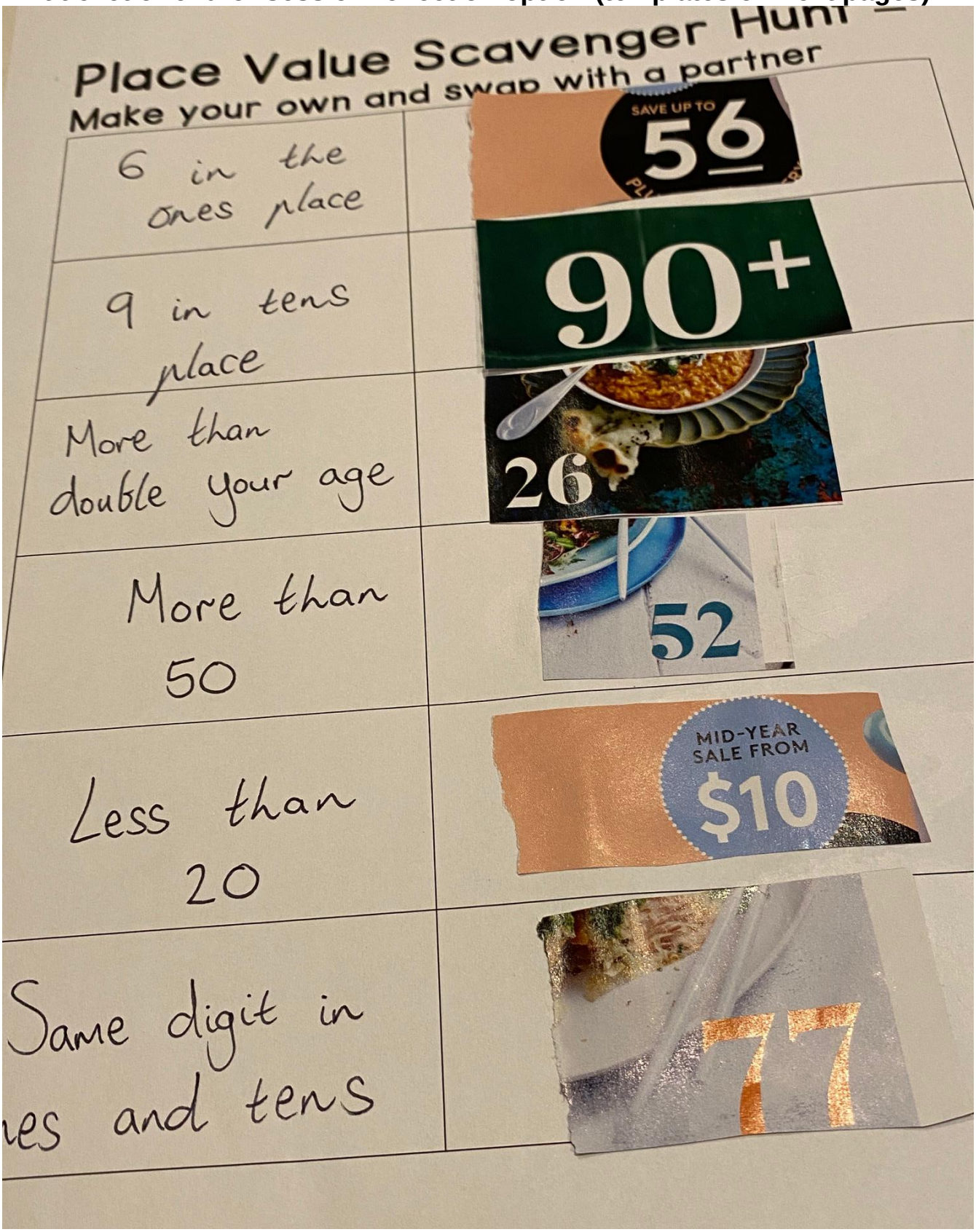
Support: Use the 20-bead version of the bead lines and roll a 3-dot or 6-sided dice to play a more supported version of the tug-of-war out of 20, instead of out of 100. Students could even play a version with just 10 beads, which is ideal to practise the 10 facts, particularly while using a 3-dot dice to keep the game competitive for longer.

Extension: Tell these students that each bead costs exactly 1 cent, or $0.01. Their goal is to get as close to $1 as possible, playing the same tug-of-war as the other students, but recording the beads as decimals, since 47 beads is worth $0.47, or 47 out of 100, so $\frac{47}{100}$

Record using three columns:

Out of 100	Fraction	Decimal (money cost)
47 out of 100	$\frac{47}{100}$ Reading this as "47 out of 100"	47 cents $0.47 0.47

Exit ticket or end-of-session reflection option (templates on next pages)

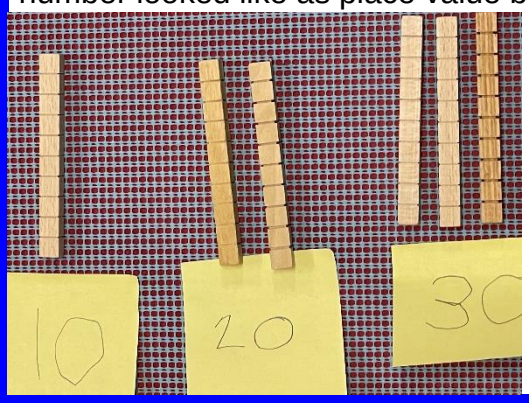
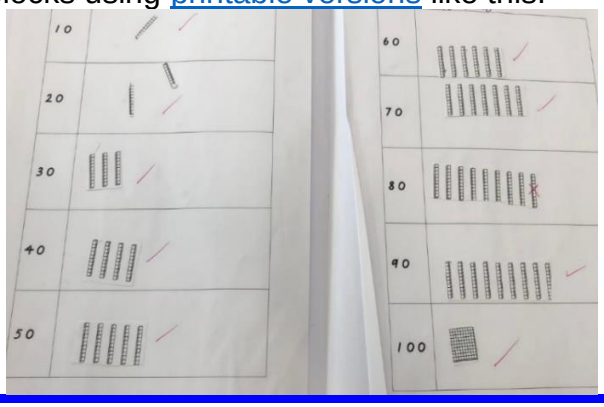


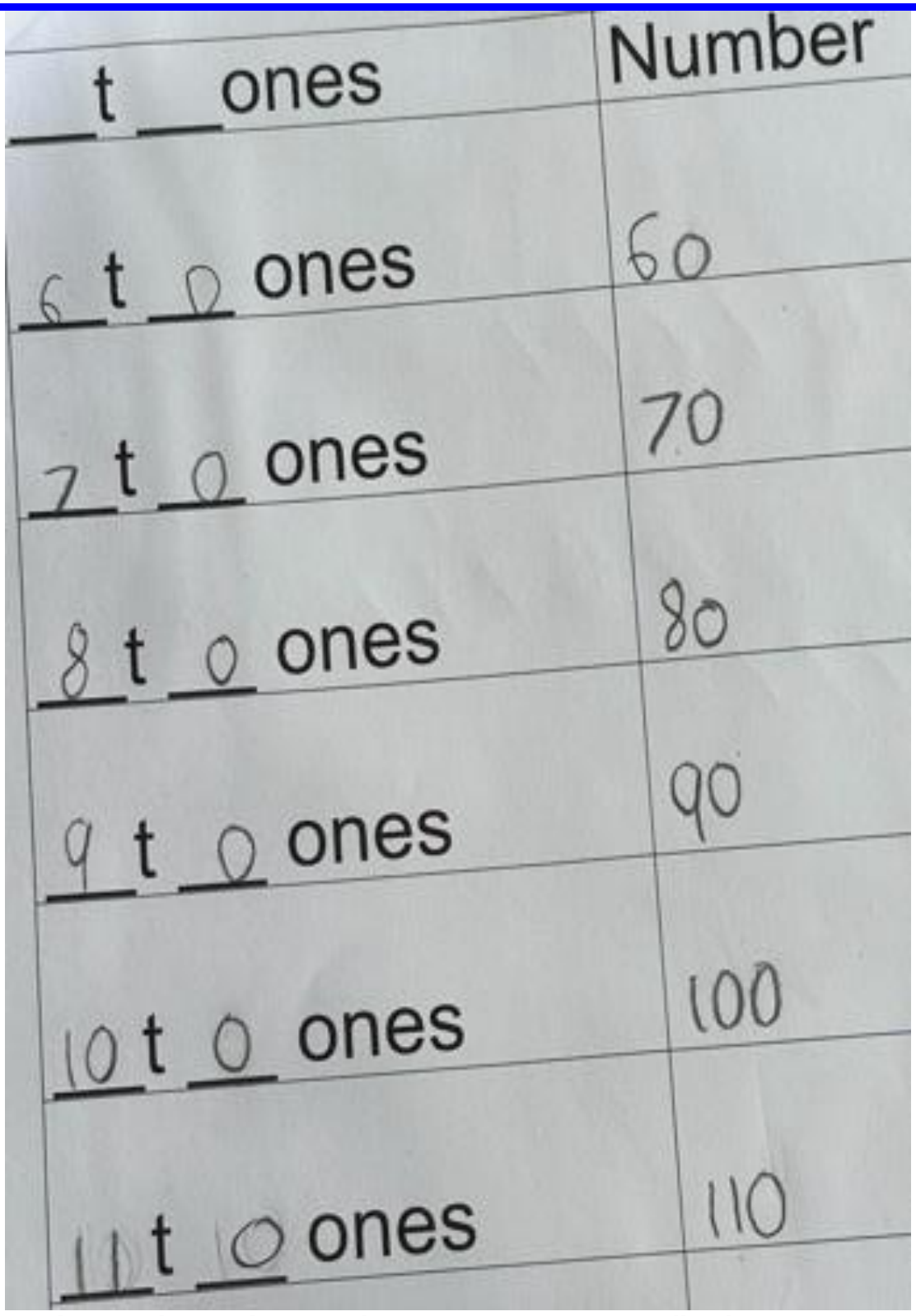
Place Value Scavenger Hunt

9 in the ones	
2 in the tens	
0 in the ones	
More than 50	
Less than 20	
Double your age	

Place Value Scavenger Hunt –

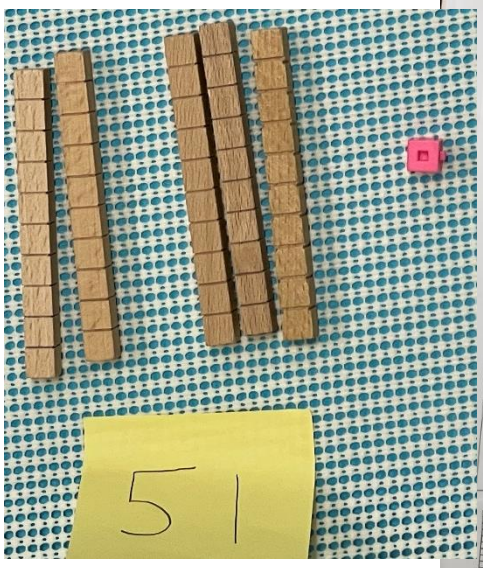
Make your own and swap with a partner

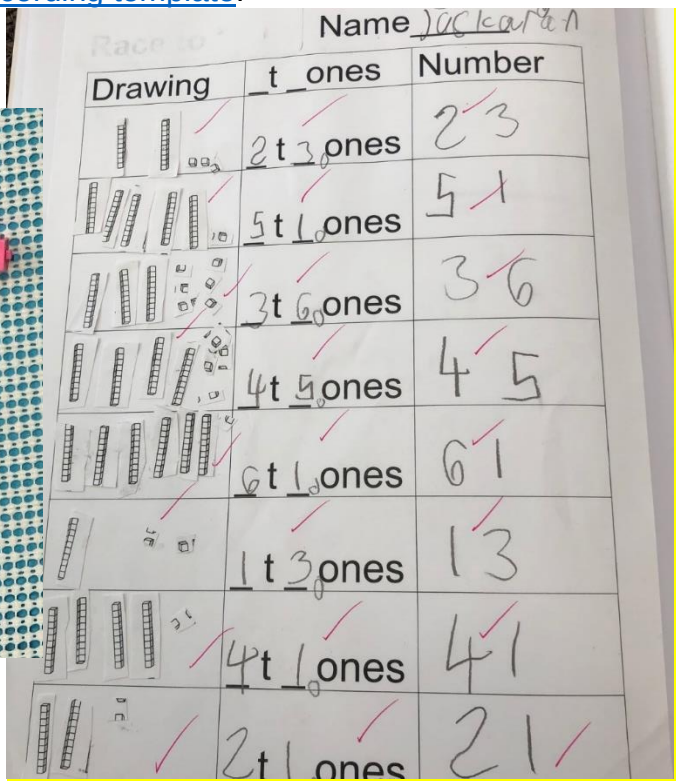
Tens-ones Lesson 10	**Introducing Place Value Blocks** **Learning intention: Make two-digit numbers using quick materials (place value blocks) where the cubes are already stuck together in bundles of ten** **Maths vocabulary: place value blocks (call them this instead of the commercial name 'MAB"), two-digit numbers (tens and ones)**
Incentive: If you do well at achieving our learning intention this maths session, at the end, we will have free sculpture building time using the place value blocks!	**Lesson summary: Students investigate the value of place value blocks (MAB), then use tens and ones blocks to create two-digit numbers, recording their findings using printed versions of the blocks.** **Materials:** • Place Value blocks – 10 tens blocks and 9 ones blocks per student. • T-O chart from this unit's folder. • *For part 1 student recording* – Printable tens blocks (pre-sliced) and Counting by 10s template all from this unit's folder. • *For part 2 student recording* – Printable tens and ones blocks (pre-sliced) and Making two-digit numbers recording template all from this unit's folder. **Modelling dialogue:** "Bundling popsicle sticks and connecting unifix cubes to make tens takes so long. I just do not have time to do that, particularly if I want to make 100! I would need to connect ten towers of ten, it is just too slow! I need something faster. Can anyone suggest a quicker way? Take student suggestions. What if we had some blocks already connected to make ten? Would that work? Permanently stuck together, hmmm…Then we could make two-digit numbers quickly and easily! Each block would have a value – the tens and ones – and the digit we write in each place would show those values and the worth of each block. So, in a two-digit number, the second digit would be worth the tens block, and the first would show the ones block." Around the fishbowl modelling desk, with the class watching, try to make a total of 100 against a student partner. The teacher collects and connects unifix cubes into towers of ten, while the student partner just counts by tens with the place value blocks (MAB). Who won? What number did I have when Mila (the student) had already made 100? Which materials make it quick and easy? **Lesson sequence – Part 1:** At first, ask students to count by tens as they collect each ten block and place it on a grip mat, also recording what each number looked like as place value blocks using printable versions like this:  



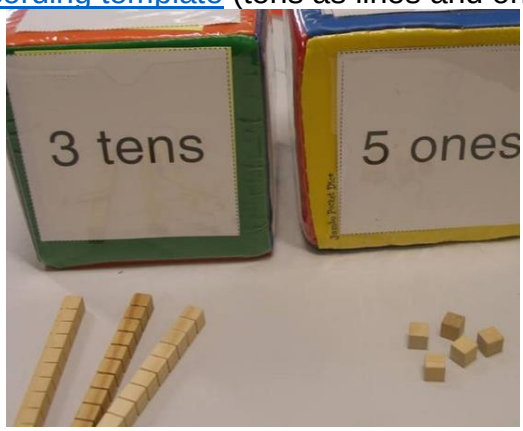
Student work sample from Thomastown East PS – collecting one ten at a time and recording the total up to at least 220 to overcome common bridging obstacles

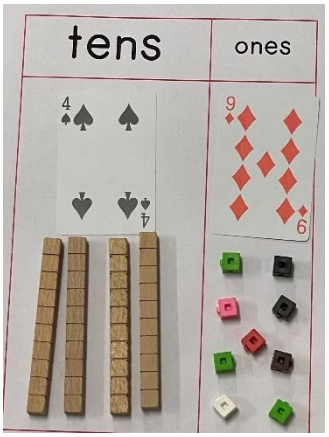
Lesson sequence – Part 2: Place the tens and ones blocks in a T-O chart from this unit's folder. Record the numbers in the same t-ones format that students used with the bundling sticks (*Sir Cumference and All the King's Tens*) series of lessons, to make a direct link to these prior learning experiences, but now with place value block representations. Record using the printable versions in the recording template:



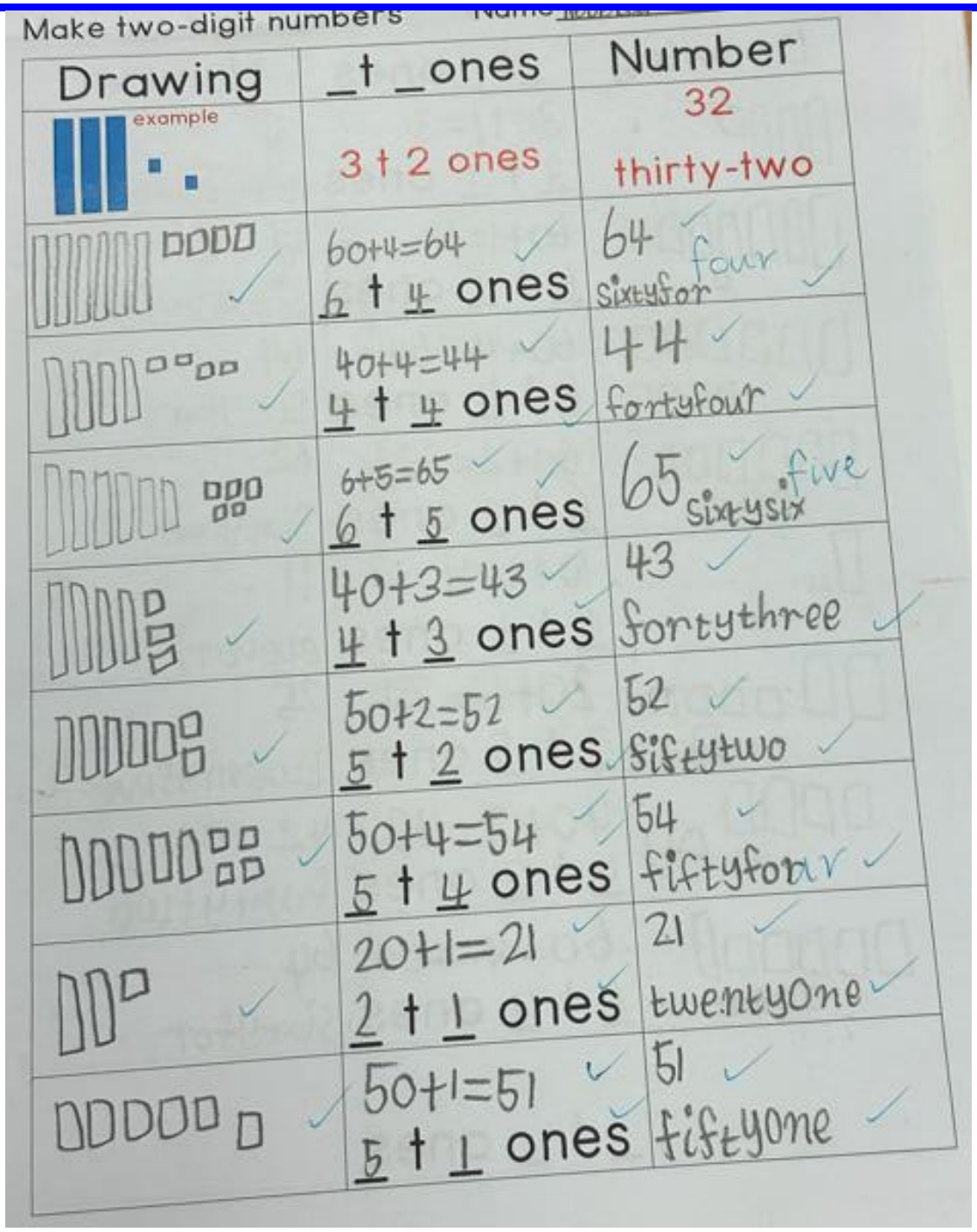


Lesson sequence – Part 3: Roll two dice, one die representing the tens, the other representing the ones. Roll the dice straight into their sides of the T-O chart, then collect the place value blocks for those rolled numbers. Each die has a place, just like how the digits represent place values. Draw the blocks in the recording template (tens as lines and ones as dots).





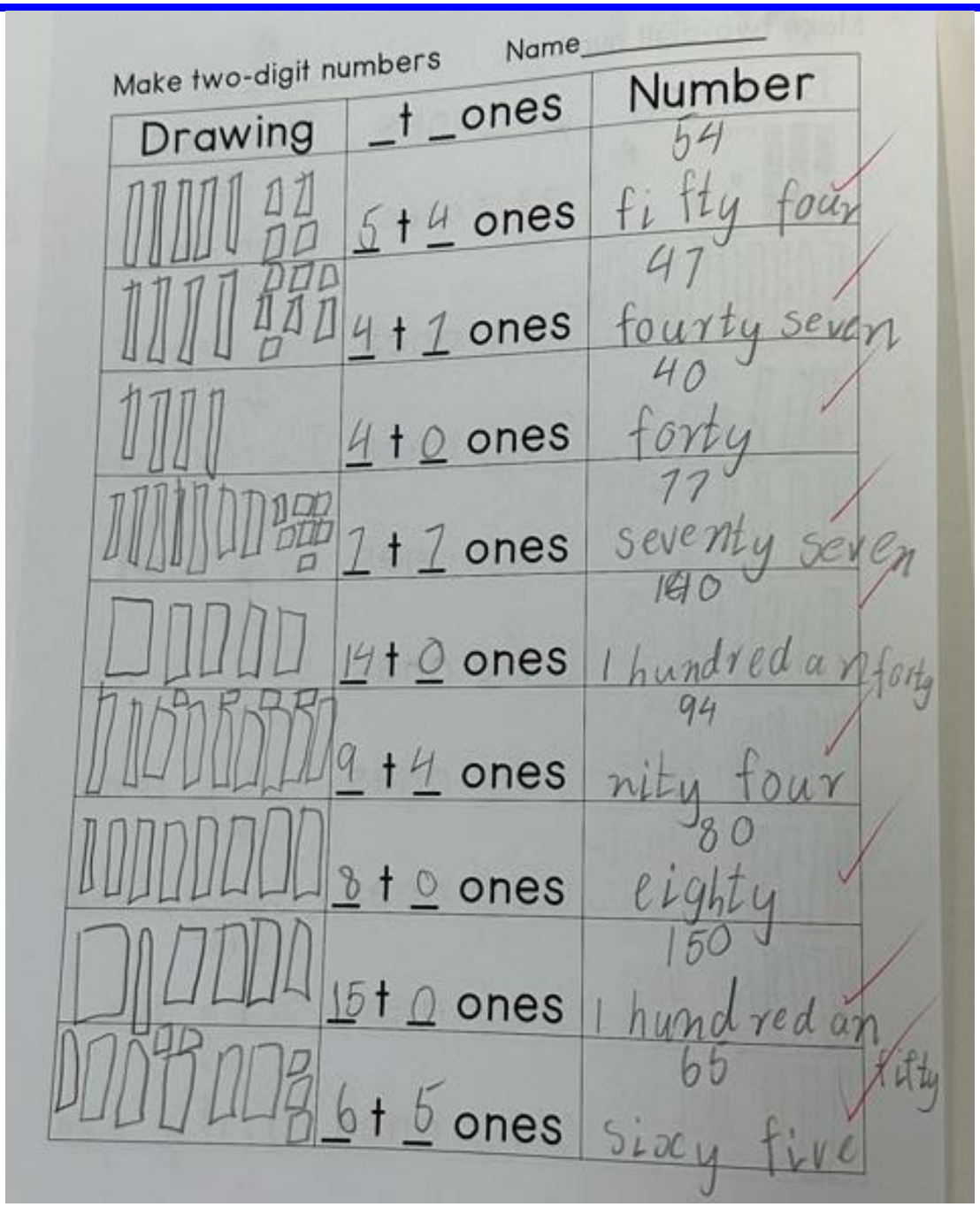
Switch to playing cards in the T-chart (instead of dice) midway through the session – each symbol on the tens card is worth one ten block, each symbol on the ones card is worth one little block.



Make two-digit numbers

Drawing	_ t _ ones	Number
example	3 t 2 ones	32 thirty-two
	60+4=64 6 t 4 ones	64 sixtyfour four
	40+4=44 4 t 4 ones	44 fortyfour
	6+5=65 6 t 5 ones	65 sixtysix five
	40+3=43 4 t 3 ones	43 fortythree
	50+2=52 5 t 2 ones	52 fiftytwo
	50+4=54 5 t 4 ones	54 fiftyfour
	20+1=21 2 t 1 ones	21 twentyone
	50+1=51 5 t 1 ones	51 fiftyone

Student work sample – Thomastown East PS

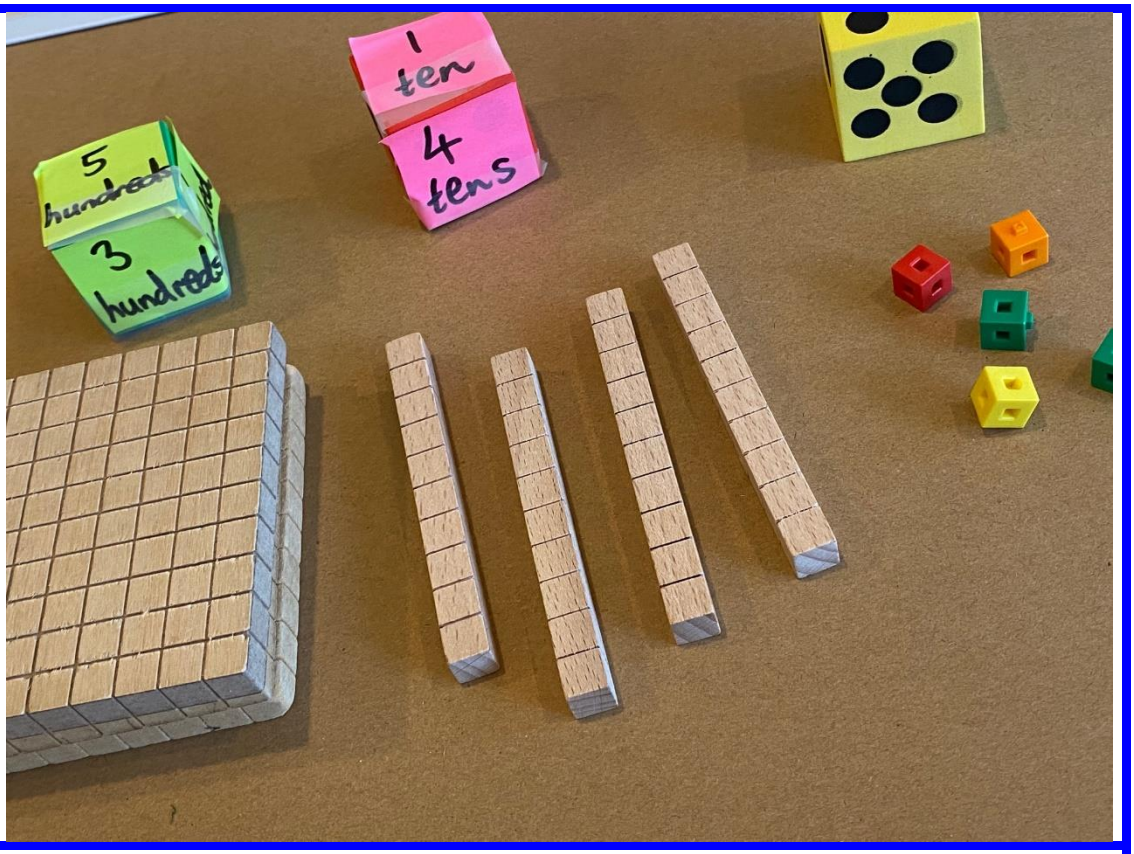


Make two-digit numbers Name_____

Drawing	_t_ ones	Number
	5 t 4 ones	54 fi fty four
	4 t 1 ones	47 fourty seven
	4 t 0 ones	40 forty
	7 t 7 ones	77 seventy seven
	14 t 0 ones	140 1 hundred and forty
	9 t 4 ones	94 nity four
	8 t 0 ones	80 eighty
	15 t 0 ones	150 1 hundred and fifty
	6 t 5 ones	65 sixty five

Questioning:

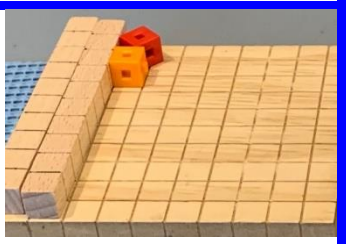
- How many ones are in this (holding up the ten block)?
- What number is this (3 tens blocks and 5 ones blocks on their grip mat)?
- Why is the tens block bigger than the ones?



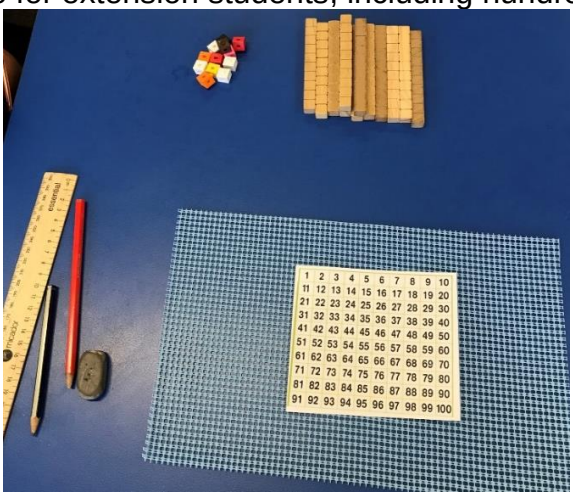
Support: Just work with the tens – no ones involved, like the student recording in the part one photograph. Roll one die during part 3, just collecting that as tens to become accustomed to the number '3' representing tens, not just ones. Place their tens in a T-O chart – we write 3 tens as '30' because it has 3 tens blocks and zero ones blocks.

Extension 1: Investigate the hundred block. How many ones are in it? How many tens? Roll three dice to make hundreds, tens and ones numbers, with the coloured dice signifying different place values.

Extension 2: Round each number to the nearest ten by placing the blocks on the mini place value chart. Are the ones closer to a full ten, or closer to empty? Round each number to the nearest hundred by placing the blocks on top of a hundred block (from the top left-hand side). Does it look closer to full, or closer to empty?



For the nearest ten: 22 rounds to 20, because the ones are closer to 2t than 3t
For the nearest hundred: 22 rounds to 0, because it is closer to empty

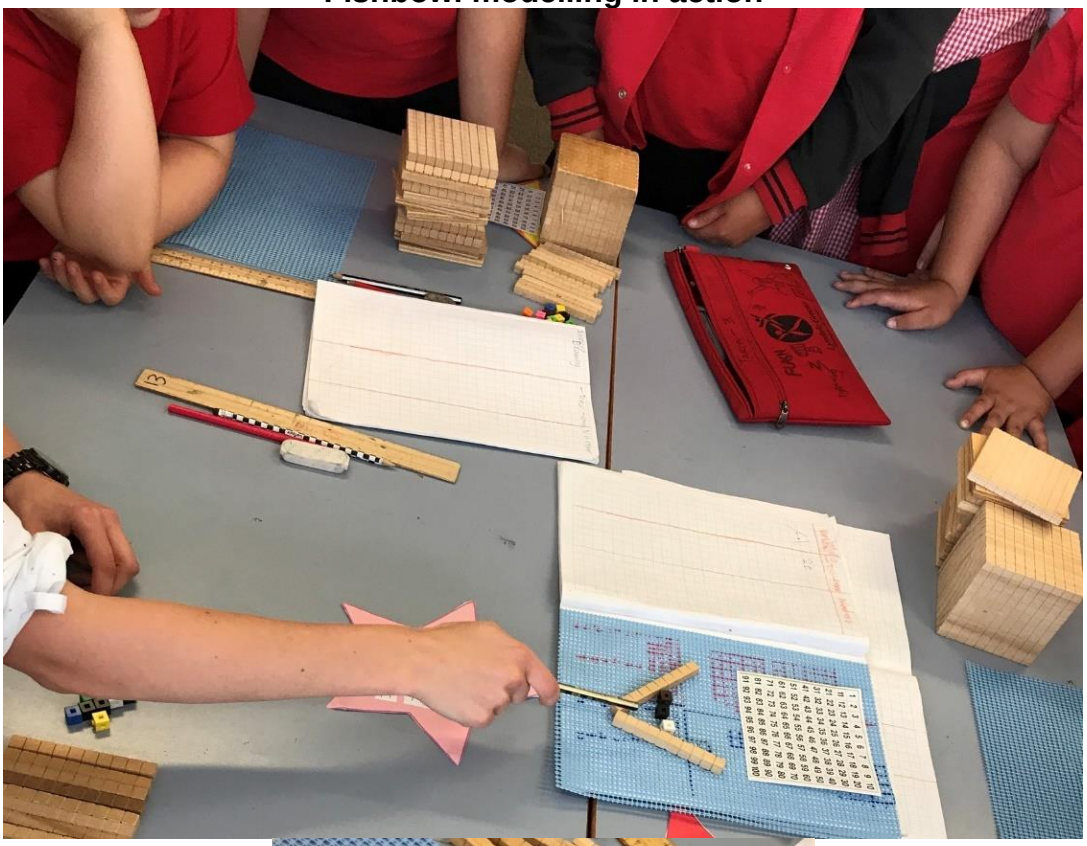
Tens-ones Lesson 11	**Place Value Names** **Learning intention: Make two-digit numbers using place value tens and ones blocks, recording these in place value form, standard form and worded form** **Maths vocabulary: place value blocks (MAB), tens, ones, place value form, standard form, worded form**
Real-life link: What was one of the first words you learnt to spell? What is one of your favourite words? For most people, it is actually their name. Today we are making our names and the place value alphabet.	**Lesson summary: Students make a letter of their name using tens blocks (MAB), then calculate the value of each letter one-at-a-time, using the mini place value chart that is the same size as the MAB for support.** **Materials:** • Mini place value chart from this unit's folder. This is a Top Ten invention – a chart that shows students the value of each number and precisely matches the size of each place value block (MAB) for tens and ones. • Place value blocks – 9 tens blocks and 9 connectable ones blocks per student. More for extension students, including hundreds blocks.  **Best set-up:** Fishbowl model, then students work independently. **Modelling:** Model making the first letter of your name using the place value blocks. After making it, model drawing it one column of your maths book, using squares for hundreds (extension), lines for tens and dots for ones blocks. Then take your letter apart, and place the blocks onto the mini place value chart. Place the tens on first, then the ones. Start from the top left-hand side of the chart (not the bottom). Students can then lift the final block ("Peek-a-boo, what number are you?") to see the value they made. "I have 9 *of the tens* and 6 *of the ones* (peek-a-boo – lift the final ones block), that makes 96." Record your number three ways (see student work samples two pages below): Place value form = 9 tens 6 ones or 9t + 6u (shorthand) Standard form: 96 Students can also practise writing the worded form using the Worded Form Sliders from earlier lessons, or the number spelling chart for assistance.

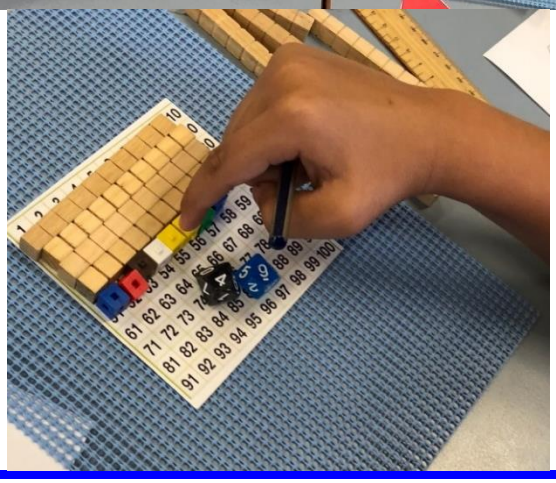
Emphasise for students to use the language *'of the tens'* ("I have 3 *of the tens* and 5 ones) so that they start to see each place value as a unit, as opposed to seeing 30 as thirty ones.

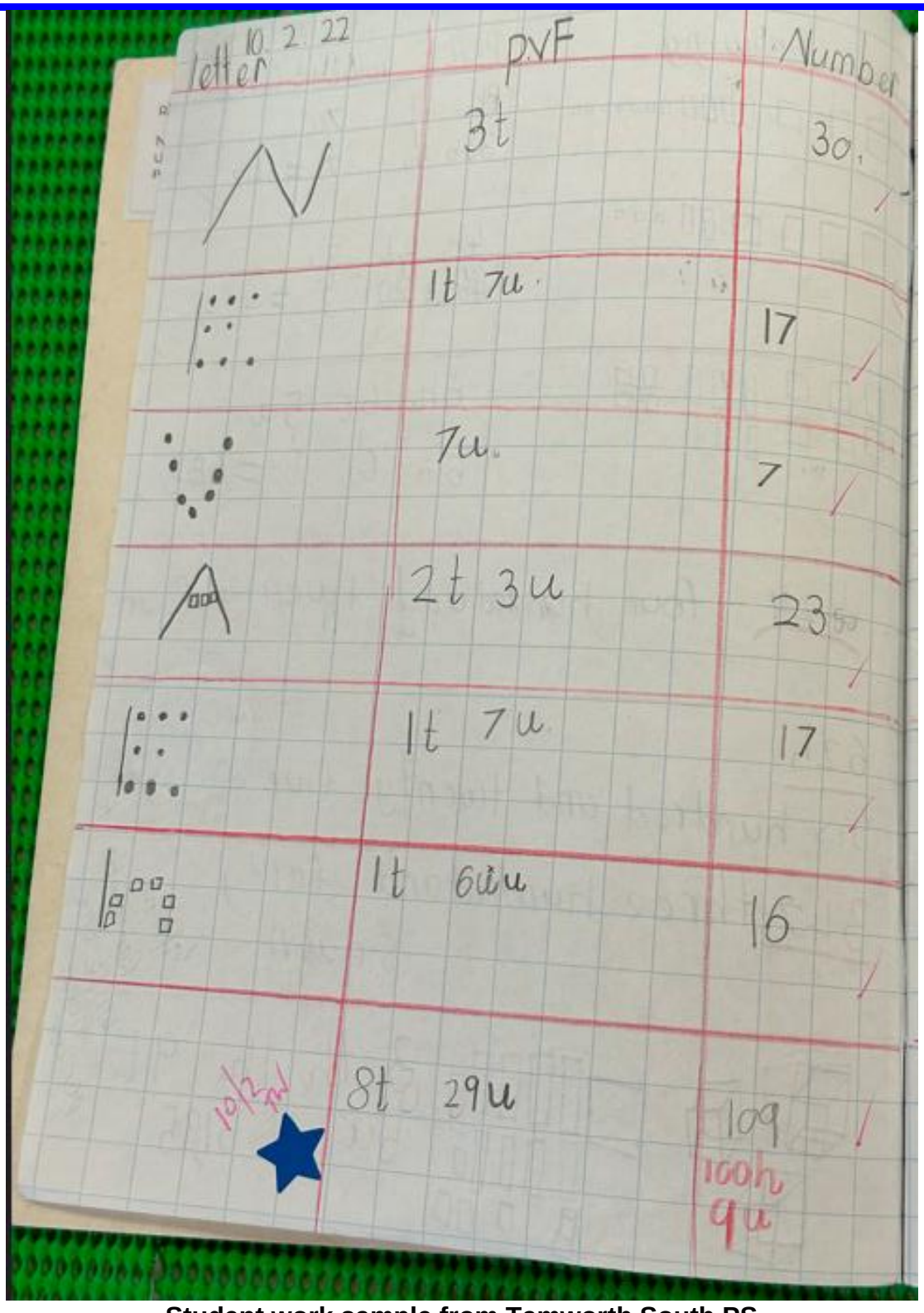
Questioning:

- Why is there a zero there? What does it show you? That there is none of that place value, i.e. zero of the ones.
- What would it be if I did this – add one more ten, take away five ones? Which place values changed and which stayed the same when I did that?

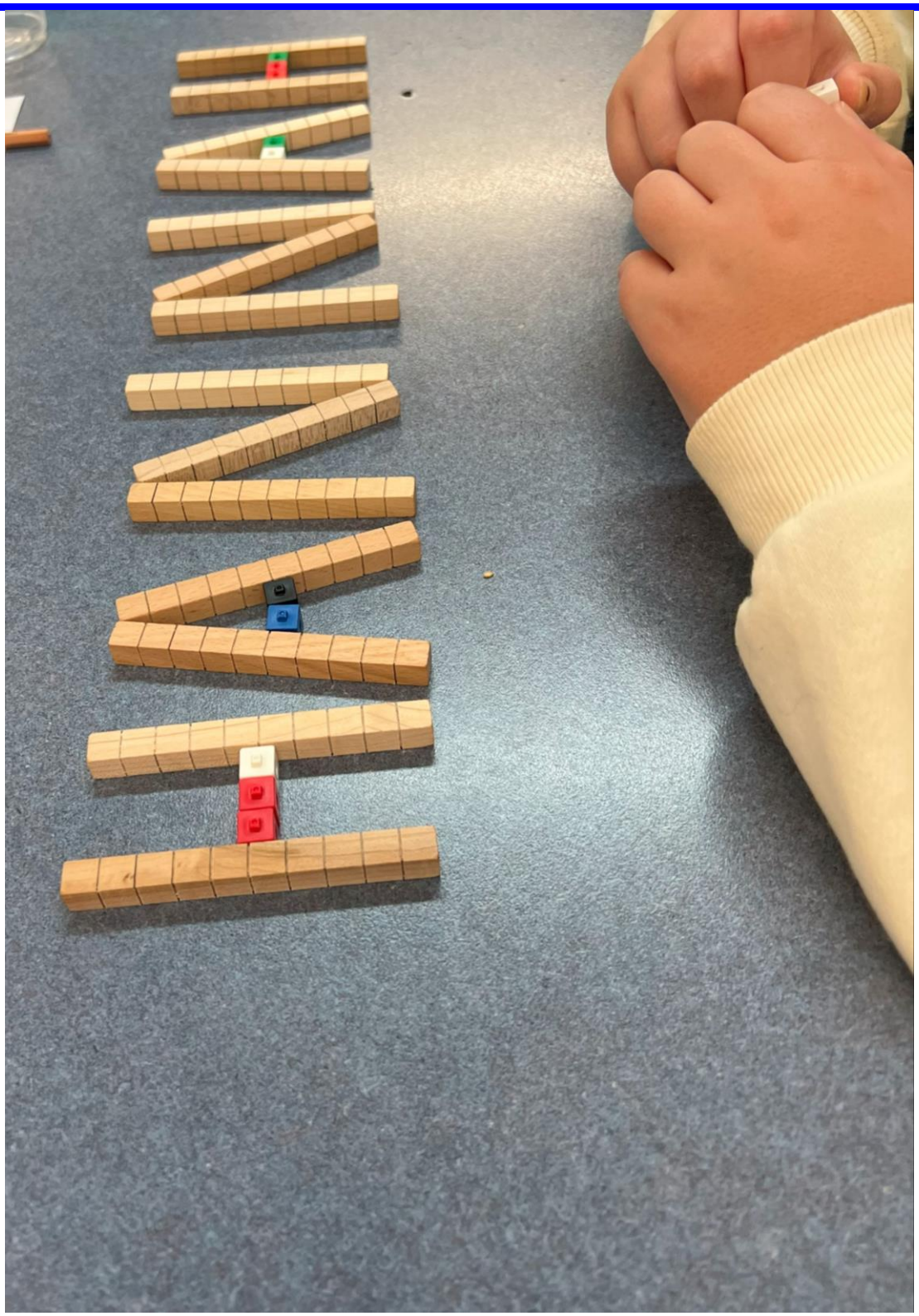
Fishbowl modelling in action



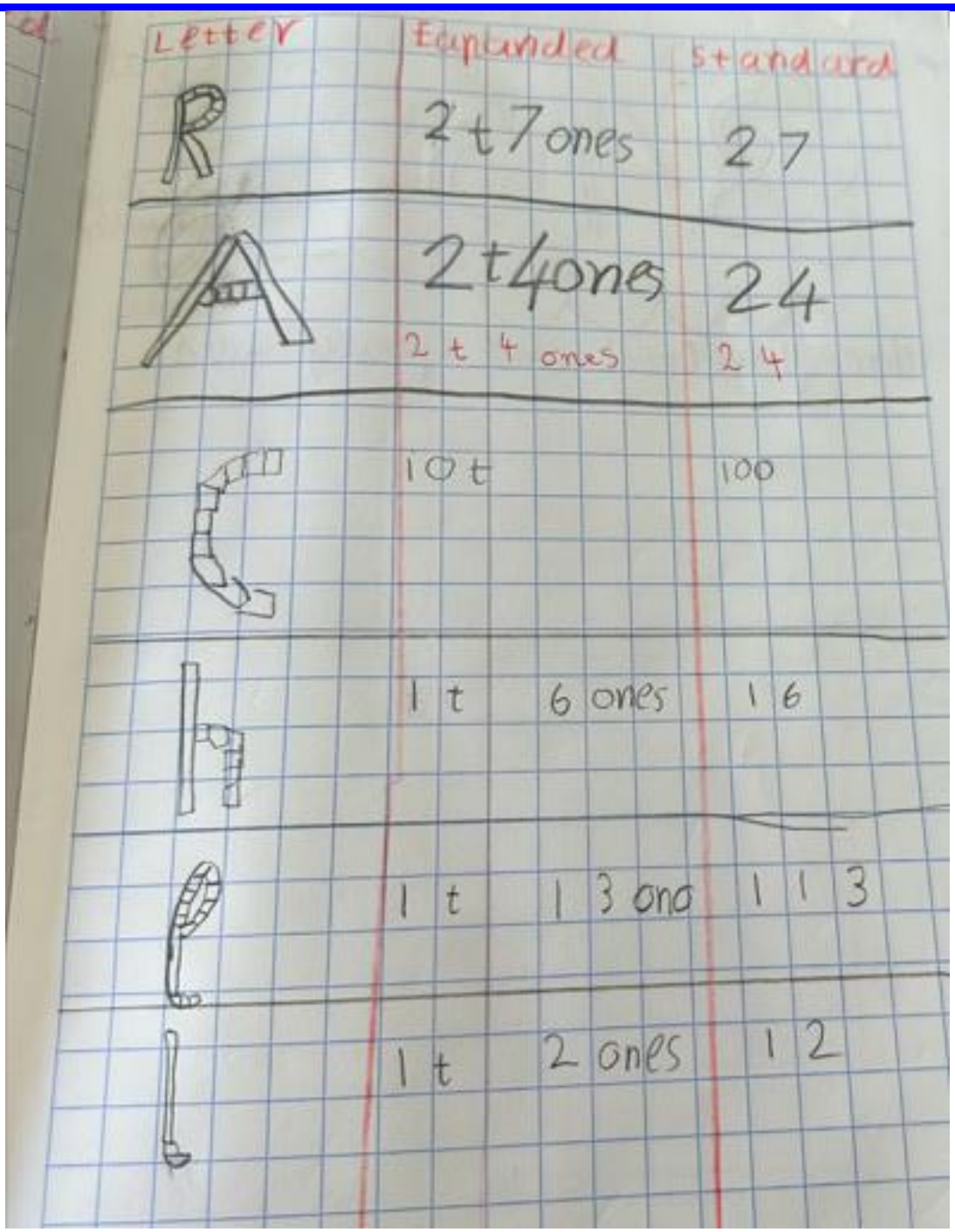




Student work sample from Tamworth South PS



Only make an entire name once ready – first focus on one letter at a time, as the entire name with very often involve renaming ones into tens and tens into hundreds

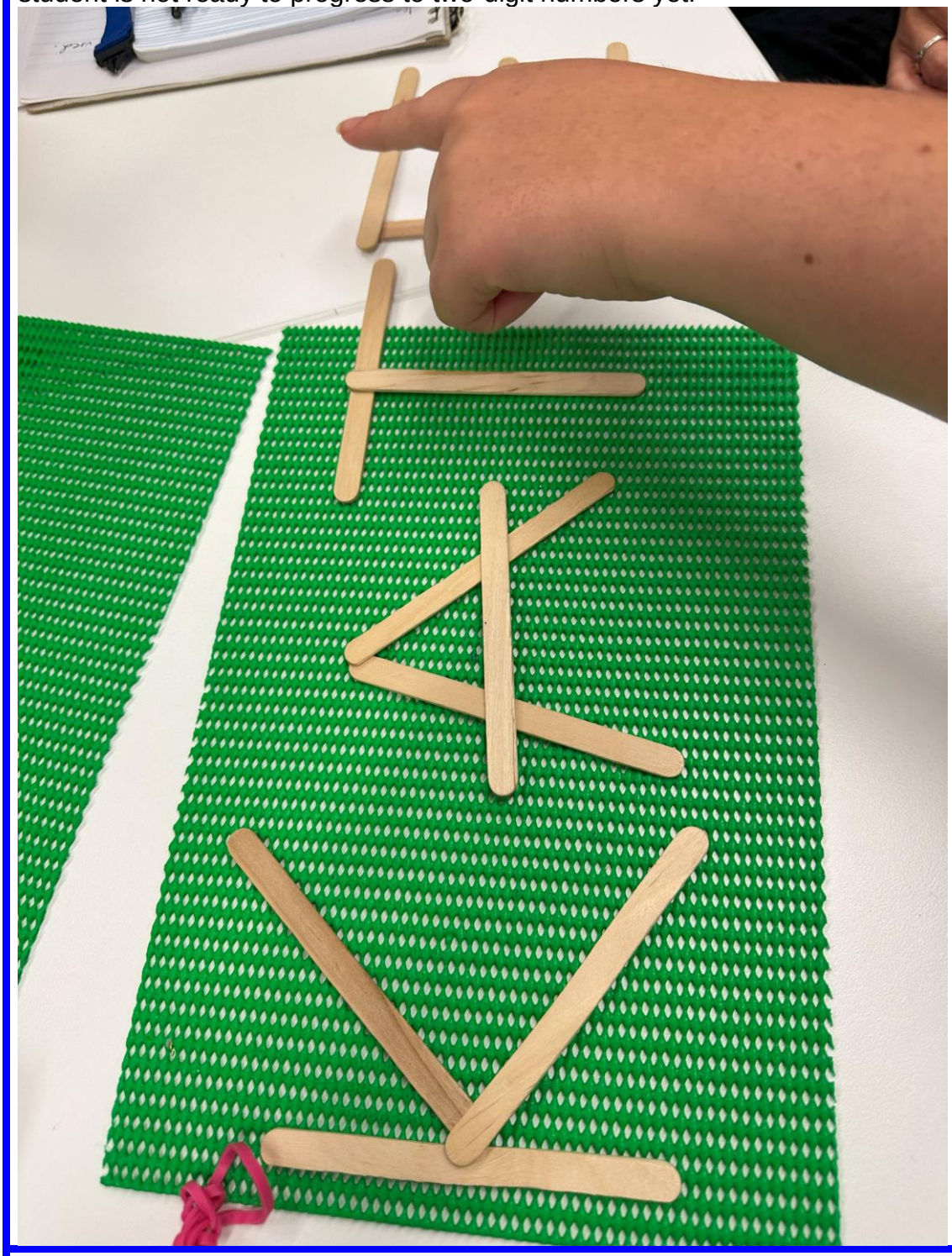


Student work sample focusing on just making one letter at a time, before attempting an entire name (which often involves a great deal of renaming)

Support 1: Use connectable cubes to make their chosen letter (doing only one letter at a time, recording it, taking it apart, then continuing), connecting them into bundles of ten.

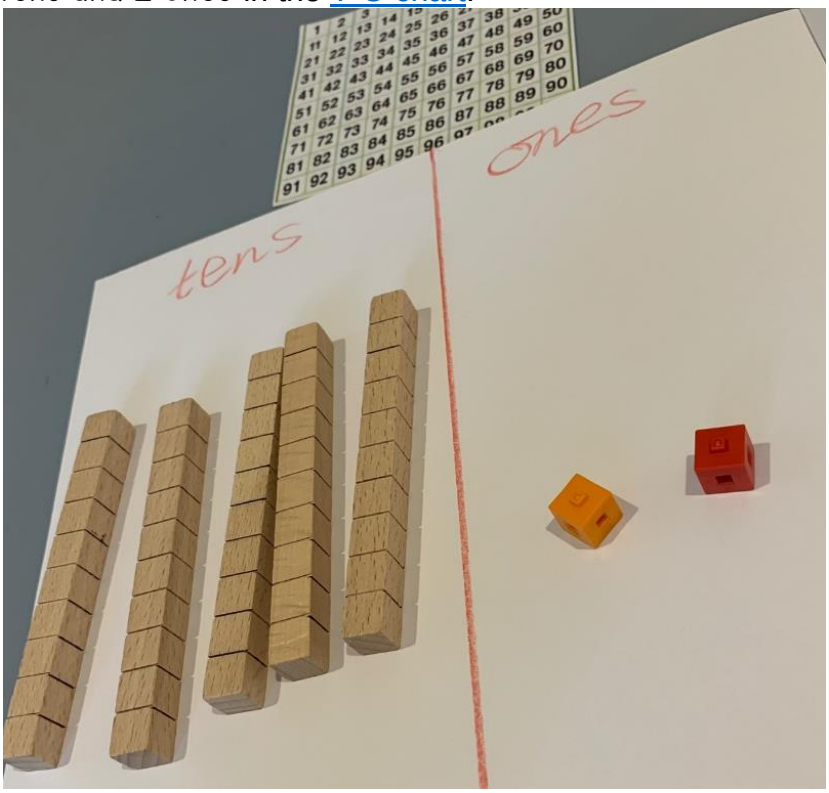
Support 2: Use only tens blocks to make their letters.

Extreme support: Use popsicle sticks and only use up to 9 sticks if the student is not ready to progress to two-digit numbers yet:



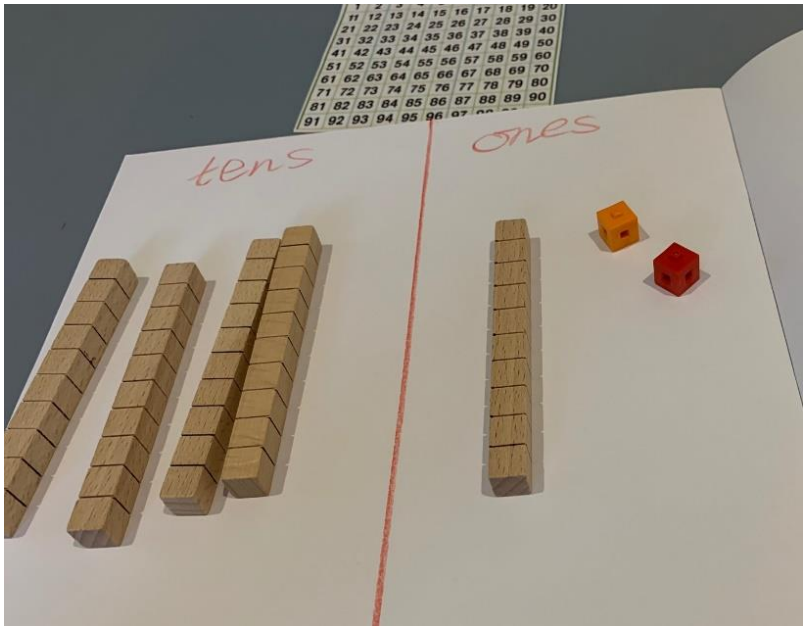
Extension 1: When making letters with only tens and ones blocks like the rest of the class, also use renaming to figure out all the ways they could have made that letter. For example, if you made a letter using 5 tens and 2 ones.

Put the 5 tens and 2 ones in the T-O chart:

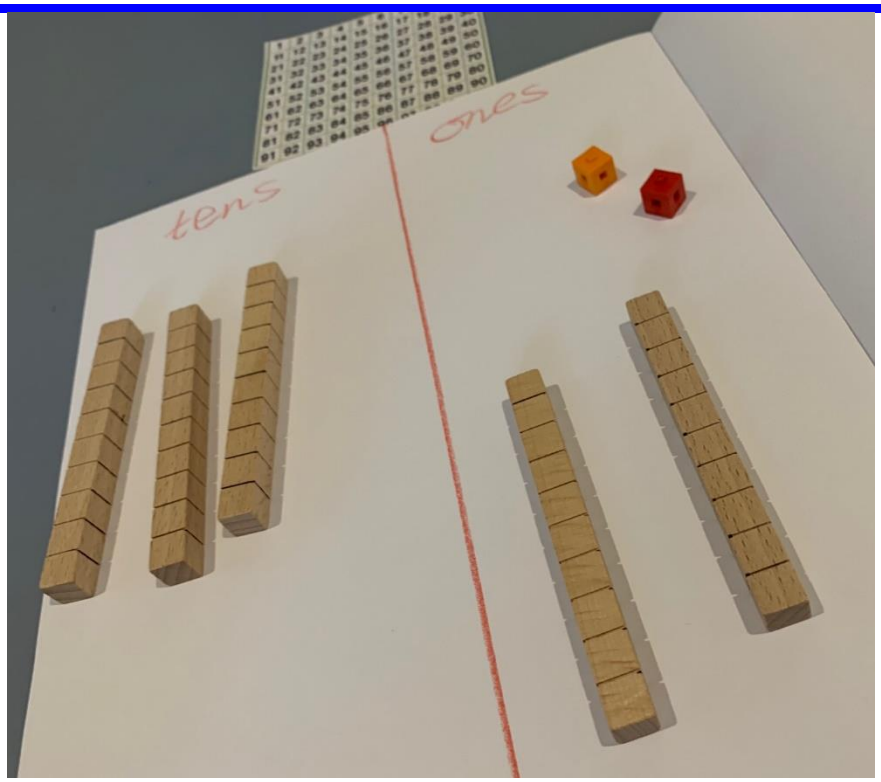


Put on your x-ray eyes to cut up the tens into ones, seeing the other ways you could have made the same number – renaming it!

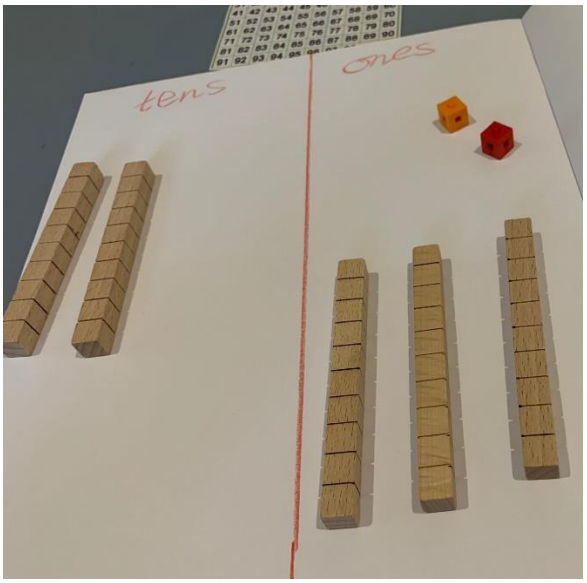
You could have also used: 4 tens and 12 ones



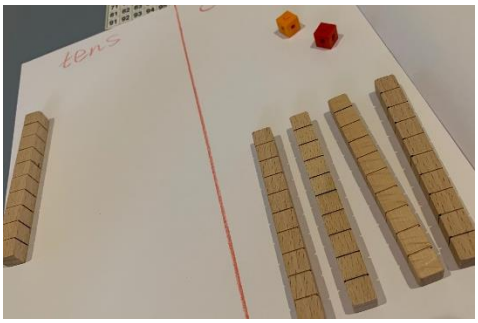
You could have used: 3 tens and 22 ones

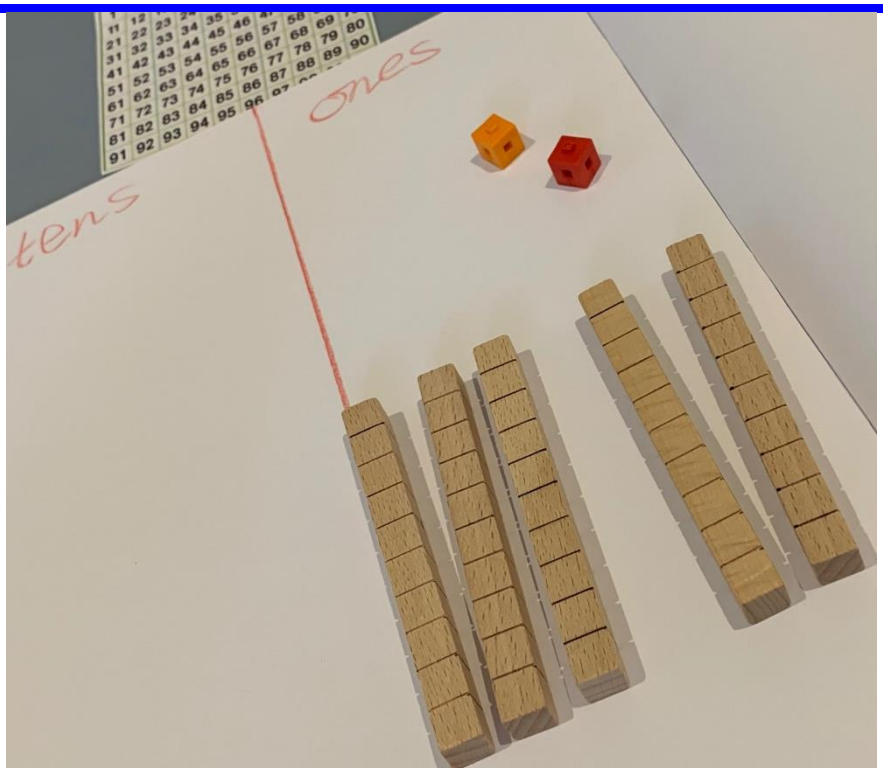


You could have used: 2 ten and 32 ones

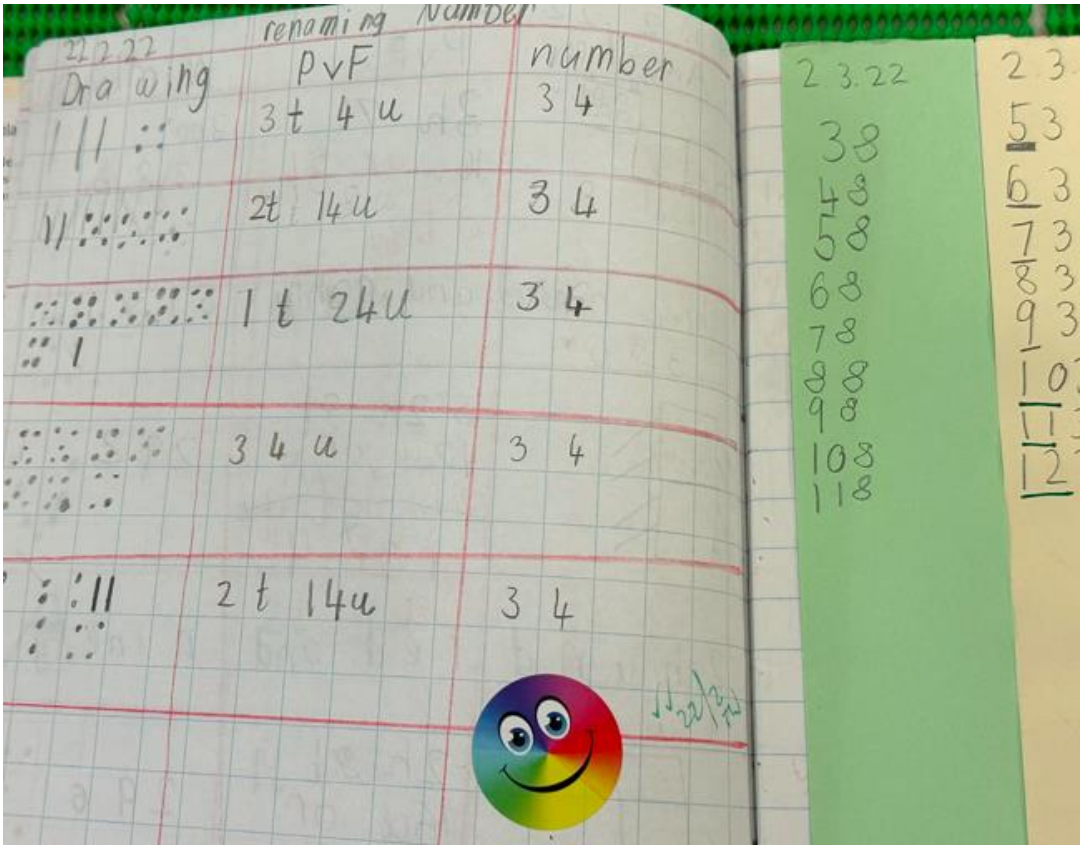


1 ten and 42 ones

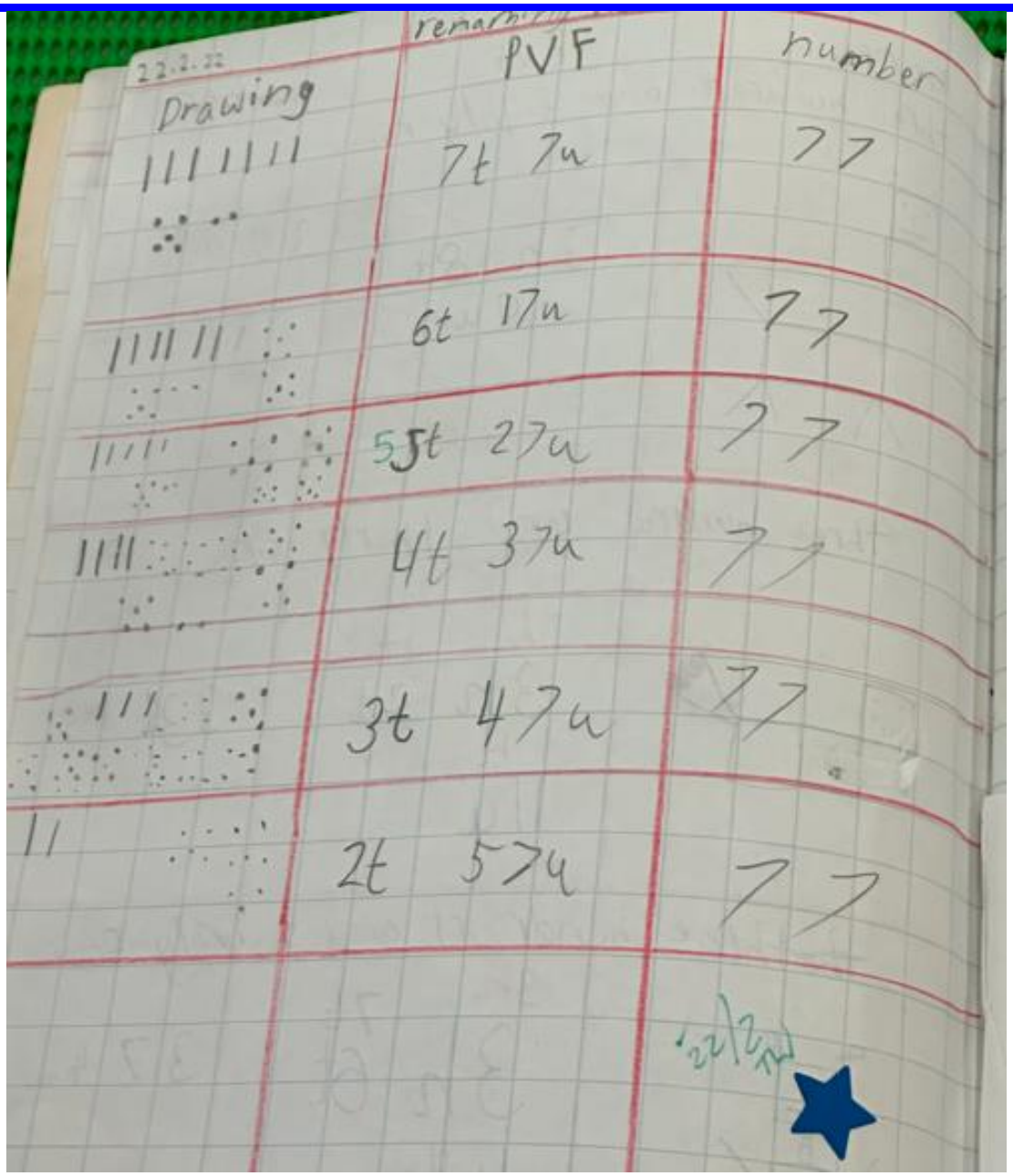




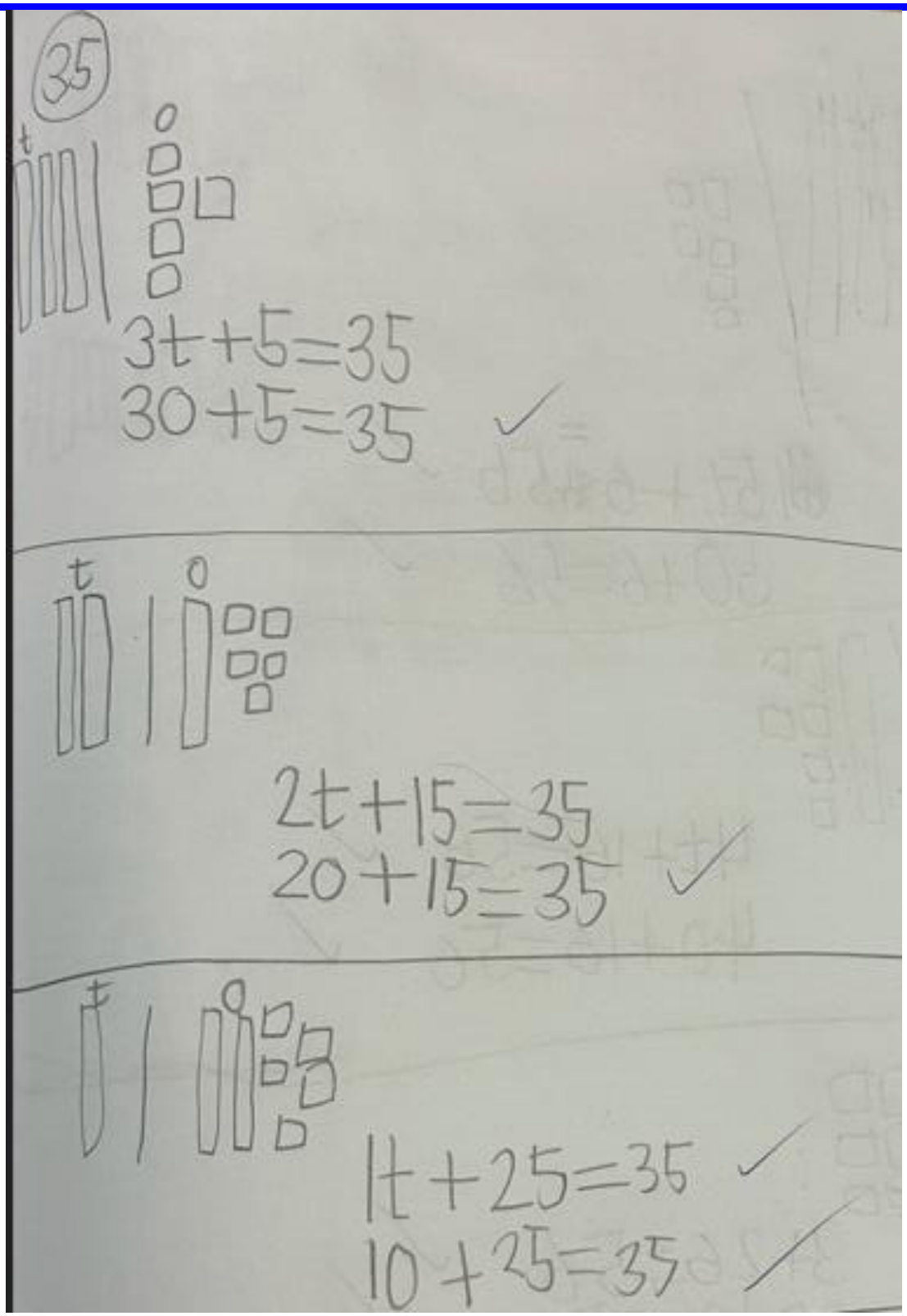
Or even: 52 ones!



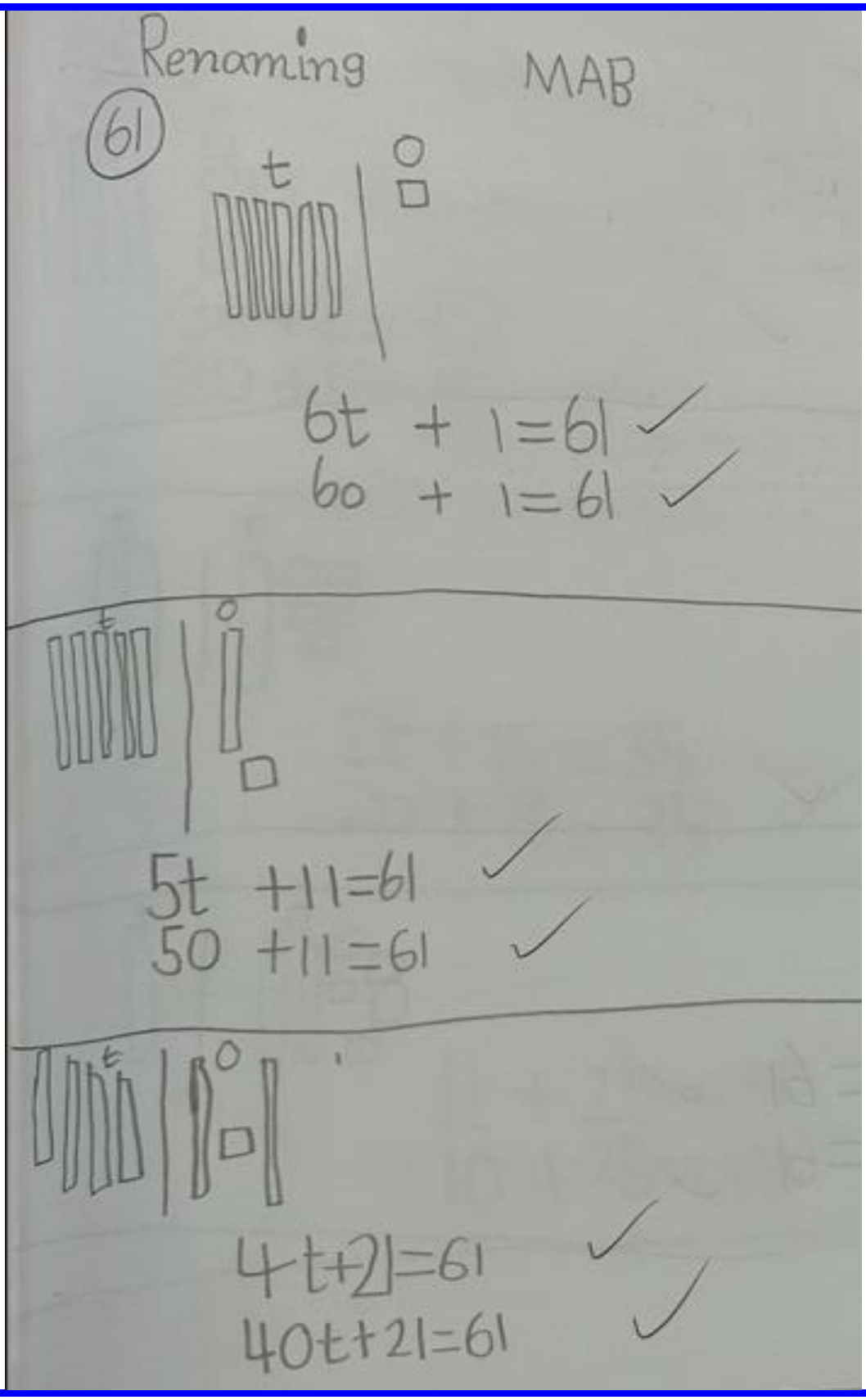
Student work sample from Tamworth South PS

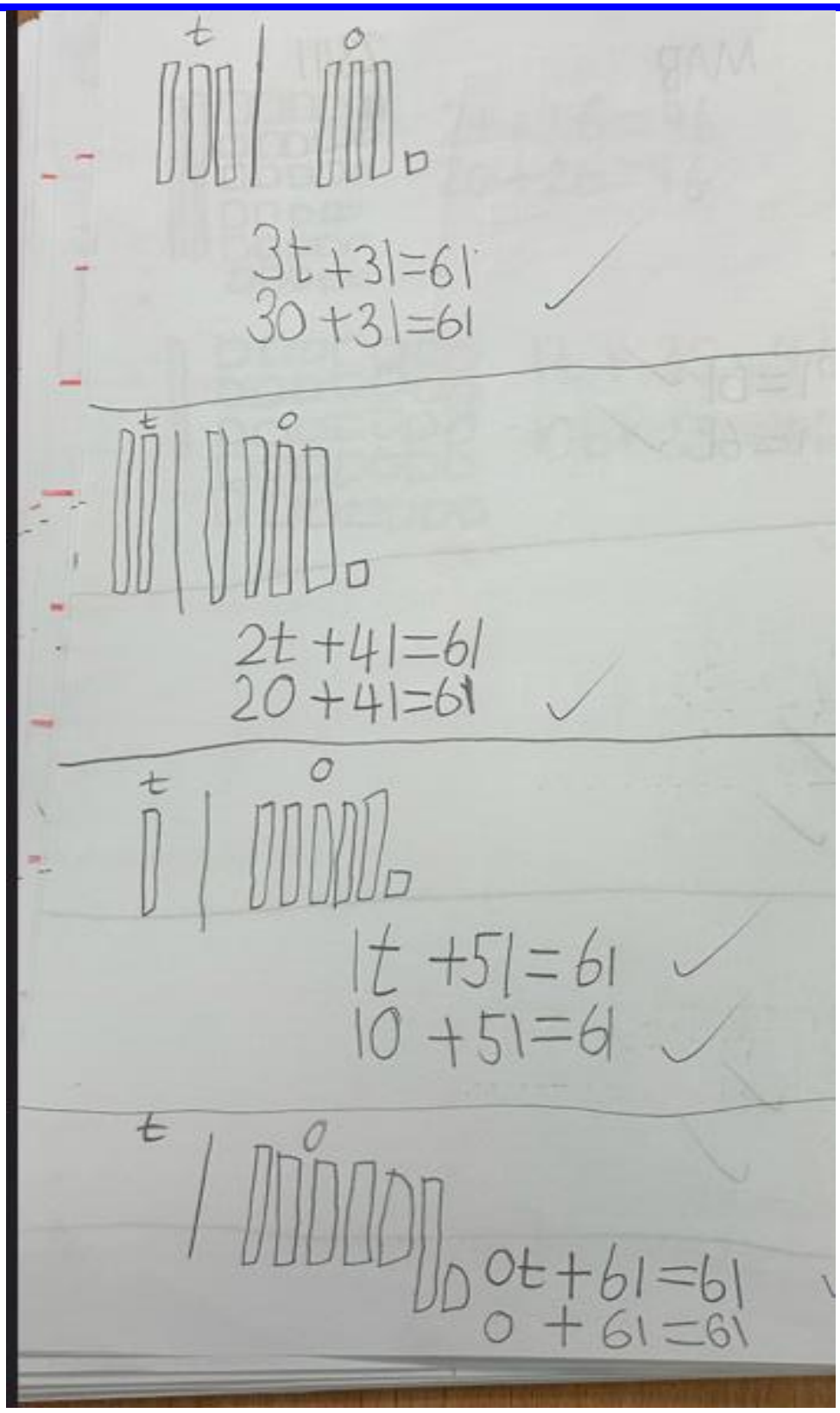


Student work sample

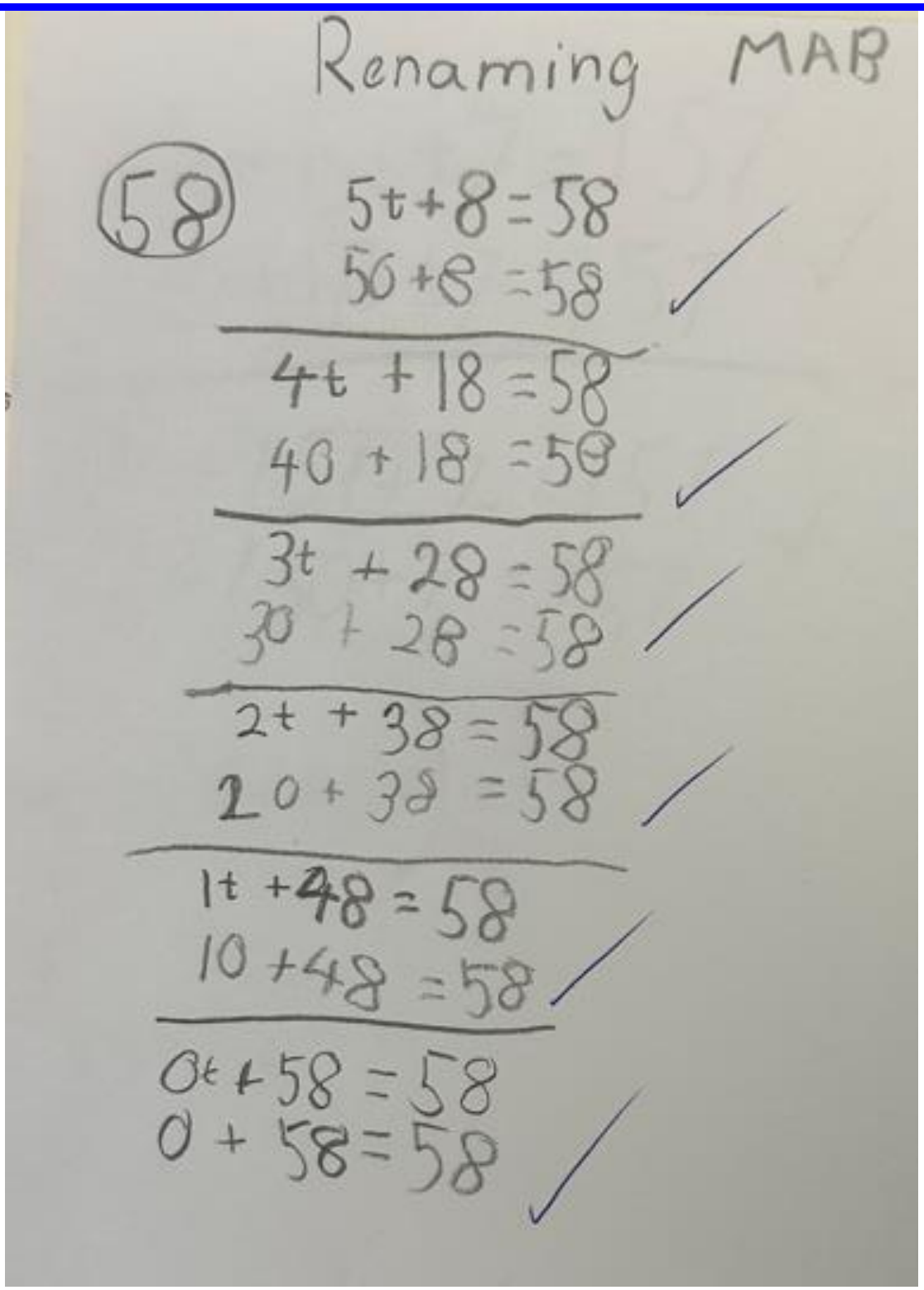


Renaming 35 student work sample – use 'x-ray eyes' (upgraded from your subitising maths superhero eyes) to see inside each ten ("How many ones are inside/what is each ten worth?").





Renaming 61 – student work sample shifting the tens to ones and using 'x-ray eyes' to see the quantity inside each block.

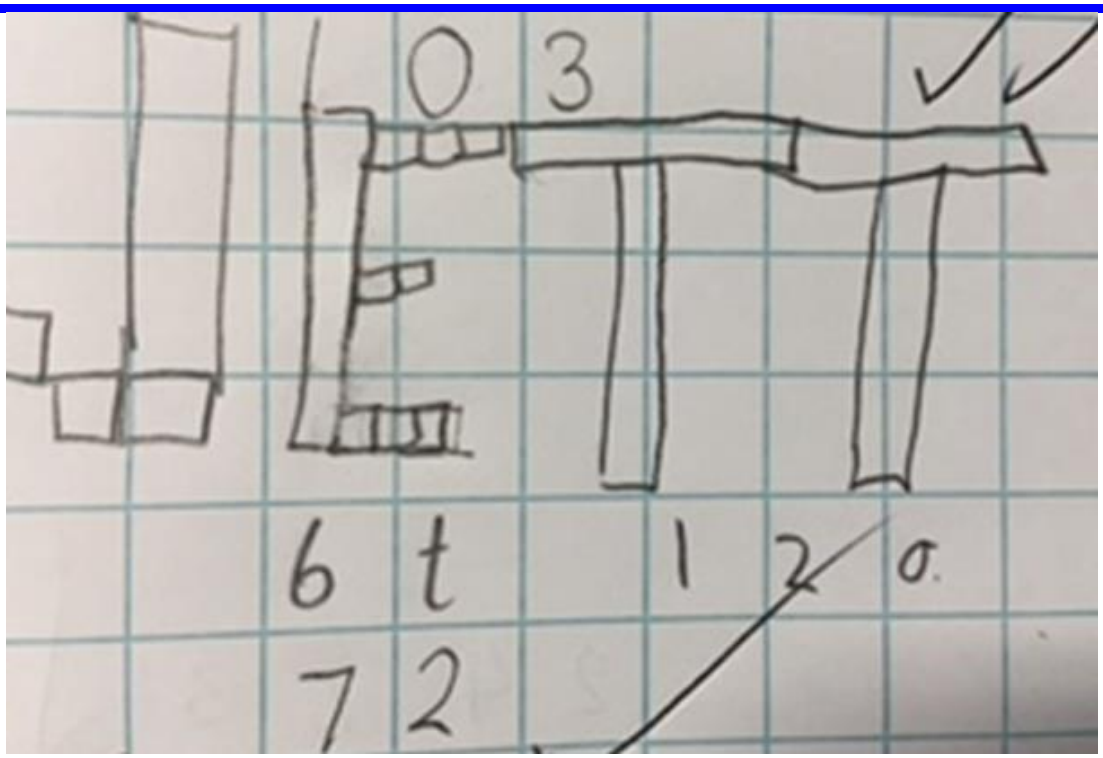


Student work sample

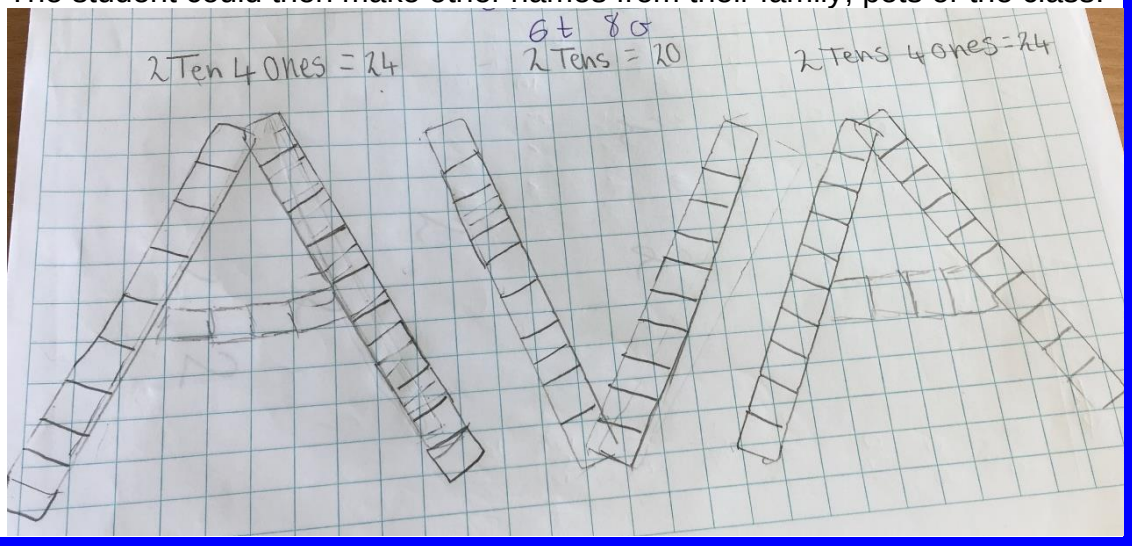
Extension 2: Use hundreds, tens and ones blocks. For example, to make the letter ‘O’, the student could use a hundred block. Calculate the value of their whole name all at once by first making it, then drawing it and finally rearranging all the blocks they used into a H AND-T-O chart.

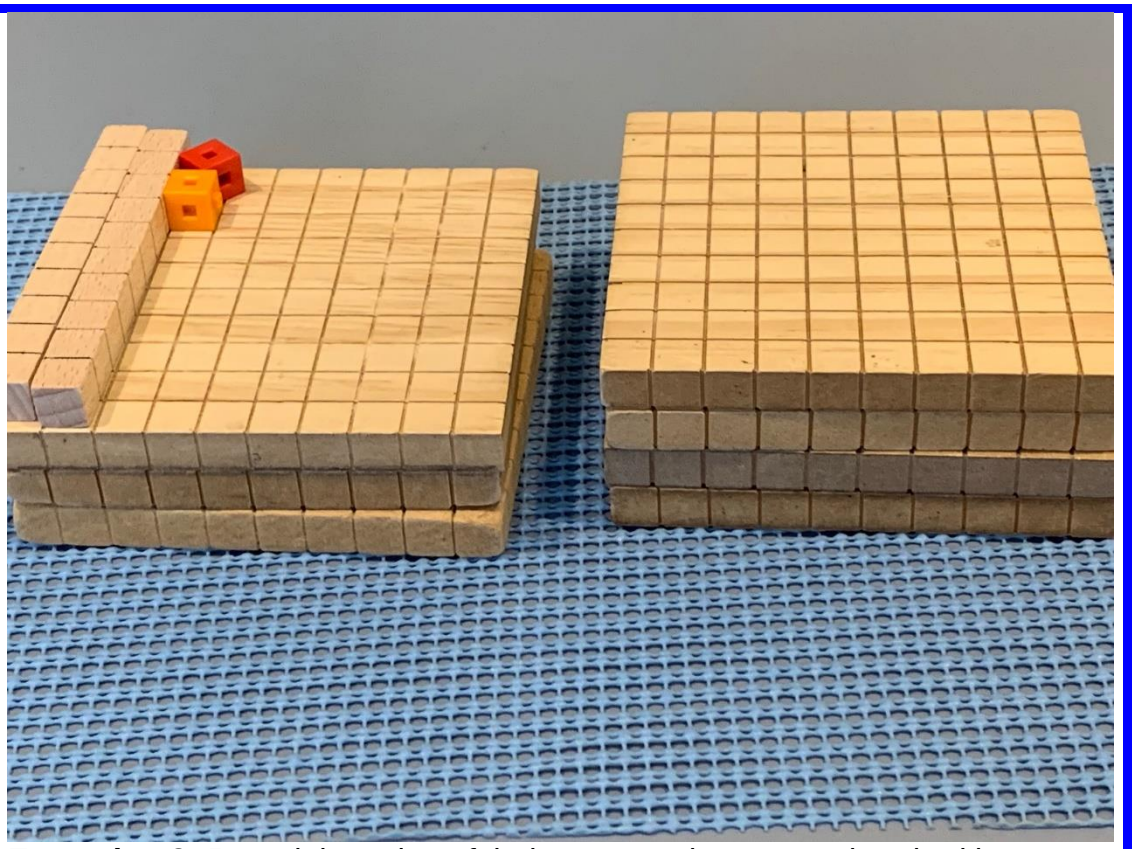
hundreds (h) and	tens (ty)	ones

H AND-T-O chart.

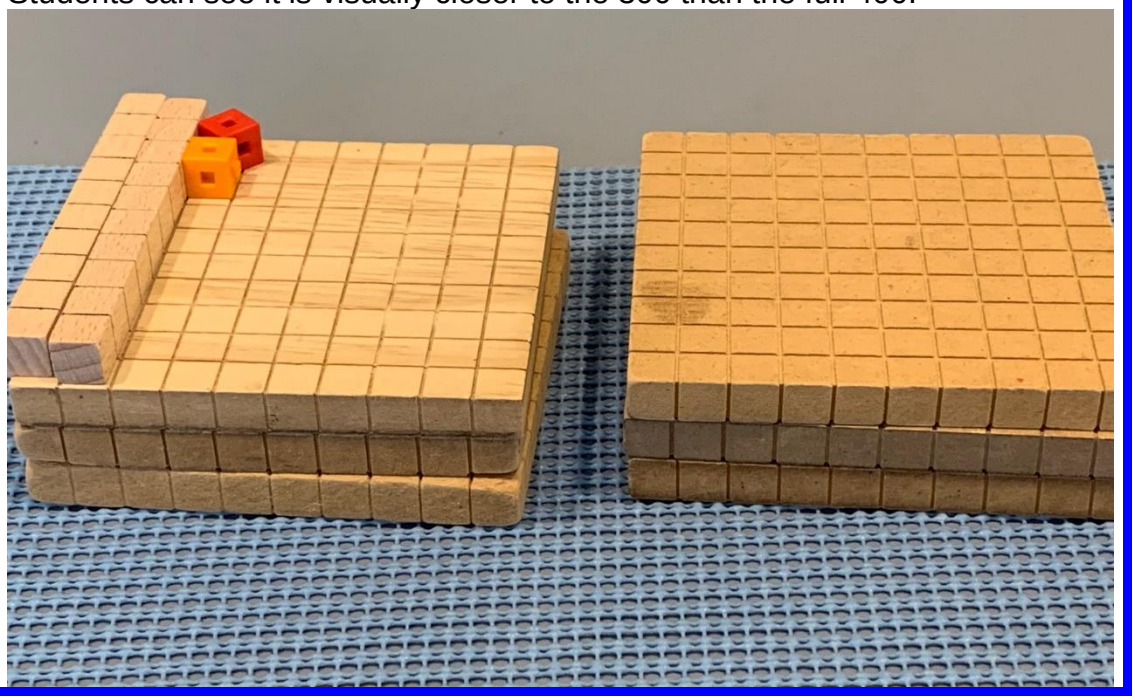


The student could then make other names from their family, pets or the class.

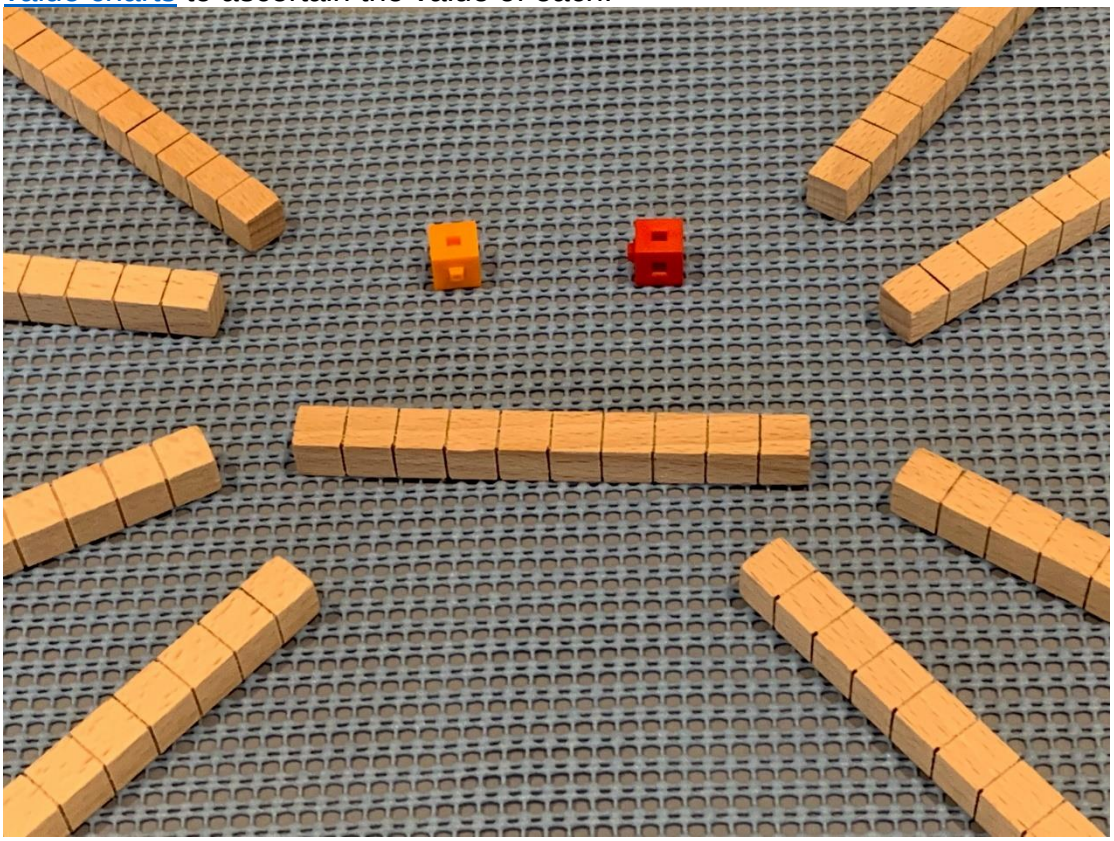




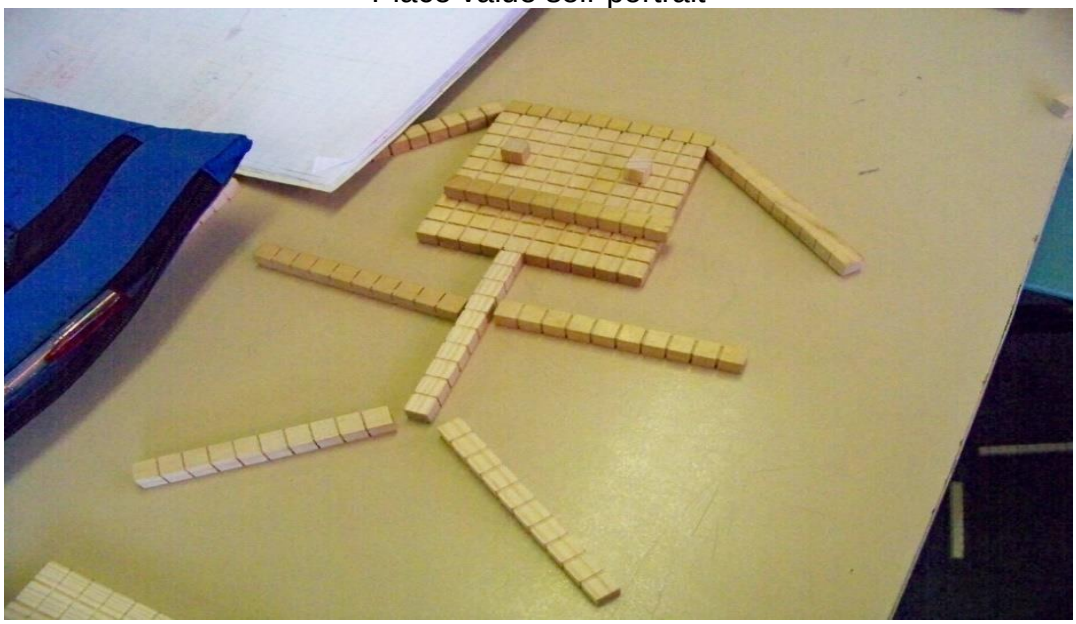
Extension 3: Round the value of their name to the nearest hundred by building all the blocks into a tower (hundreds at the base, tens on top then ones beside the tens) and see what it is closer to by putting it next to a rounding tower. For example, is 322 closer to 3 hundred or 4 hundred? Students can see it is visually closer to the 300 than the full 400.



Follow-on: Students could also make place value animals or stick figures, using just the tens and ones blocks, then place these onto the mini place value charts to ascertain the value of each:



Place value self-portrait



Suitable extension lessons are detailed in the unit focused on Three-Digit Numbers (Place Value Unit 15), but could easily be varied to only involve tens and ones blocks if needed as a mid-range extension.

Tens-ones Lesson 12

PLACE VALUE BLOCKS – COMPLTETE SERIES OF LESSONS

Learning intention: Make two-digit numbers using place value tens and ones blocks, recording these in place value form, standard form and worded form
Maths vocabulary: place value blocks (MAB), tens, ones, place value form, standard form, worded form

Games link: Relate this session to the game of hide-and-seek. Invite students to tell stories about their best hiding spots. Tell a made-up story about yours, such as a time when you hid for so long in such a fantastic spot that your family had dinner without you! Once, someone in my family hid in the heating vent and got stuck for about 10 minutes when trying to get out because they had contorted their body to such an extent. Another family

Lesson summary: Students roll two dice, make a two-digit number using tens and ones blocks on the mini place value chart, then pick up the final block to work out or check the total: "Peek-a-boo, what number are you?"

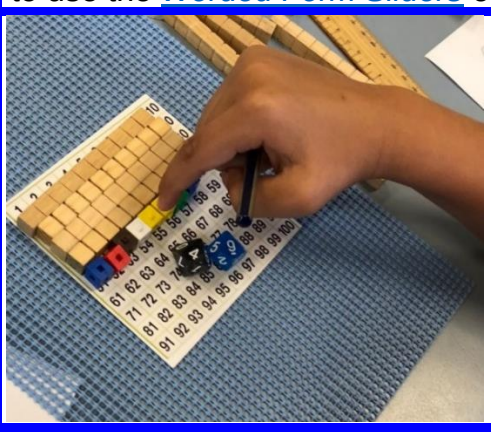
Materials:

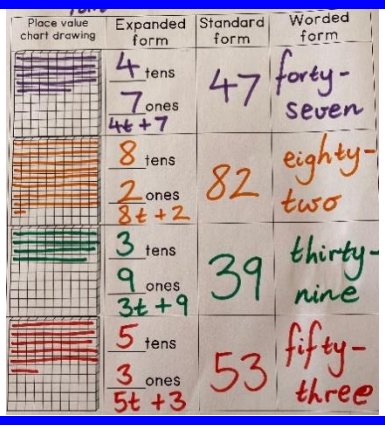
- 9 tens and 9 ones blocks per student.
- One blue 10-sided dice and one red 10-sided dice (or dice that are two colours, for example, red represents tens and blue represents ones).
- Mini place value chart from this unit's folder.
- Mini place value chart recording templates from this unit's folder.

Best set-up: Fishbowl model, then regular like-ability maths buddies.

Introduce the place value blocks: For a while now, we have been working on tens and ones – two-digit numbers. So far, what materials have we used? Brainstorm with students (popsicle sticks, cubes, ten frames).
Introduce the new material – place value blocks. Give each student a ten block and ask them to check how many cubes are in it. Give them another ten block, does this have the same number? How about this block? Is it still ten? Are you sure? You might even decide to trick students, pretending that you have hidden one block that does not have ten in it. Ask them to hunt for it for 5 minutes, then reveal there is no such block – they always have 10!

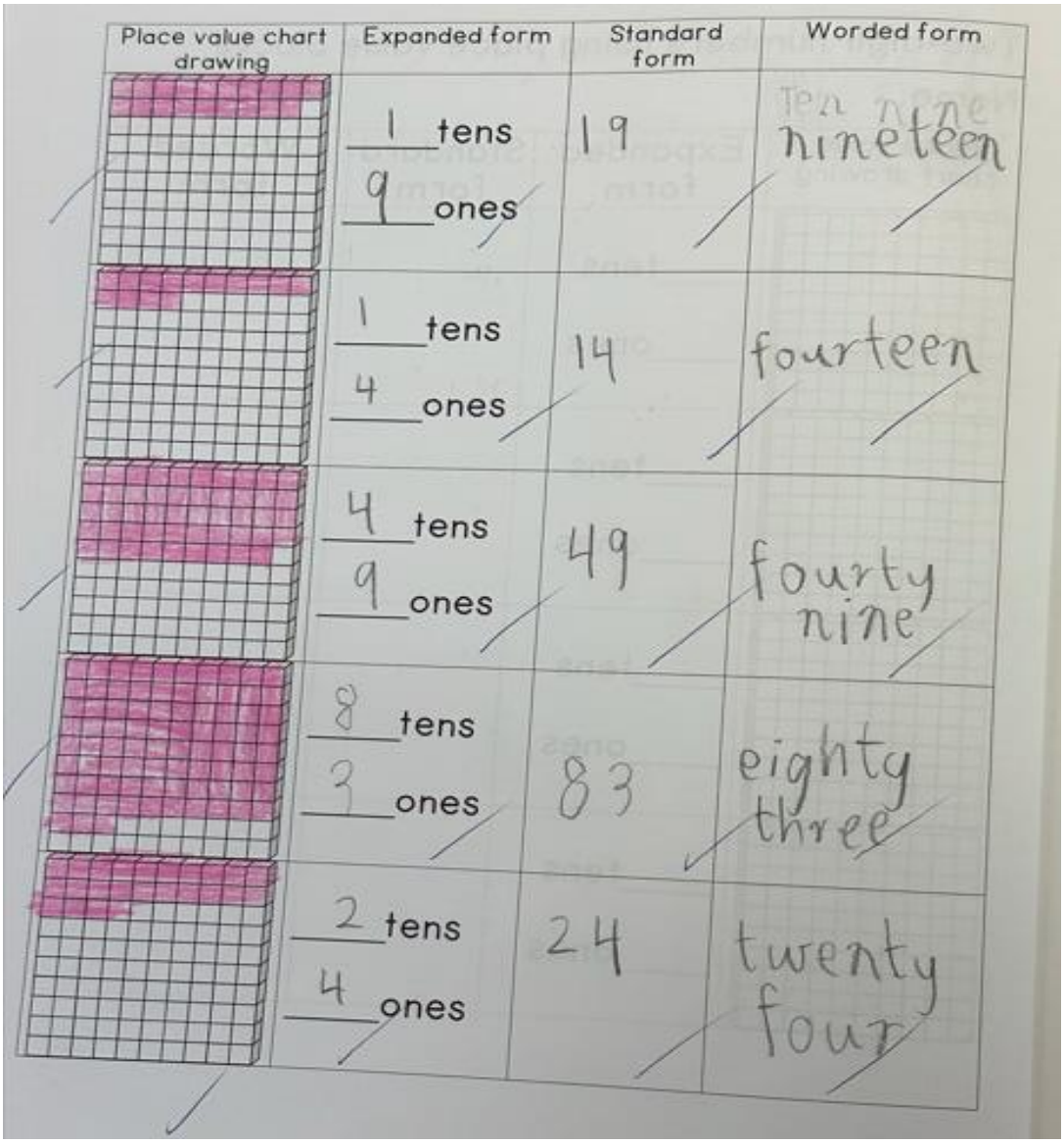
Modelling: Model by starting with the tens, laying these down on top of the mini place value chart, horizontally starting from the top left-hand side (1). Then add the ones below the tens, again from the left-hand side. Pick up the final block, saying, "Peek-a-boo, what number are you?" to reveal the total. You can try to figure out the number first, counting the tens, "1 ten, 2 tens, 3 tens, 4 tens, then counting the ones, 7 ones. 4 tens and 7 ones makes 47." Check by lifting the final block. Students can record as:
4t 7 makes 47 or 4 tens and 7ones makes 47 forty-seven (continue to use the *Worded Form Sliders* or spelling assistance chart for support)



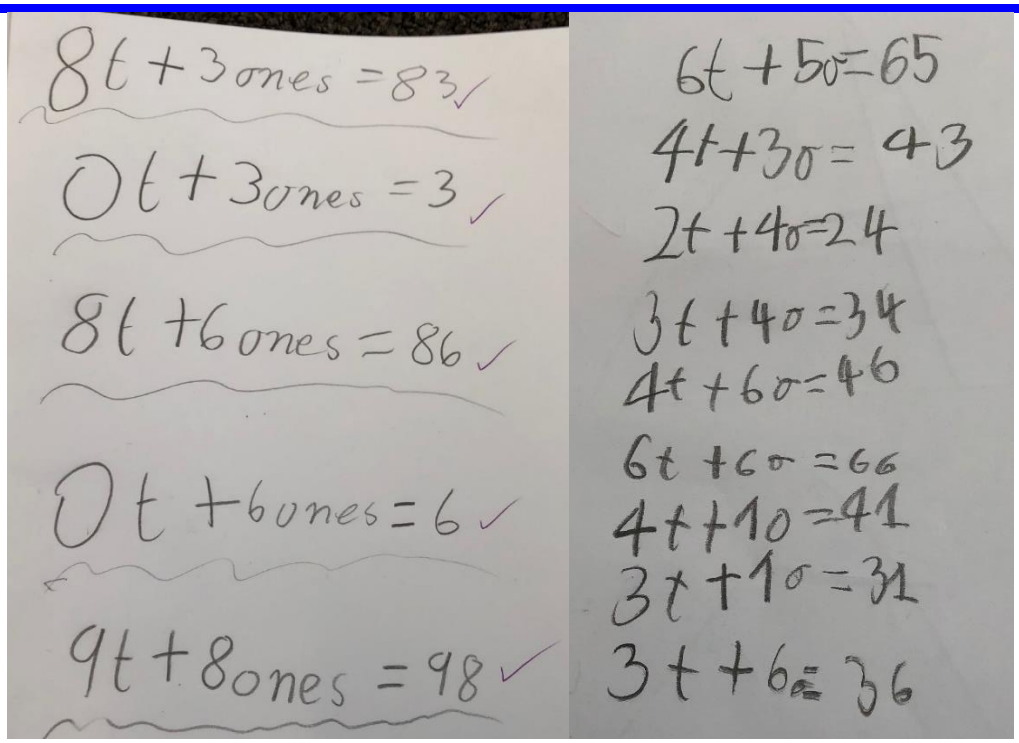


Both templates are in this unit's folder – mini place value chart and the matching recording template.

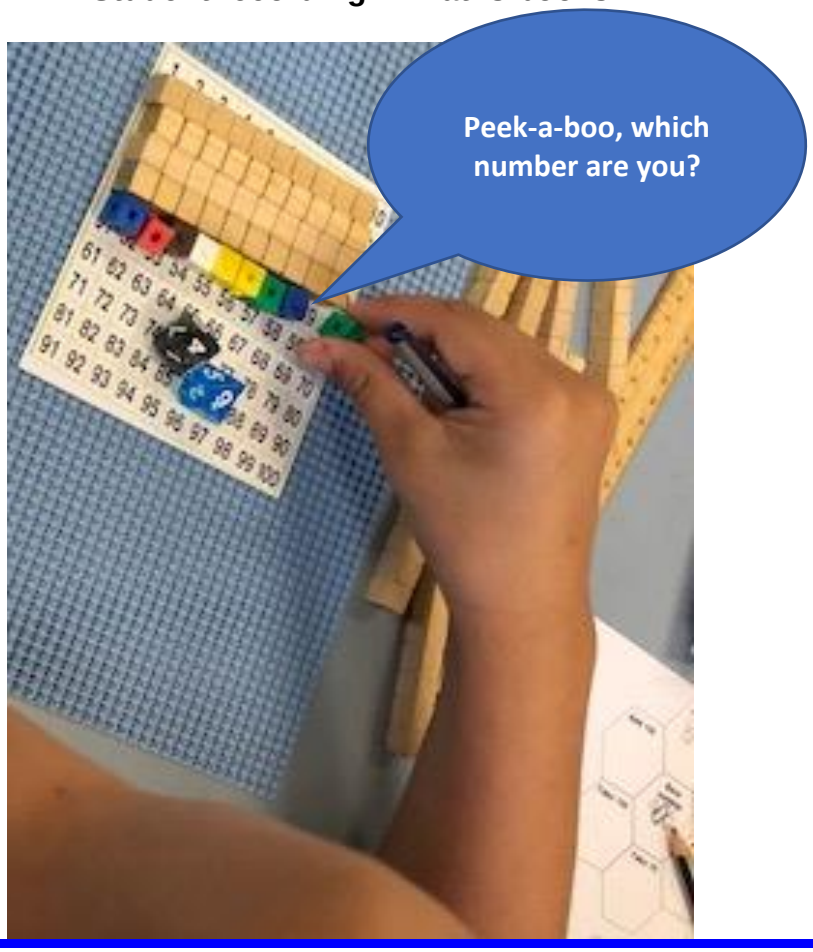
member hid in a cupboard that stored all our books and boardgames, which stoppled onto their head as they were hiding, and they immediately yelled, “HELP! HELP!”



Student work sample



Student recording in maths books



YouTube clip: Play this YouTube clip showing jumping giant crocodiles in the Northern Territory: youtube.com/watch?v=Nz-hQ95NXqw

Questioning:

- What number do you think you have made? How many tens does it have? How many ones?
- How many more ones do you need to fill up that ten?
- How many more ones and tens do you need to make the full 100?

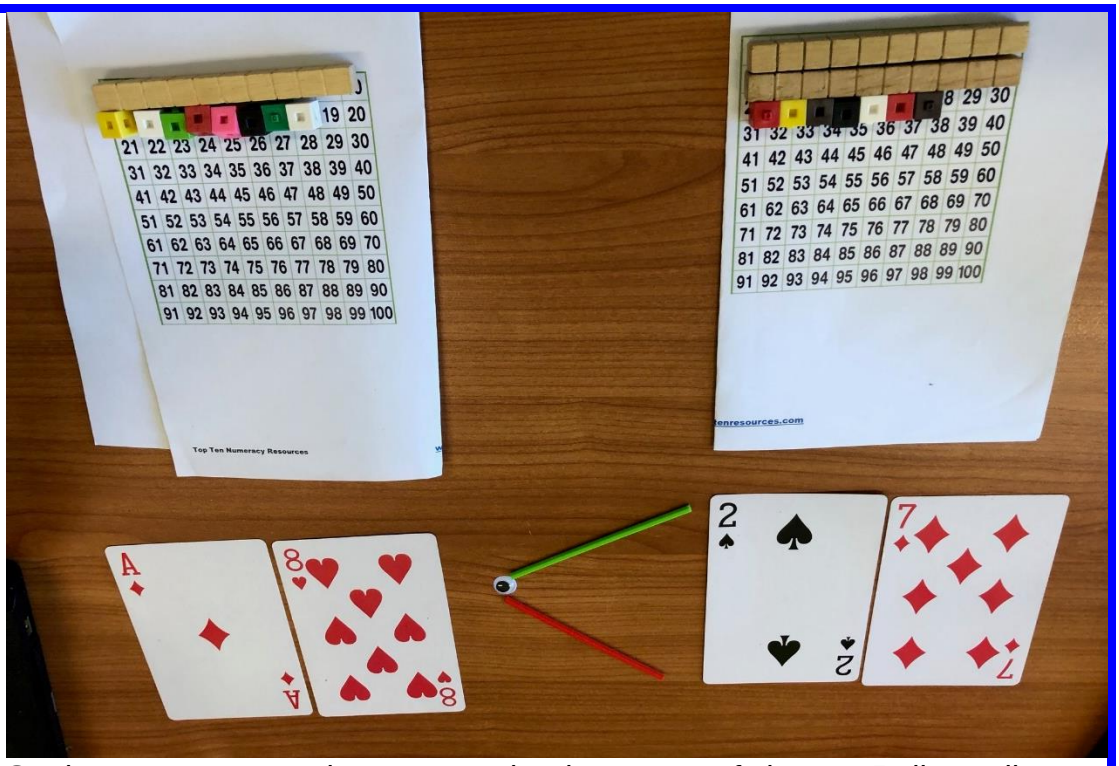
Support: Just use one dice, rolling and making just the tens at first.

Extension 1: Figure out how many more they need to fill the 100 chart, learning to partition 100. Do this by building up, working out how many ones they need to reach the next complete ten, then how many tens to complete reach 100. **Misconception alert:** 36 + 64 makes 100, not 36 + 74.

Extension 2: Round their number to the nearest ten. Does your final row look closer to full or closer to empty? For example, 56 looks a bit more full than empty, so it rounds to 6 tens or 60. Write this in red beside the regular recording:
5t 6 makes 56 (looks closer to) 60

Extension 3: Work out whether their number is closer to 0 or 100. For example, does 76 look like closer to the full block, or closer to empty? Pretend it is a chocolate block, do you have most of it left or is it closer to empty? 7t 6 makes 76 (looks closer to) 100

Variation 1: Who has more?
Today, each of these blocks represents one fish. Make popsicle stick crocodiles for 5 minutes with students, using popsicle sticks, googly eyes, bits of paper as teeth, and use markers for decoration.

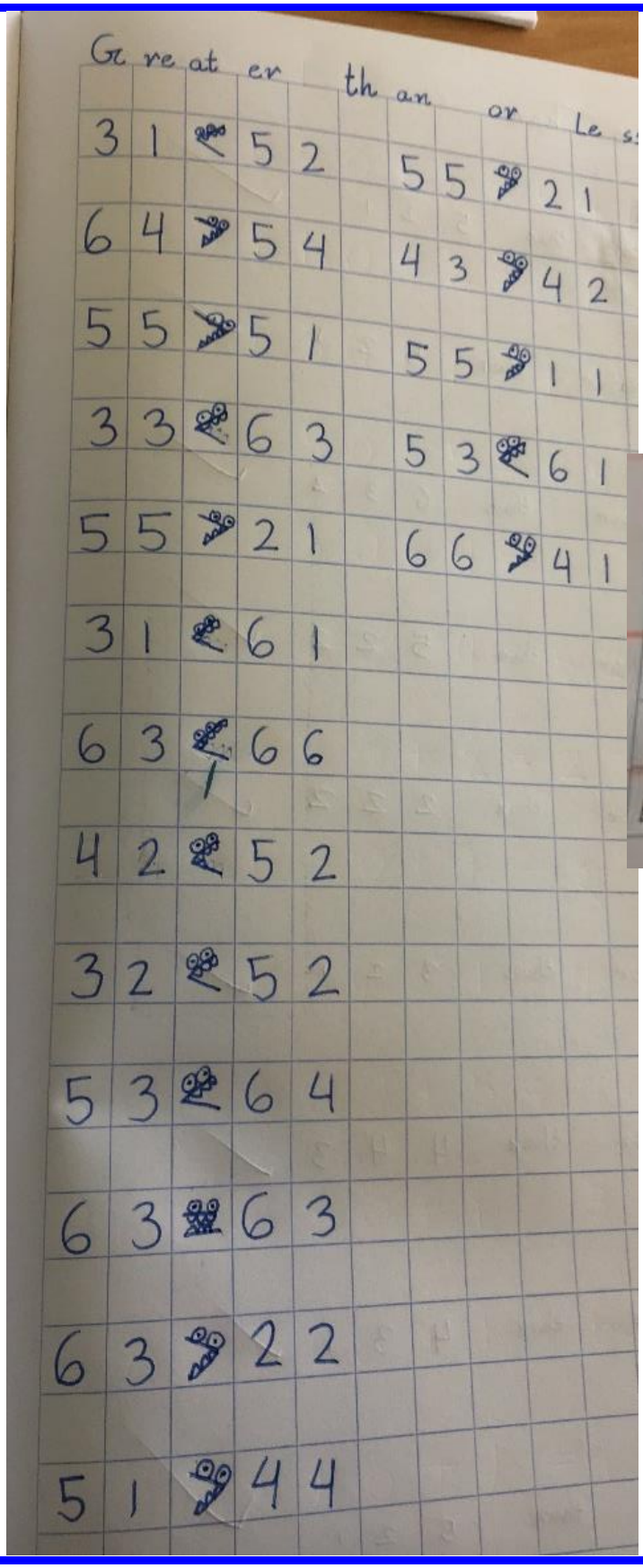


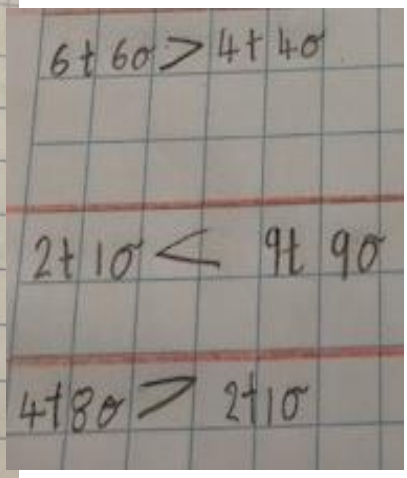
Students compete against one another in a game of chance. Roll two dice, then choose which die will be their tens and ones, aiming to make the largest/greatest number possible.

Build the numbers using tens and ones place value blocks on the mini place value chart.

Compare their total to their partner's, with the crocodile greater than/less than sign eating the larger pile of fish.

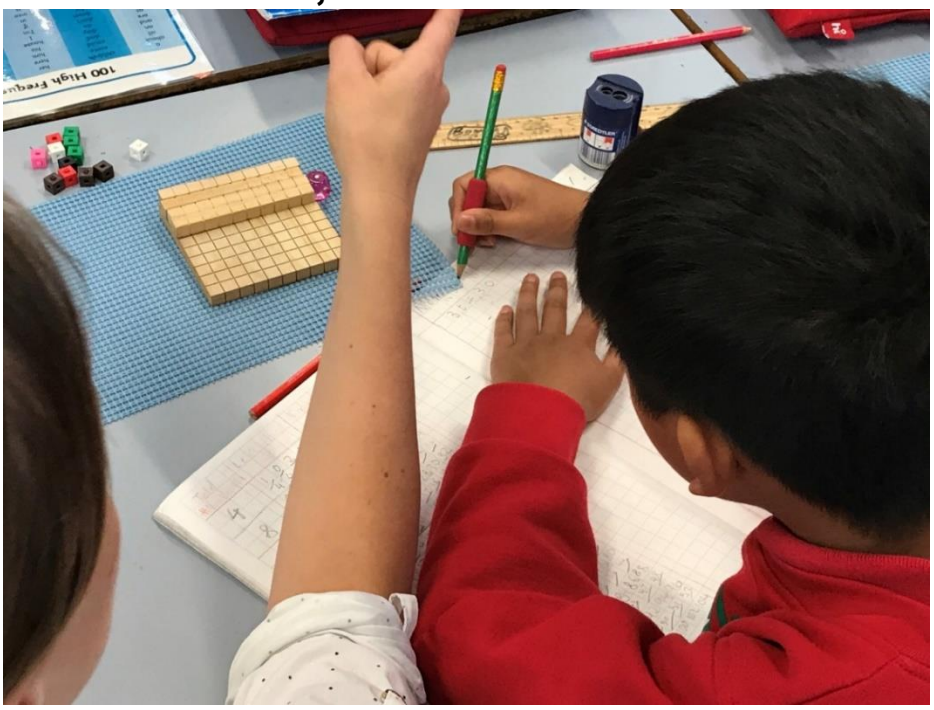
Record the numbers in tens and ones, as well as standard form (digits), then show the crocodile as a greater/less than sign in their maths books (see next page).





Real-life link: Enjoy browsing through and reading about a few crazy types of races: listverse.com/2017/04/28/top-10-wacky-animal-races-from-around-the-world/

Variation 2: Race to 100, then 200



Students use one or two 1 hundred blocks as their gameboards. Students collect tens and ones to race to reach 100 (later 200 to ensure students can bridge over 100) before their partner. Roll 2 coloured dice, for example, the red for tens and blue for ones.

Red die rolled '1' so add 1 ten, blue die rolled '2' so add 2 ones. What is your number?

lh lt 4ones or 1lt 4 ones makes 114

Record the place value and standard form each turn, before rolling again.

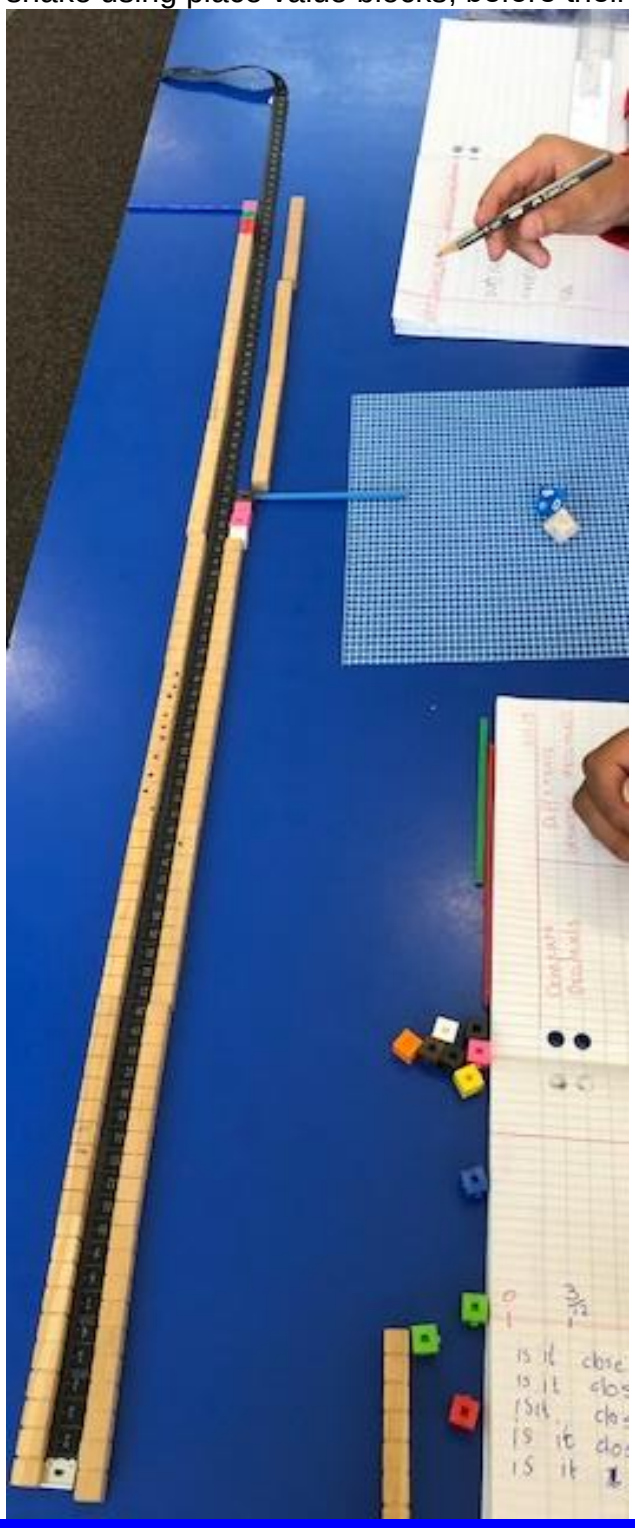
Support: Just race to 100 against a like-ability partner using one die (rolling tens only).

Extension: Round each number before your next turn to its nearest ten (is it closer to a full row or empty on your final row) and also to the nearest 100 (is the whole block closer to empty or full).

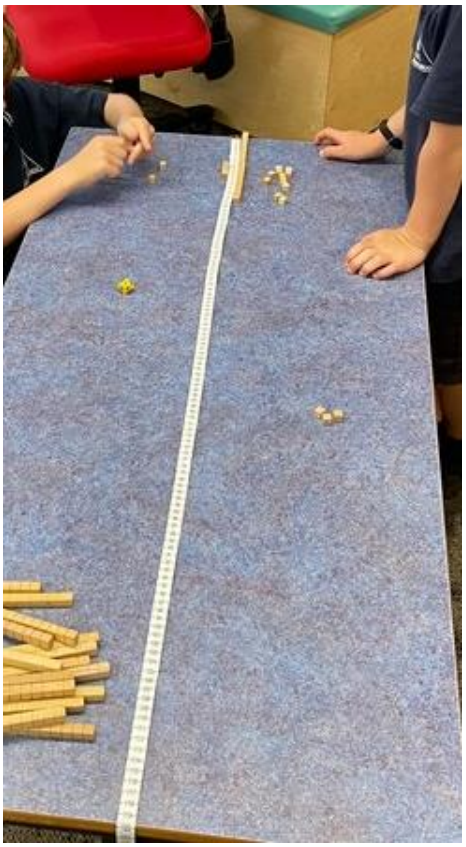
Real-life link: Discuss the longest snake in the world, the anaconda! Use this fact page to spark discussion: natgeokids.com/au/discover/animals/reptiles/anaconda-facts/ Now let's make some really long place value snakes! Can you make your place value snake as long as an anaconda before the end of the session?

Variation 3: **Race to 100 Measuring Tape – Tens and Ones Snakes!**

Students stick a measuring tape to their desk. Students aim to build a 100cm snake using place value blocks, before their partner's snake reaches 1m too.



Roll two dice – a 6-sided red dice for the tens and blue 6-sided die for ones. Use a 3-dot dice for the tens if available. When you have 10 ones, rename to make 1 ten. This is better if students are using connectable ones cubes, so instead of 'trading' to make 1 ten, the 10 ones literally connect to make 1 ten, because 10 ones is not *like* 1 ten, 10 ones *is* 1 ten!



Race to 100 in action – credit to Our Lady of Help Christians Primary School in Warrnambool.

Students roll two dice to make a tens and ones number, making it with tens and ones blocks along their desk, on top of a blu-tacked measuring tape. Students lift the final block ("peek-a-boo") to reveal the number they have made. Alternatively, students can make the number just above or below the measuring tape, so it literally says the total as a checking and feedback mechanism. "I now have 7 tens and 6 ones, that's 76!" With each roll, students record their running total: 7t6 makes 76

For competitive races, one partner builds on the north side of the measuring tape, one partner builds on the south side. Emphasise for students to start at zero and keep their blocks closely pushed together to ensure the measuring tape is reading their numbers accurately, for example, 3t 4 ones = 34 (as shown by the measuring tape below).

As students build their running total, they may end up with more than 10 ones. If you use the connectable 1cm blocks, students can literally connect these to make 1 ten. If you do not have the connectable 1cm blocks, encourage students to rename their ten ones for 1 ten, to make their snake easier to manage on the way to 1m.

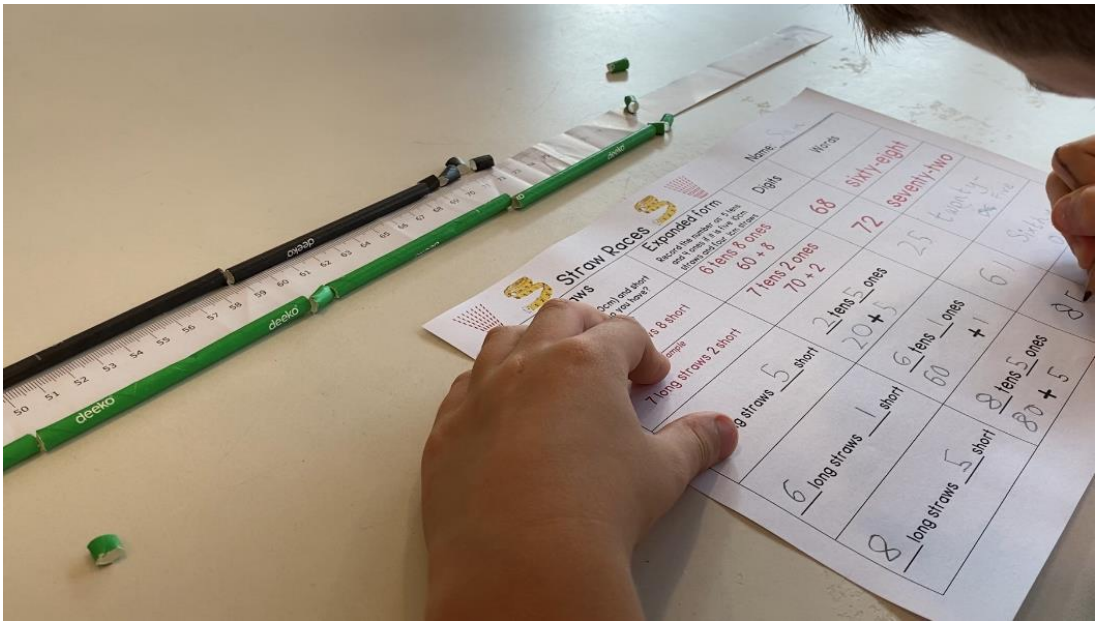
The first student to reach the end of the measuring tape (100cm) wins!

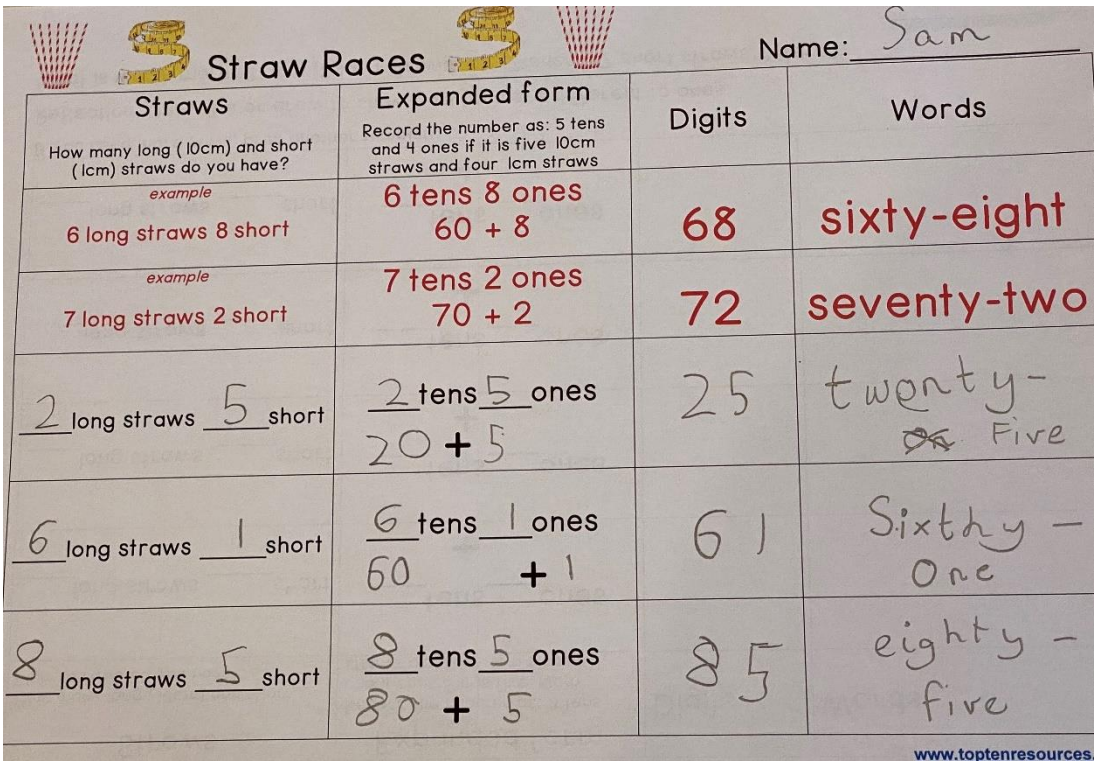
Alternative material for schools short on MAB/place value blocks or as a variation with new materials: You can also run this session with straws cut to 1cm and 10cm.

This is also a great way for students to be able to play these games at home (particularly using the mini place value charts and races along the measuring tapes), without having to send home anything but straws and a few printed (but not laminated) templates.

Straws version of the 'peek-a-boo session' with the mini place value chart (straws are cut to 10cm and 1cm to match the chart):

Straws version of the race to 120cm or 150cm along a measuring tape:





Student recording sample (Year 1) during the straws race

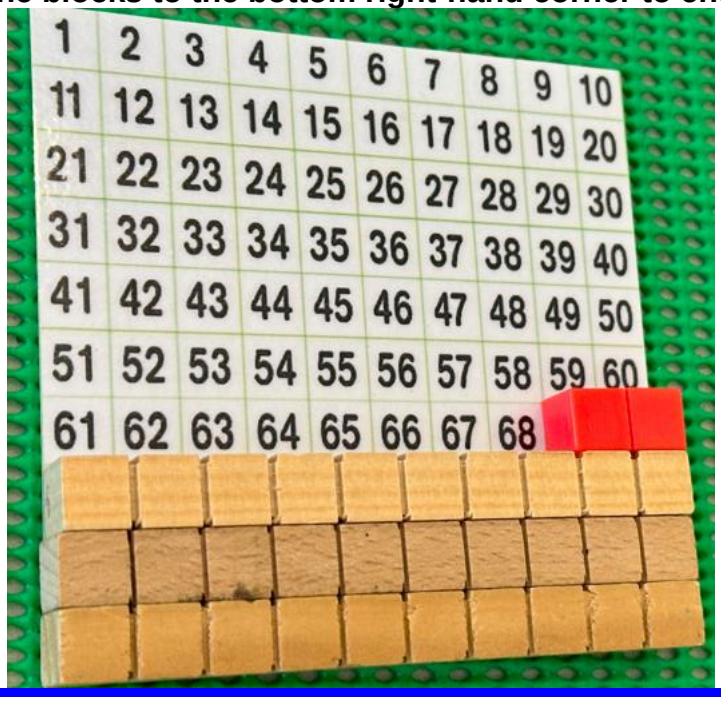
[Recording template]

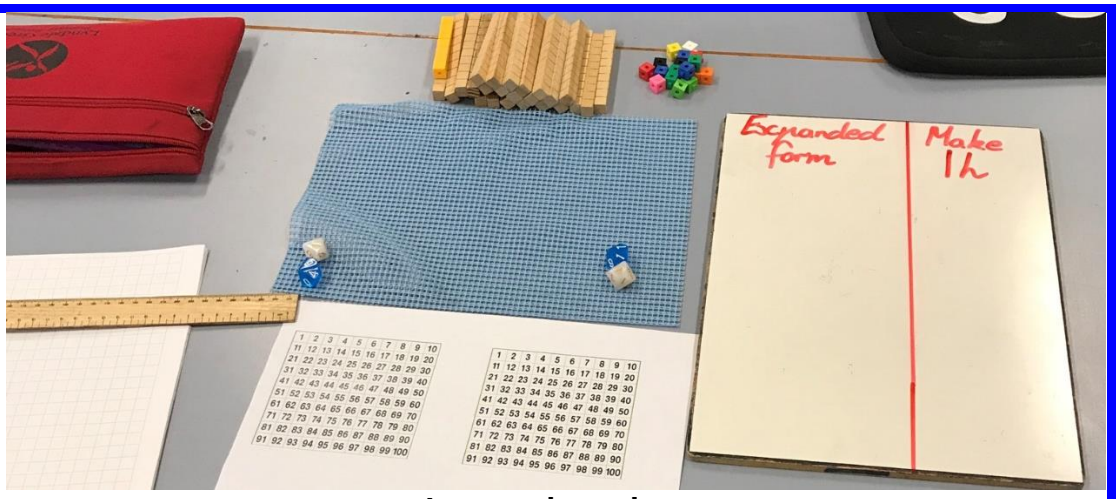
Variation 4: **Make 100 Challenge**

Make 32 (remember to "Peek-a-boo, what are you?" and lift the final block to see it is 32):

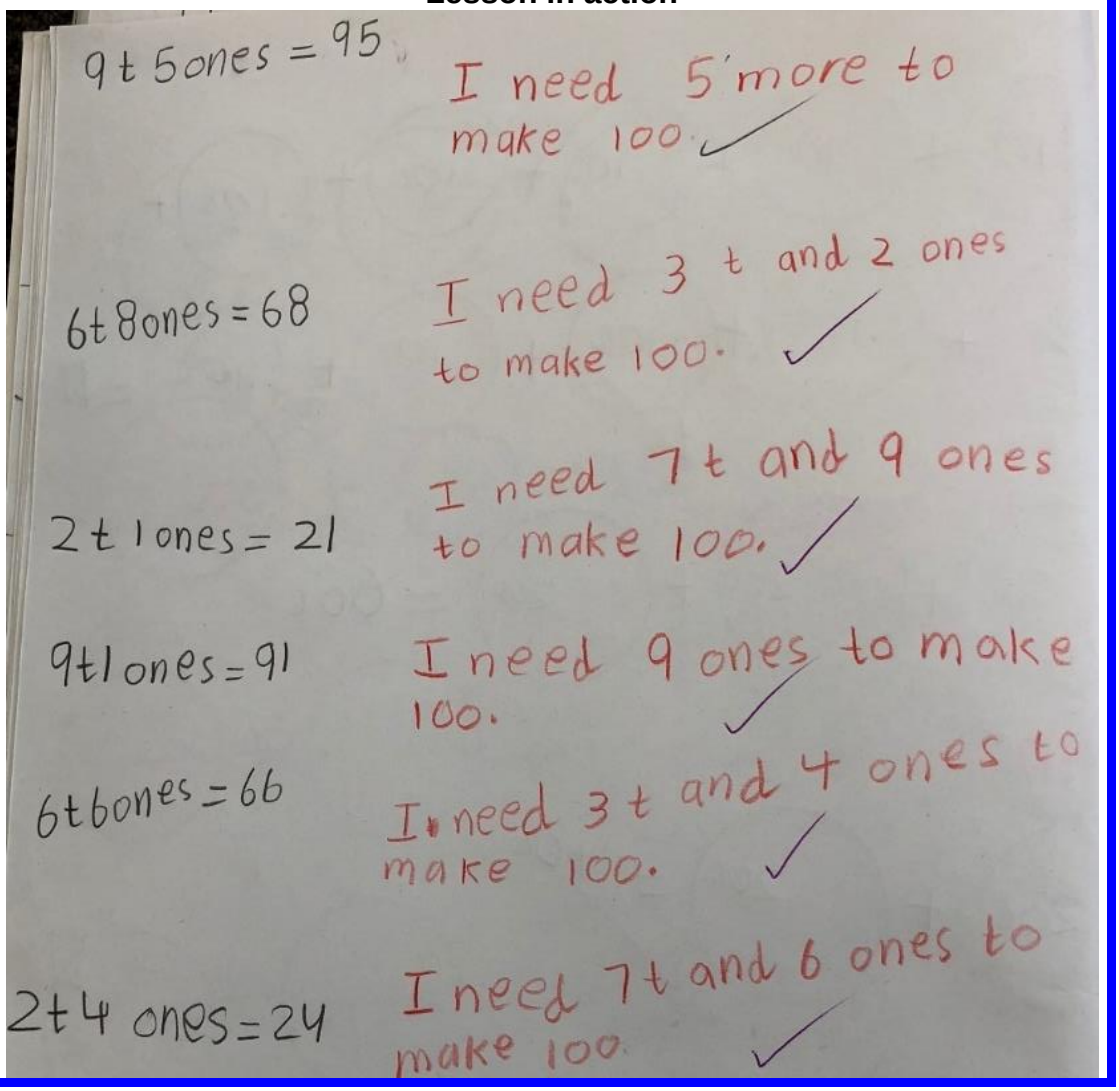
Try to work out how many more to make 100.

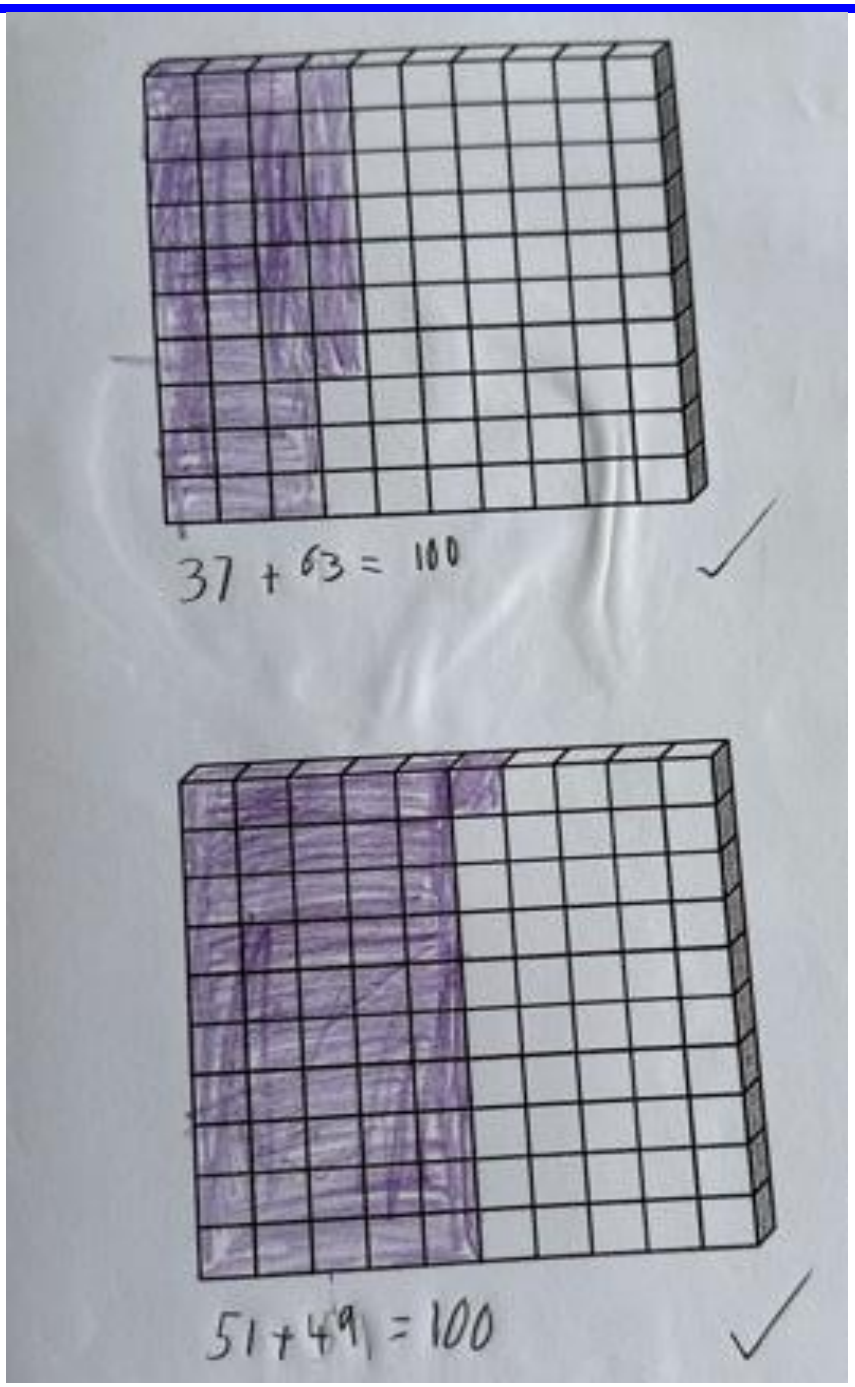
Then push the blocks to the bottom right-hand corner to check:





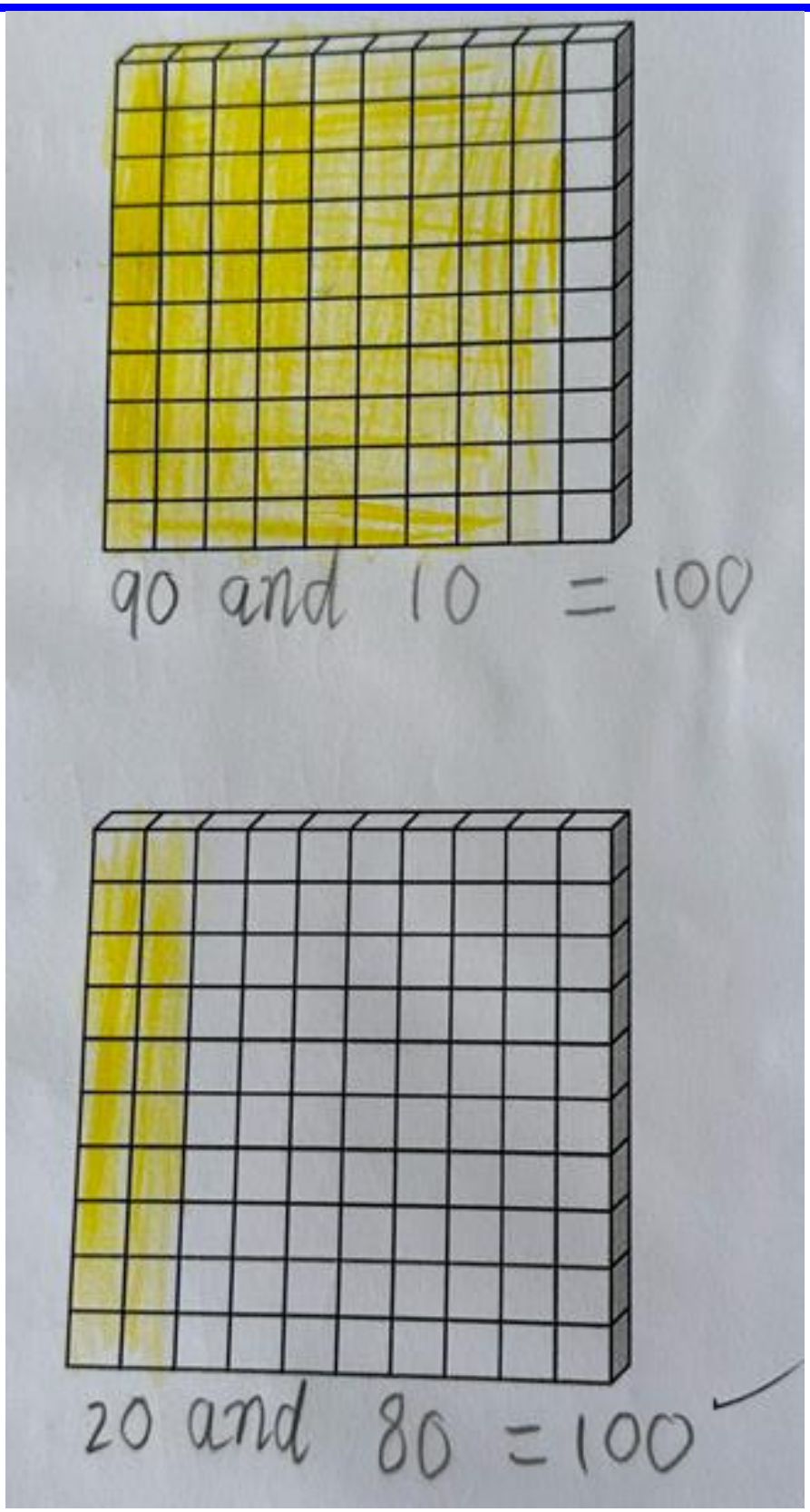
Lesson in action



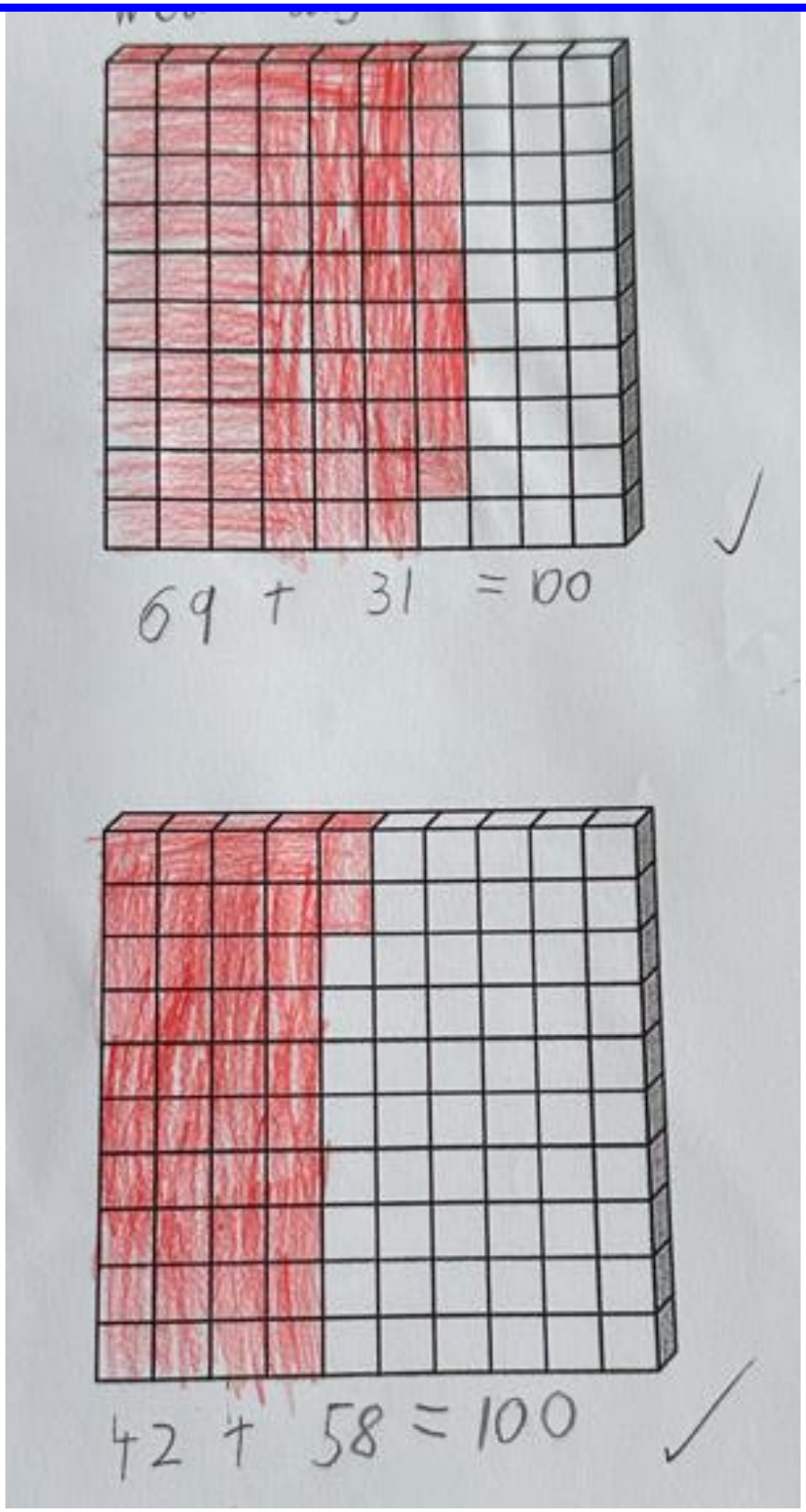


Student work sample – Template 1 or Template 2:

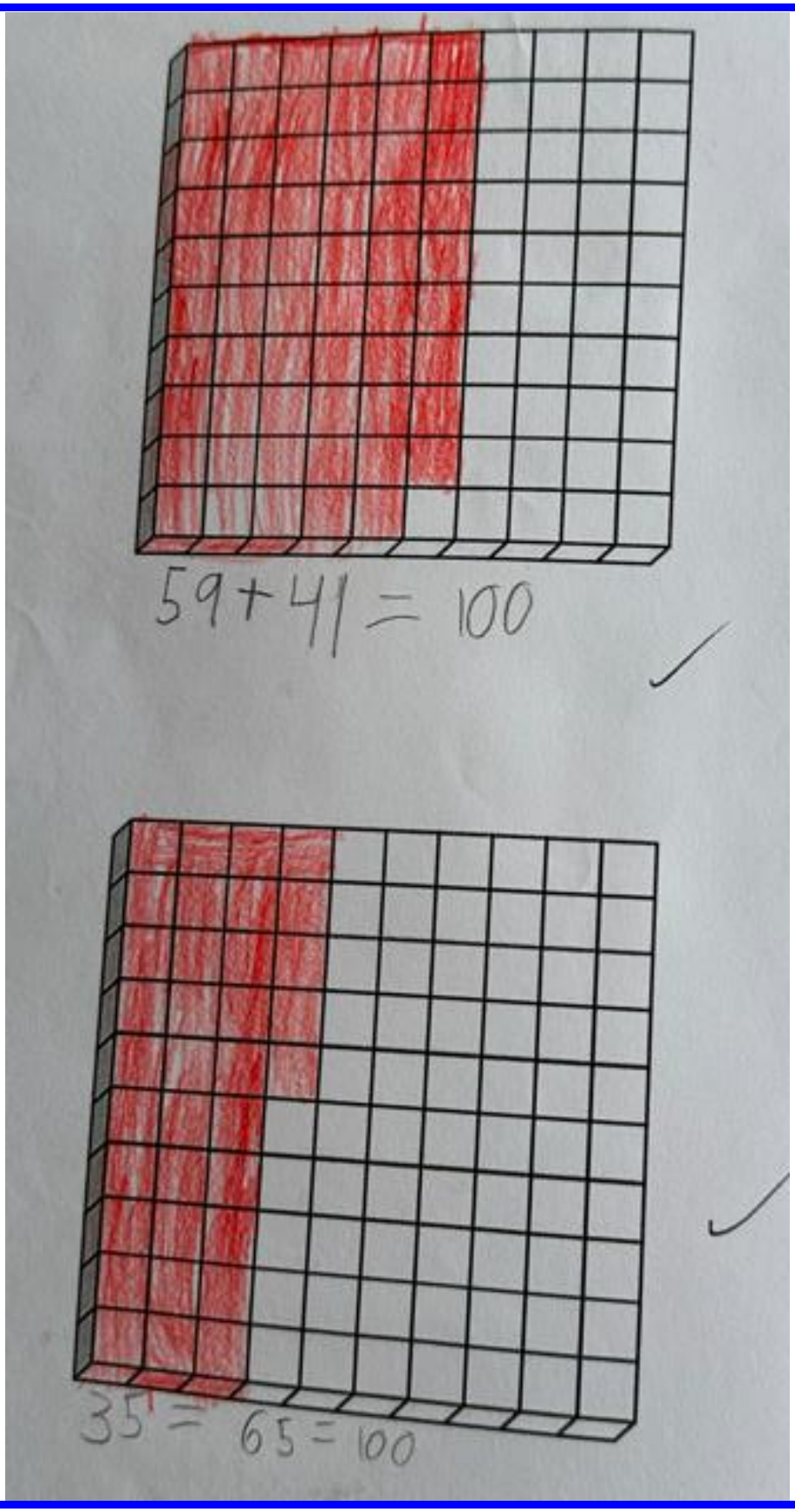
Extremely common misconception: 37 + 73 is 100, because students simply apply the 10 facts to both place values without accounting for the ones making another ten. The mini place value chart, when used with place value blocks, is a concrete calculator to dispel this misconception.

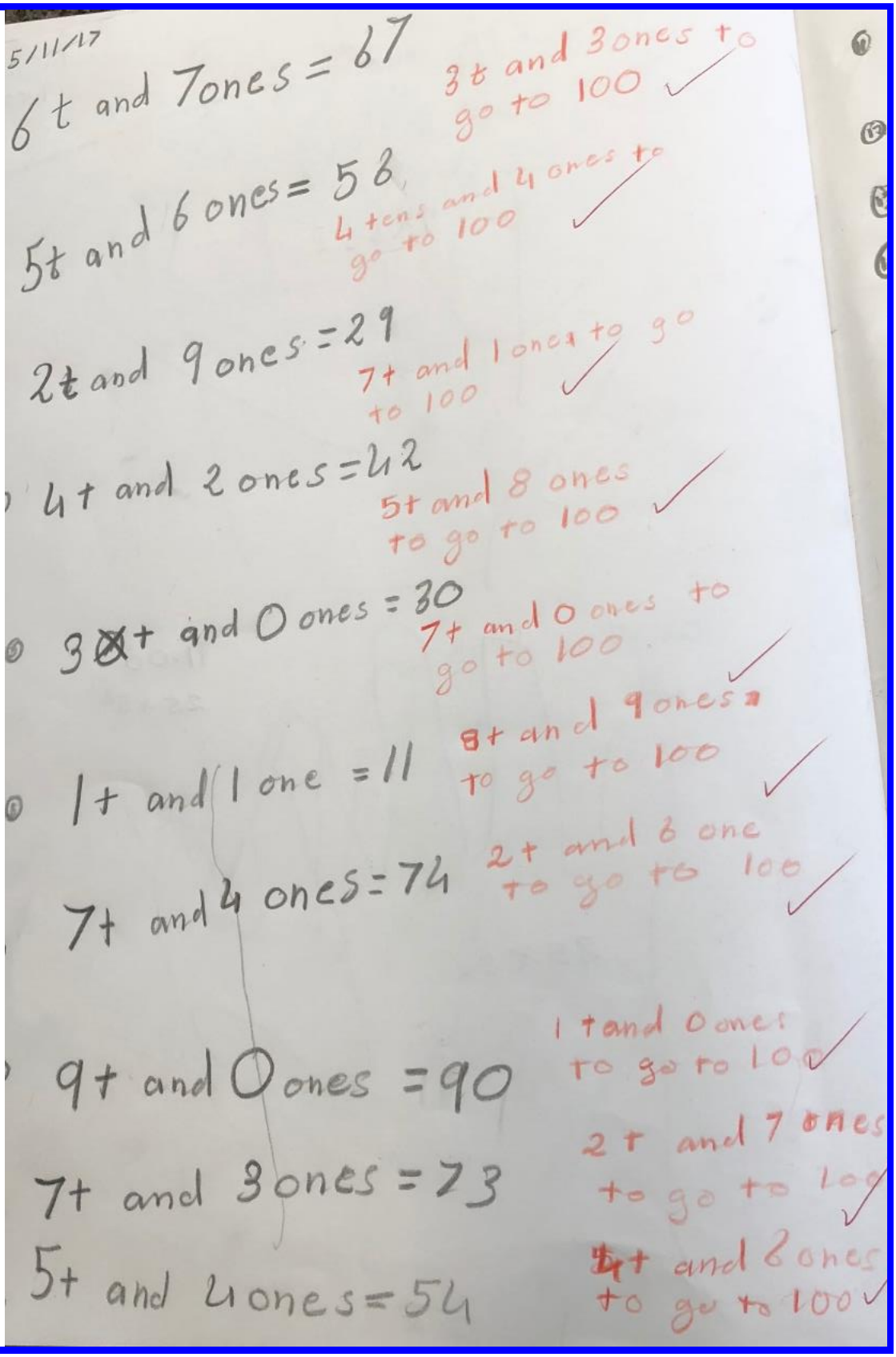


Template 1 or Template 2

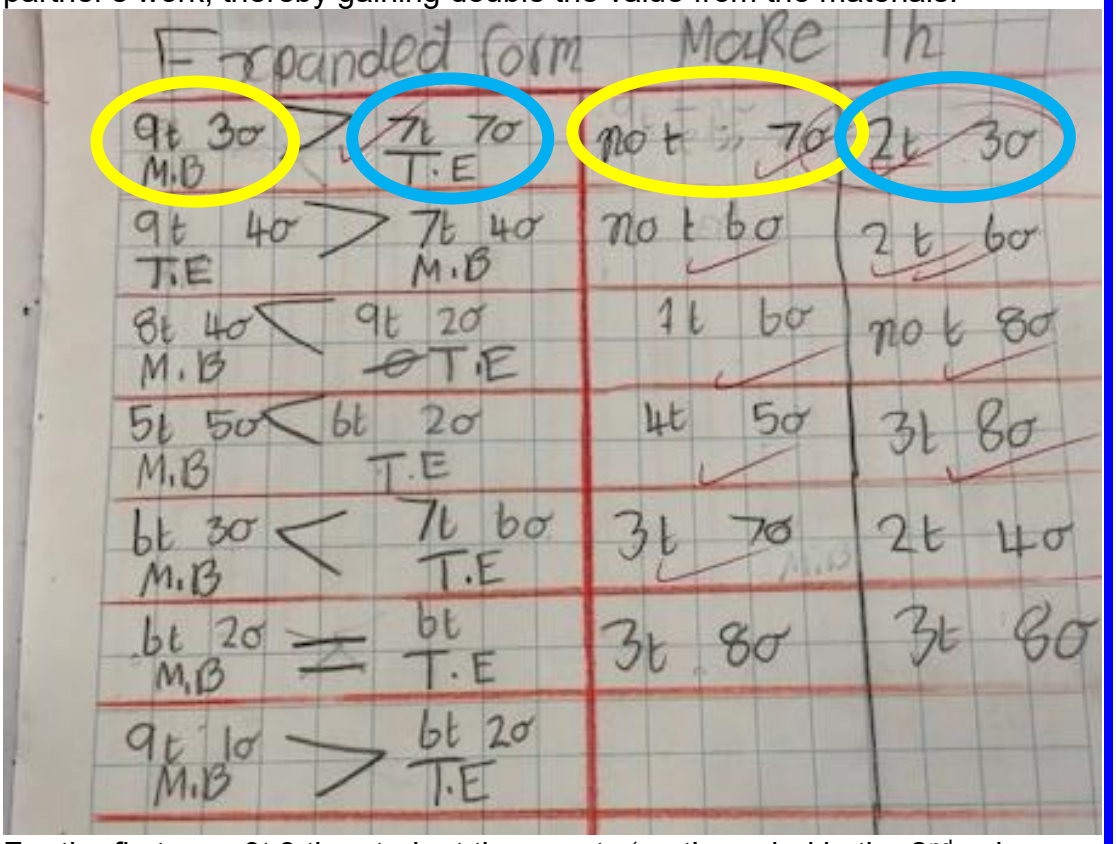


Template 1 or Template 2



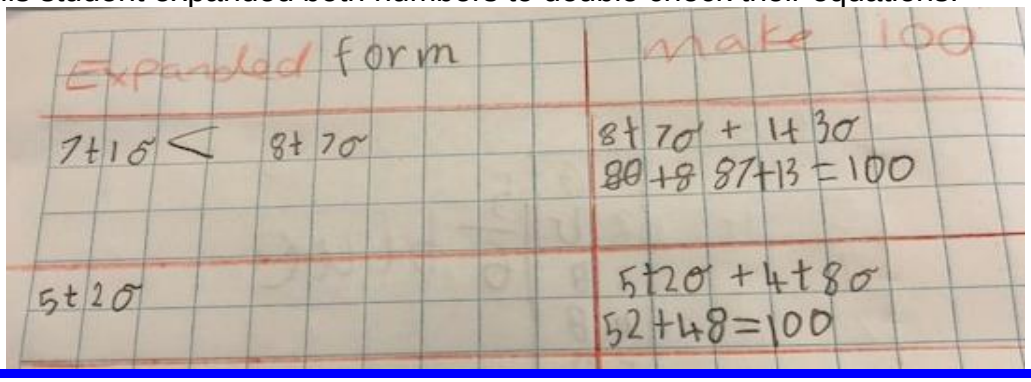


In this example, the student first ordered their number against their partner's (playing 'who has more' variation 1), then played make 100 as an extension. The student recorded how many more she needed to make 100 from the left-hand side number in the third column, then from the second column number in the fourth column. The 'M.B.' are her initials and 'T.E.' is her partner's initials. This is a great example of students recording both their and their partner's work, thereby gaining double the value from the materials.



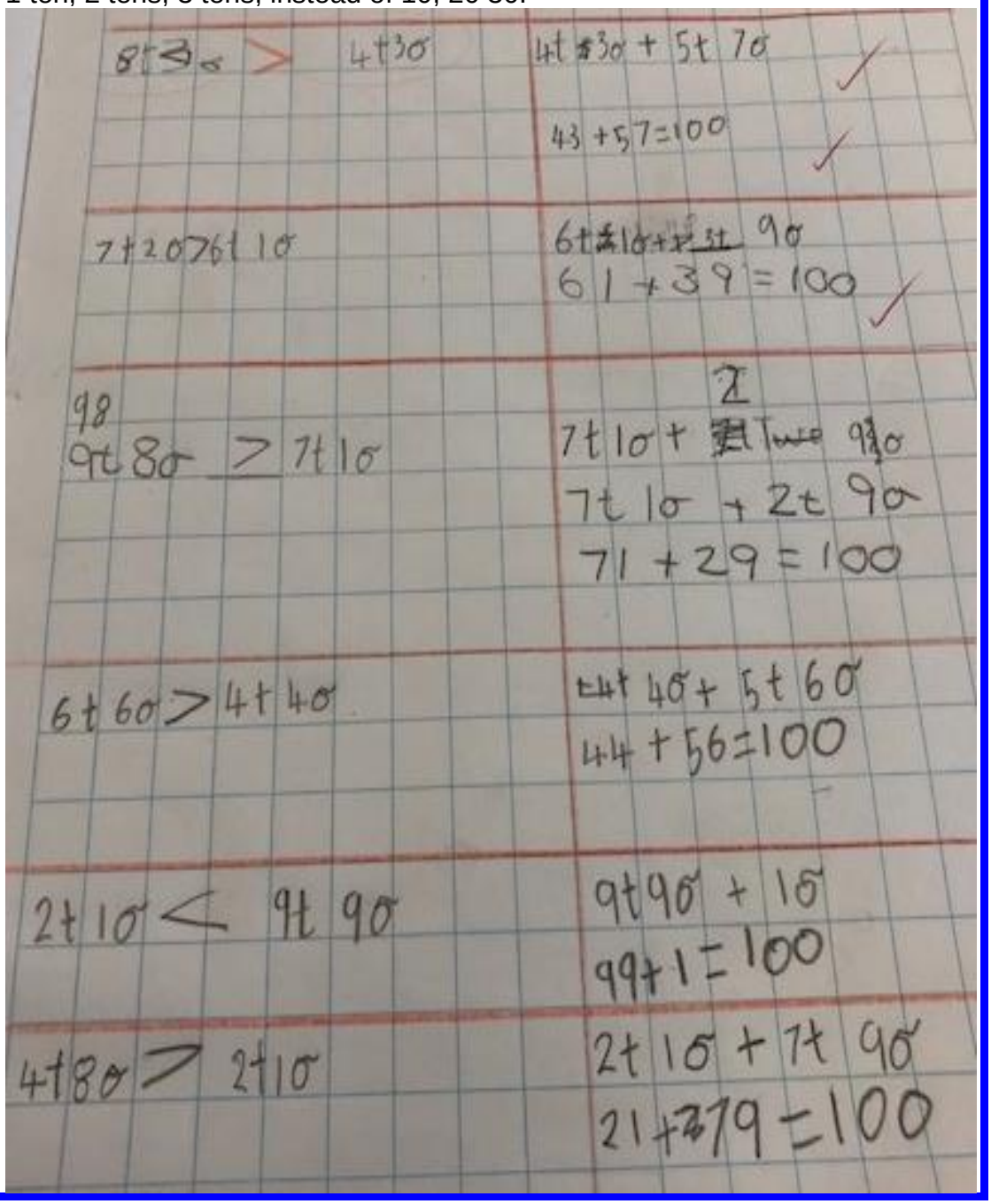
For the first row, 9t 3 the student then wrote 'no t' needed in the 2nd column and 7 more ones needed to make the 1h. For 7t 7ones (77), the student initially thought it would be 3t 3ones needed to make 100 (a very common misconception) but then changed to 2t 3ones after being asked to recheck by building the tens and ones blocks on top of a 1h block, seeing that 3t and 7t already makes 1h so there would be too many.

This student expanded both numbers to double check their equations:



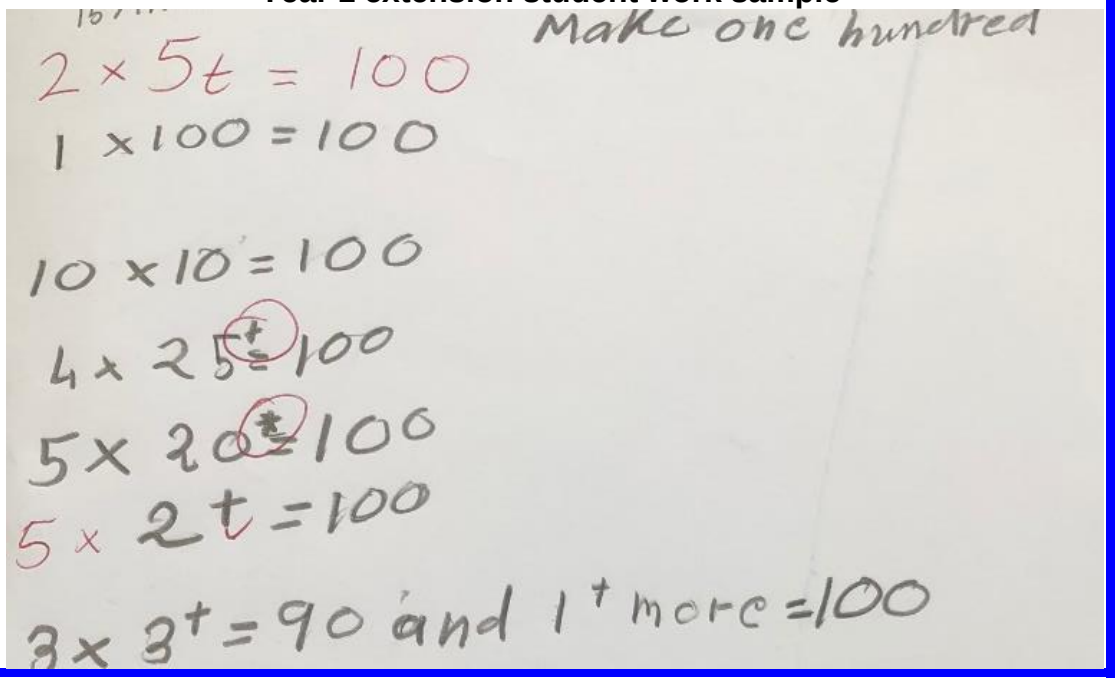
In the below student work sample, the students played the who has more variation 1, then just made their own number to 100 using the mini place value charts to solve how many they needed.

Encourage students to build up to the next ten first by figuring out how many more ones they need to fill their current row, then count how many more tens they need after that by counting the rows. Assist students towards counting, 1 ten, 2 tens, 3 tens, instead of 10, 20 30.



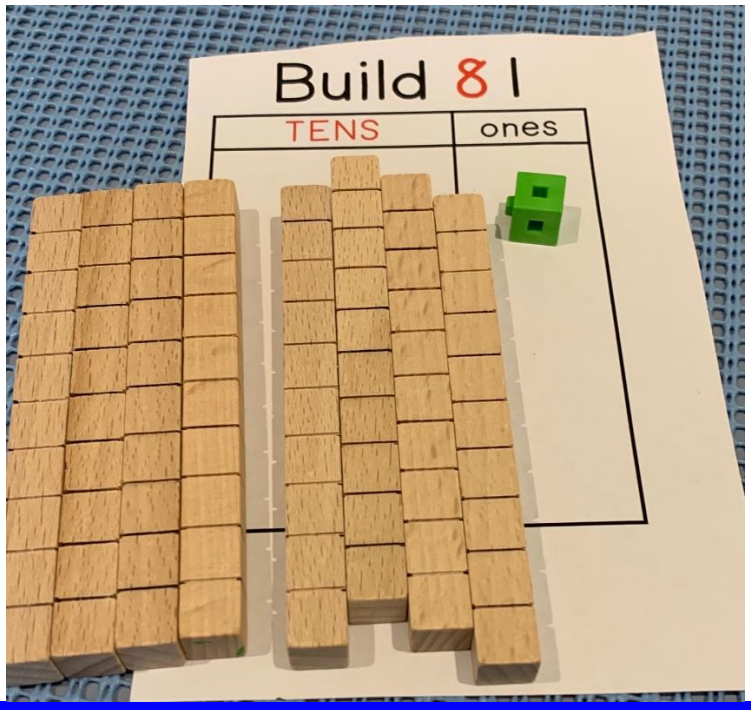
Extension: Figure out all the possible ways to make 1 hundred. Use the hundred block as their base. Experiment with different ways of combining tens and ones on top of it. For example, I see 3 groups of 3 tens and 1 more ten = 3 x 3t + 1t = 10t or 1h

Year 1 extension student work sample



Formative assessment option: Build two-digit number cards

Use the build two-digit numbers cards from this unit's folder, but instead of using popsicle stick bundles, this time students use place value blocks to make the numbers.



Tens-ones Lesson 13

Magic Number Reveal

Learning intention: Count by tens and ones, describing a running total of a two-digit number in its place value and worded forms

Maths vocabulary: ten (ten ones), 't'/'ty' for tens, place value form, worded form

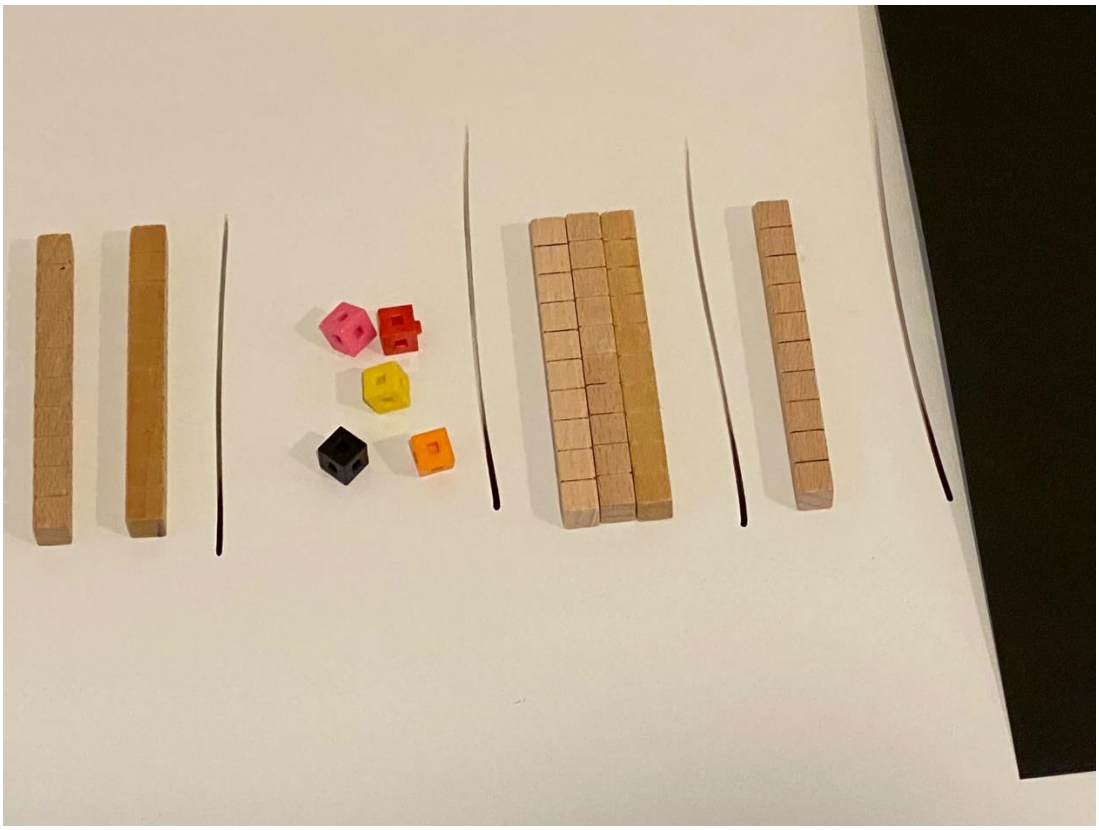
YouTube hook: Today, you are becoming magicians! The most important part of being a magician is the 'reveal' time. You are going to hide a number and slowly reveal it. To get in the right frame of mind, watch these virtual magic tricks: youtube.com/watch?v=2KLXRTKLXvo

Lesson summary: Students make a number together, for example, 79. Students then mix up some of the tens and ones, so that there are a few tens, then ones, then tens (in no particular pattern). Students use an A3 piece of black paper to gradually reveal the number, as 'number magicians.' As each new block appears, the student whose turn it is needs to say the running total.

Materials:

- Place value blocks (MAB).
- A3 black paper (or any colour).

Best set-up: Fishbowl model, then regular like-ability maths buddies.



Reveal one part at a time and try to keep track of the running total, usually by focusing on the tens first, then the ones. Also think about which place value changes and which will stay the same.

Modelling: In pairs, students make a number together, for example, 79 as 7 tens blocks and 9 ones. At first, place all 7 tens on the left and all 9 ones on the right. However, students then mix up some of the tens and ones, so that there are a few tens, then ones, then tens (in no particular pattern). Draw lines between each section of blocks. Each section should only contain one type of block (tens or ones, but not both).

Next, students use an A3 piece of black paper to gradually reveal the number, as 'number magicians.'

As each new block appears, the student whose turn it is needs to say the running total. For example, the first block is revealed as a ten, student A says, "1 ten, ten," (saying the place value form, then the worded form).

The next blocks revealed are two ones, so student B says, "1 ten 2 ones, twelve."
The next reveal is 3 tens. Student A says, "4 tens 2 ones, forty-two."
The next reveal is 2 tens. Student B says, "6 tens 2 ones, sixty-two."
The next reveal is 5 ones. Student A says, "6 tens 7 ones, sixty-seven."
This continues until the entire total is revealed.

Key tip: Which place value is changing for this turn? Which place value will stay the same as the last turn? Why?

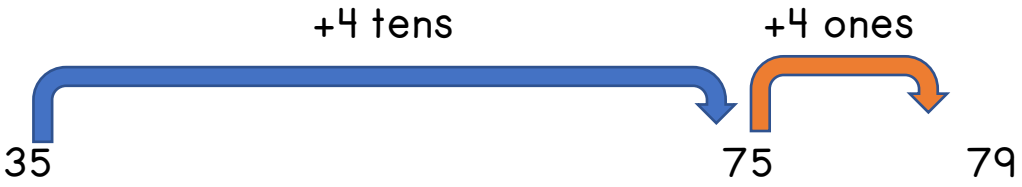
Support: As blocks are revealed, place them on the mini place value chart, assisting students to read the new number just by adding the newly revealed block to the existing total that is shown on the chart.

Extension 1: Include hundreds and thousands in the reveal.

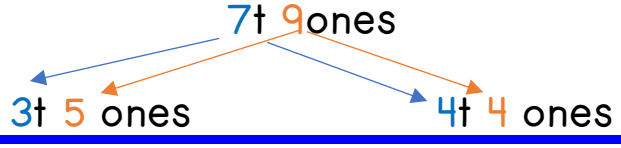
Extension 2: Work out the value of the blocks that are currently still hidden (not simply the value of the revealed blocks). Encourage students to use a jump strategy or split strategy to solve this.

For example, let's say the total is 79, and 35 is currently revealed. Well, 3 tens and 5 ones are revealed, so we need 4 more tens to get to 7t because 3t + 4t makes 7t, so 4 tens are under the paper. There are also 4 ones hidden, because 5 ones and 4 ones would make 9 ones.

Students could record like so using a number line (jump strategy):



Or students could record like this (split strategy):



Extension 3: Use coins to represent decimals ($1 as wholes, 10c as tenths, transparent counters as hundredths).

Tens-ones
Lesson 14

Place Value Paint Sliders

Learning intention: Make two-digit numbers using clues, then record these in drawings, place value form, standard form and worded form
Maths vocabulary: ten (ten ones), 't' and 'ty' for tens

Real-life link: Discuss students' favourite colours. How many colours do you think there are in the world? Okay, yes there is purple, green, red, and so on. but what if each colour is slightly different because of how dark or light it is? What about the different shades of colours? So, how many do you think there would be now? Infinity! Who has helped paint the house or their room before? Paint samples are pretty cool and come in so many

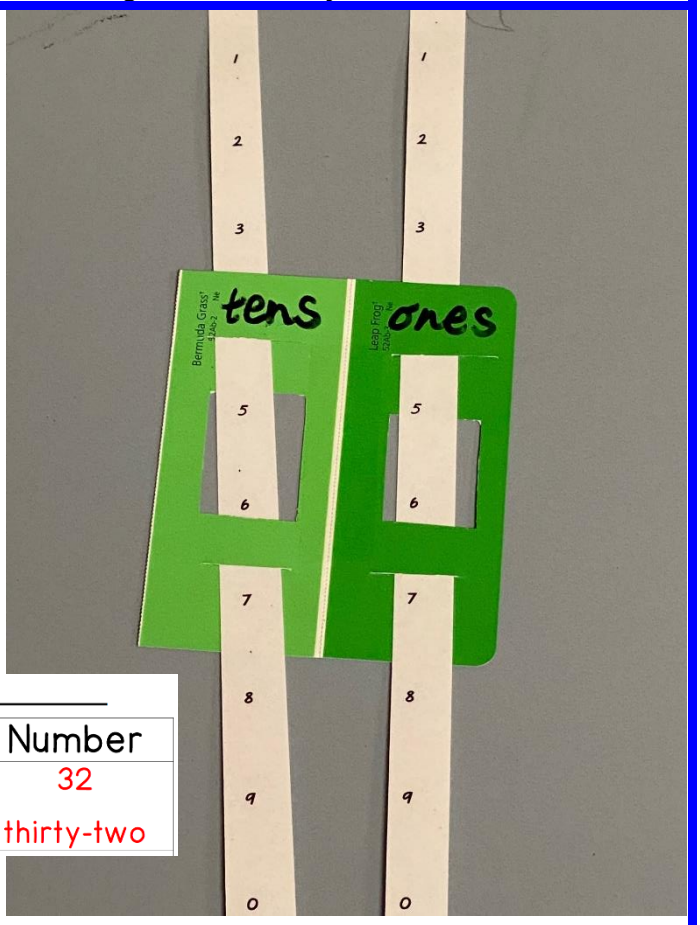
Lesson summary: Students make tens and ones numbers using paint place value sliders.

Materials:

- Paint colour samples from Bunnings or similar – use a Stanley knife to cut the rectangular or square holes. Slice and laminate the place value paint slider templates from this unit's folder. Slide through the holes.
- Place value blocks – 9 tens and 9 ones.
- T-O chart to organise their place value blocks.
- If recording in words, use the Number spelling assistance charts from this unit's folder. Make two-digit numbers recording templates as well.

Best set-up: Fishbowl model, then regular like-ability maths buddies.

Modelling: Students work in pairs. Student A makes a number using the paint slider. Student A keeps this hidden from student B, but reads it out, "I have 5 of the tens and 4 of the ones." Student B makes the number using place value blocks. Student A then reveals the number on the paint slider to student B and checks their work.



Students can record using the make two-digit numbers recording template from this unit's folder.

Make two-digit numbers Name_____

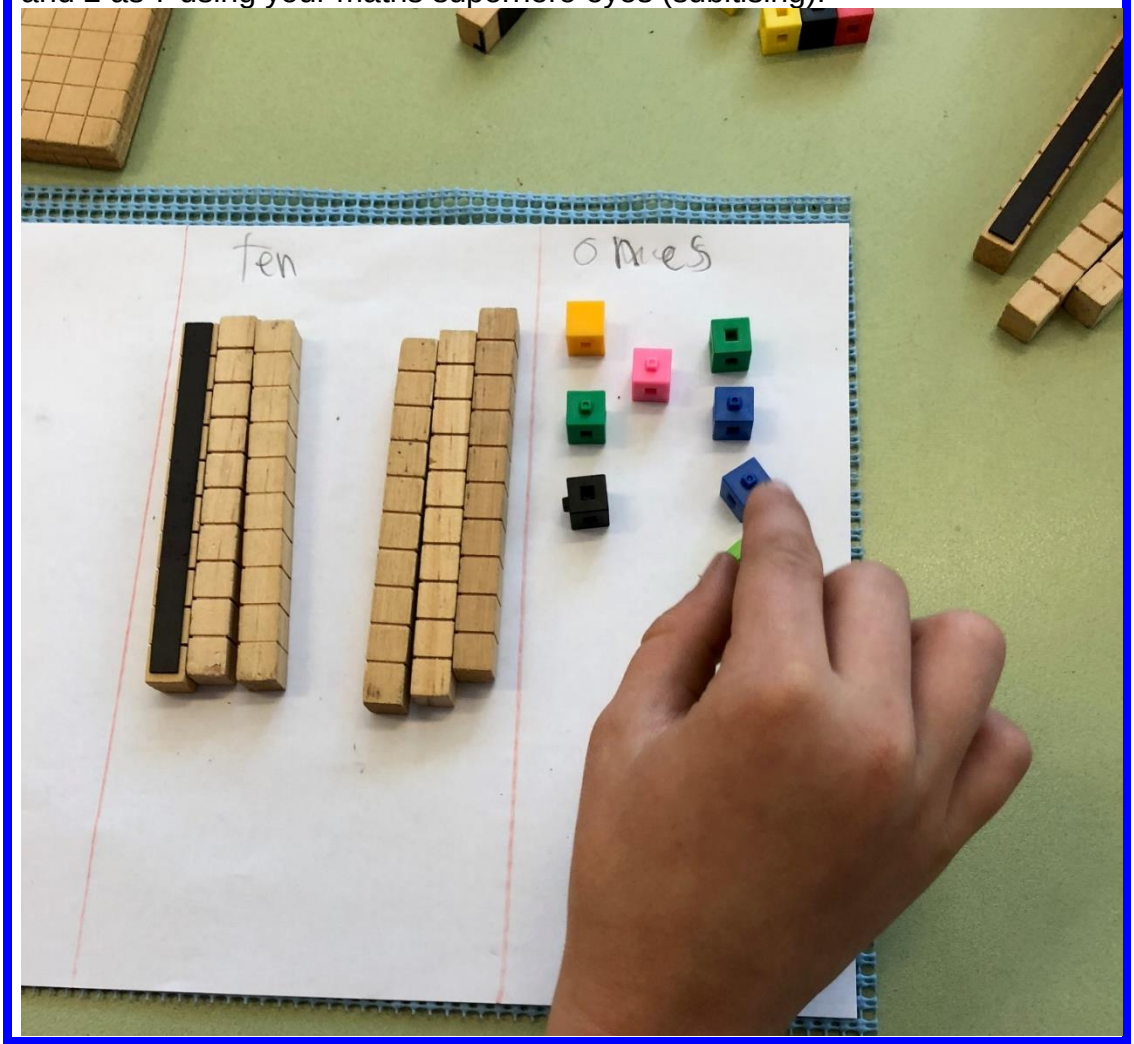
Drawing	_t _ones	Number
example	3 t 2 ones	32 thirty-two

Alternatively, fold 4 columns in their books to record, as shown here:

Tens + ones	Drawing	Number	Worded form
5 tens + 4 ones (the clue)	IIIII . . . . (what you made in your T-O chart)	54	Fifty-four

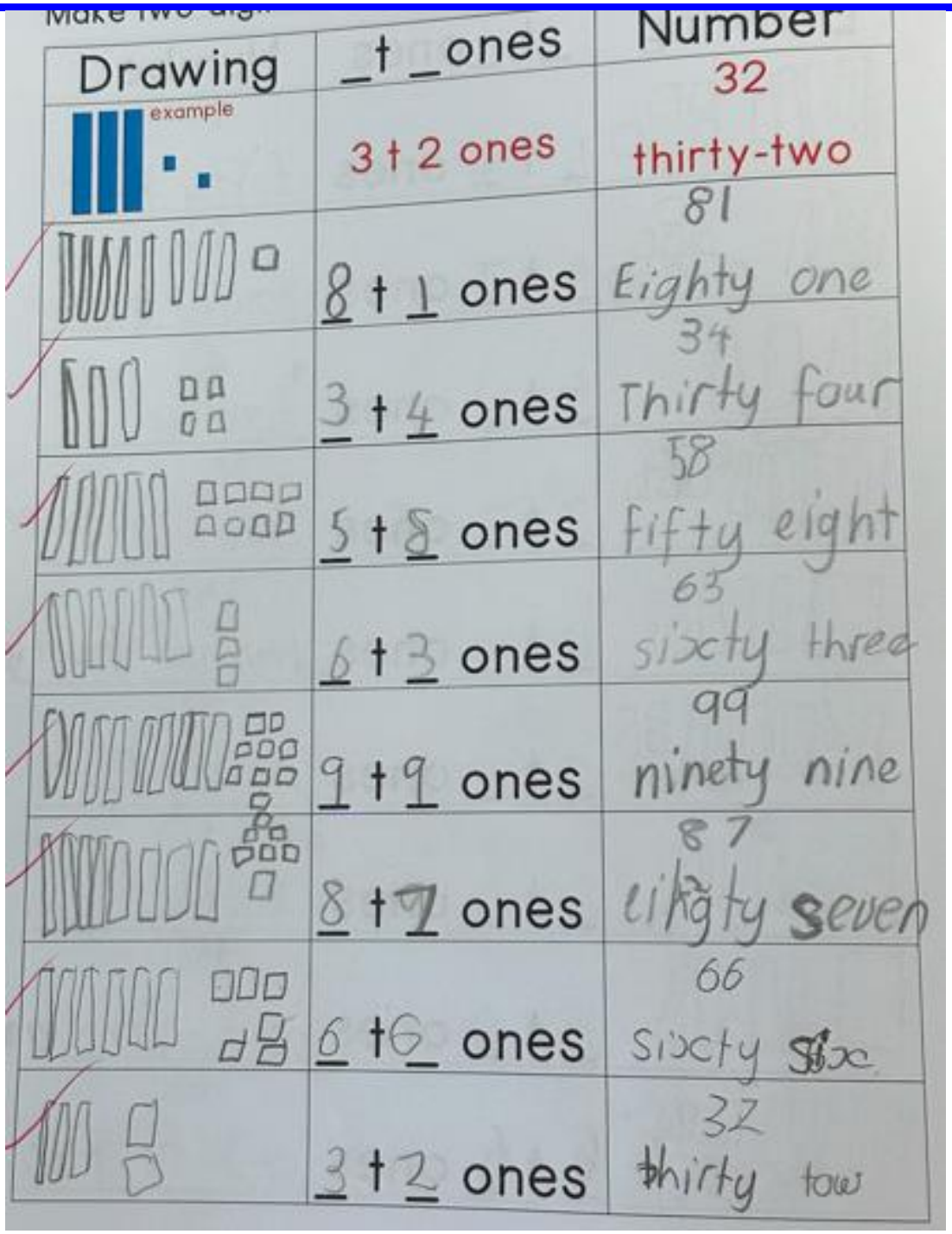
different colours and shades. Sometimes, I just collect a few from Bunnings because I just love a particular colour, or for craft projects. Today they are your maths tools.

Encourage students to set up their ones and tens so they can see them easily. How do you like to see 6? 3 and 3, so set up the 6 tens as 2 groups of 3. How do you like to see 7? As 5 and 2, so set it up so you can see the 5 and 2 as 7 using your maths superhero eyes (subitising).



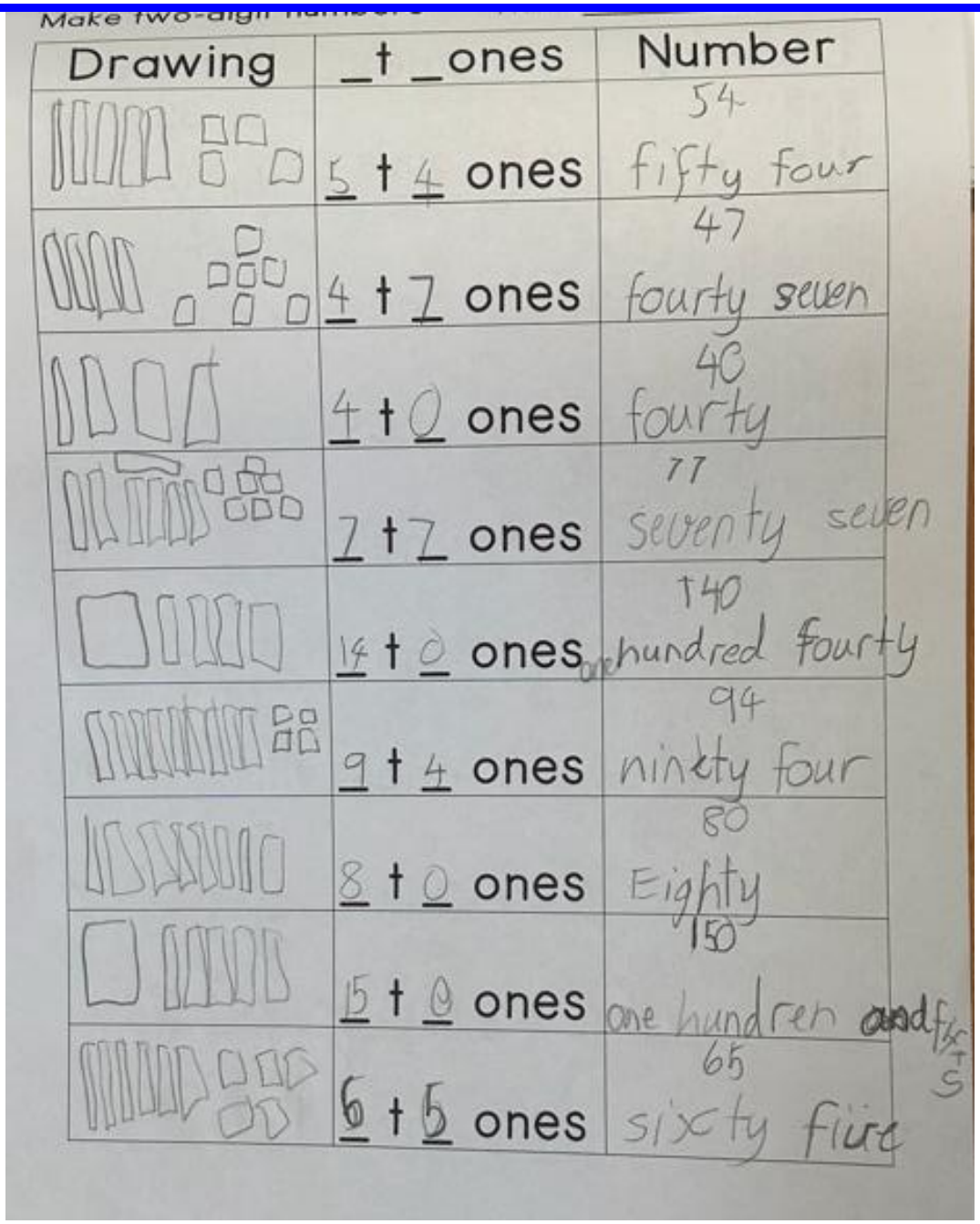
Questioning:

- How many tens and ones are in that number?
- What if we made that number using just ones? How many would we need?
- What number would it be if we added one more ten? Check by sliding the tens place one digit forward. So, instead of counting forward 10 ones, we can just go up by 1 in the tens.
- What number would it be if we took away one ten? Check by sliding the tens place one digit back, using the paint place value slider. So, instead of counting back 10 ones, we can just go back by 1 in the tens.



Drawing	_t_ ones	Number
example	3 t 2 ones	32 thirty-two
	8 t 1 ones	81 Eighty one
	3 t 4 ones	34 Thirty four
	5 t 8 ones	58 fifty eight
	6 t 3 ones	63 sixty three
	9 t 9 ones	99 ninety nine
	8 t 7 ones	87 eighty seven
	6 t 6 ones	66 sixty six
	3 t 2 ones	32 thirty two

Student work sample



Drawing	_t_ones	Number
	5 t 4 ones	54 fifty four
	4 t 7 ones	47 fourty seven
	4 t 0 ones	40 fourty
	7 t 7 ones	77 seventy seven
	14 t 0 ones	140 hundred fourty
	9 t 4 ones	94 ninety four
	8 t 0 ones	80 Eighty
	15 t 0 ones	150 one hundren and fifty
	6 t 5 ones	65 sixty five

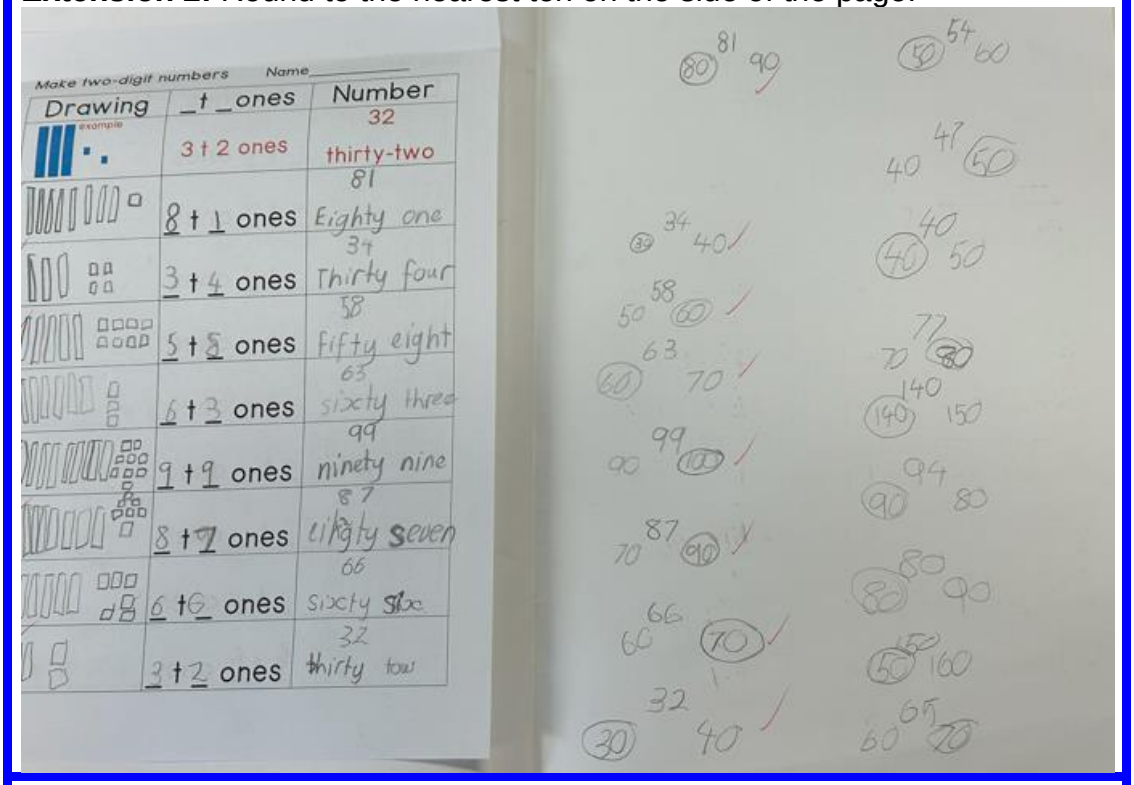
Student work sample

Support: Make the paint slider visible to both partners, who assist each other to make the number without the oral 'mystery' element at first.

Extension 1: Also record the expanded form:

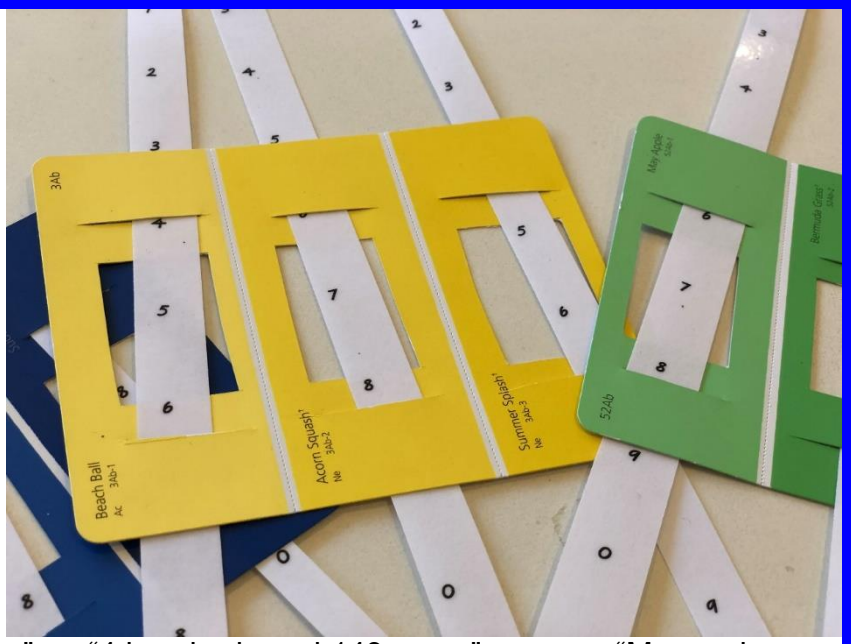
Tens + ones	Drawing	Number	Worded form
5 tens + 4 ones 50 + 4	| | | | |	54	Fifty-four

Extension 2: Round to the nearest ten on the side of the page:



Extension 3: Give their clues in a renaming format. For example, for 54, student A would say, “My number has 54 ones,” or, “3 tens 24 ones.” Student B would need to work out that they cannot collect 54 ones, or 24 ones, because they physically do not have that many, so would need to grab 5 tens and 4 ones instead.

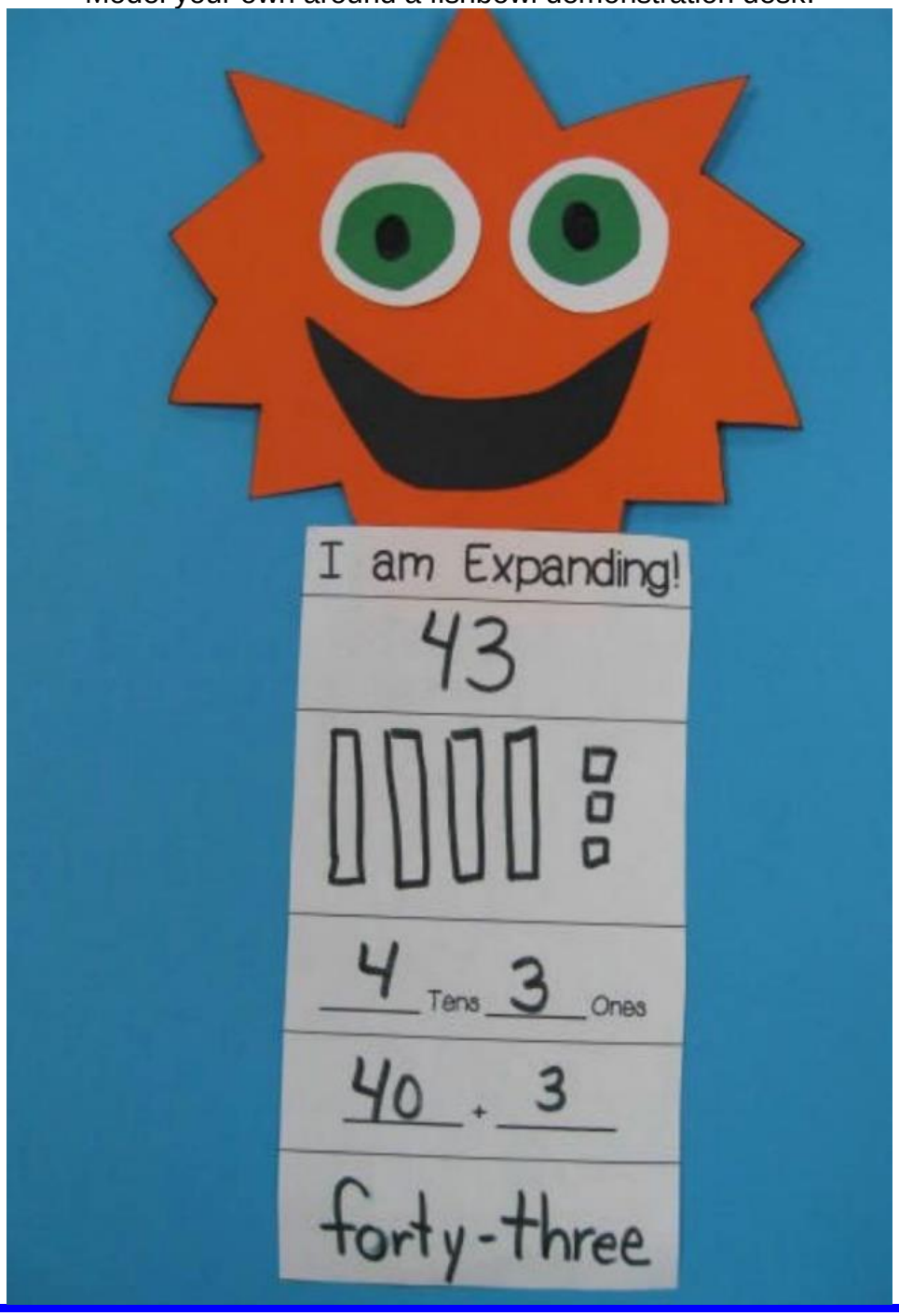
Extension 4: Use a three-column H-T-O paint slider to make three-digit numbers. Record numbers in place value form, worded form and rename it multiple times. Use renaming clues to their partner, for example for 543, “My number has 54 tens and 3 ones,” or, “4 hundreds and 143 ones,” or even, “My number has “1 hundred 43 tens and 13 ones.”



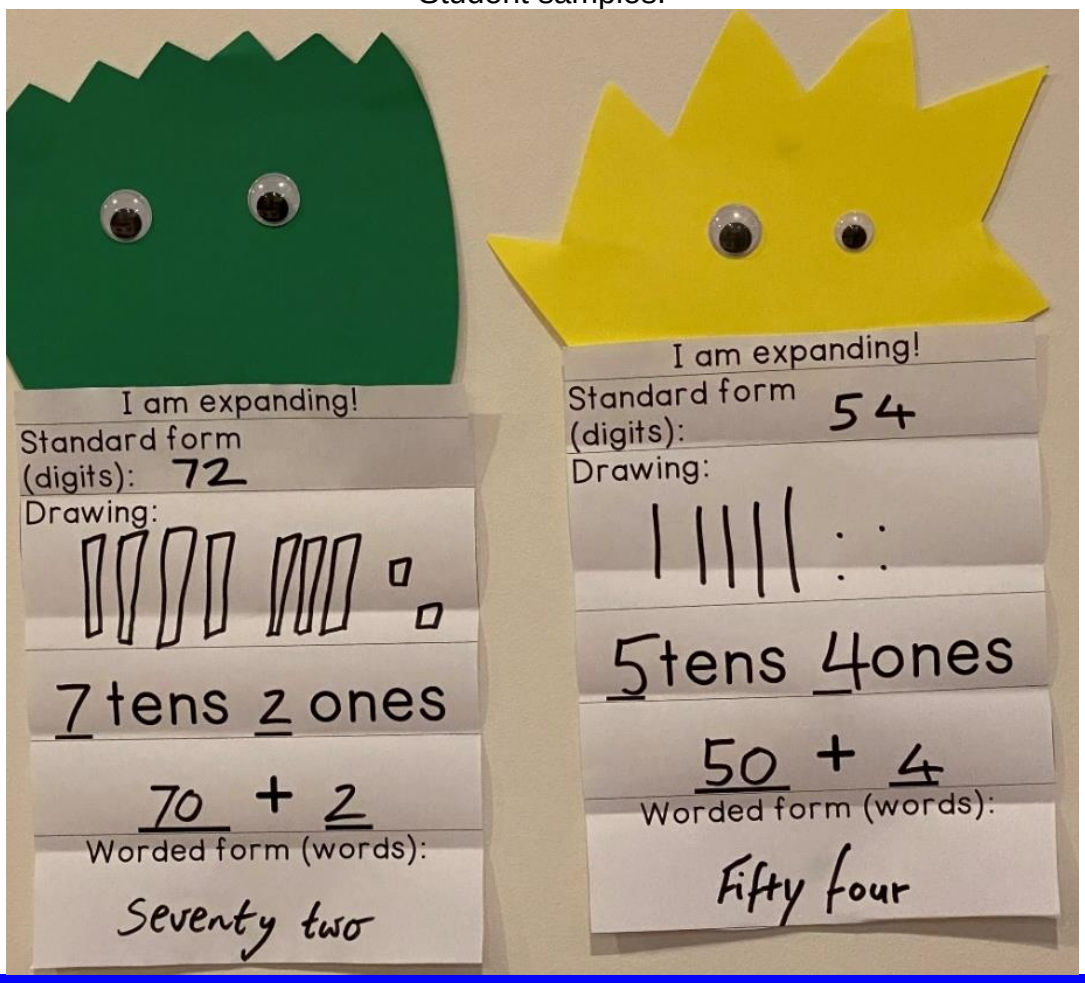
Formative assessment – exit ticket: Make a place value monster (photographs on the next page).

There is a template on the following pages for the body, but for the face students can design their own using 5 minutes of craft time and coloured paper.

Model your own around a fishbowl demonstration desk:



Student samples:



I am expanding!
Standard form (digits):
Drawing:
_ tens _ ones
____ + __
Worded form (words):

Tens-ones
Lesson 15

Birds on the Wire

Learning intention: Make two-digit numbers using an abstract representation for a complete ten, working out and recording the running total in its place value, standard and worded forms

Maths vocabulary: ten (ten ones), 't' and 'ty' for tens, place value form, standard form, worded form

YouTube hook*:* Watch this amusing YouTube Clip *Birds on the Wire*, which also touches on themes such as kindness and karma: youtube.com/watch?v=k2PJ6T7U2eU&ab_channel=long_island_ice_tea

Lesson summary: Students use coat hangers and pegs to represent tens and ones. At each set of ten wooden pegs, students rename the ten single pegs to make one ten, represented by a coloured peg.

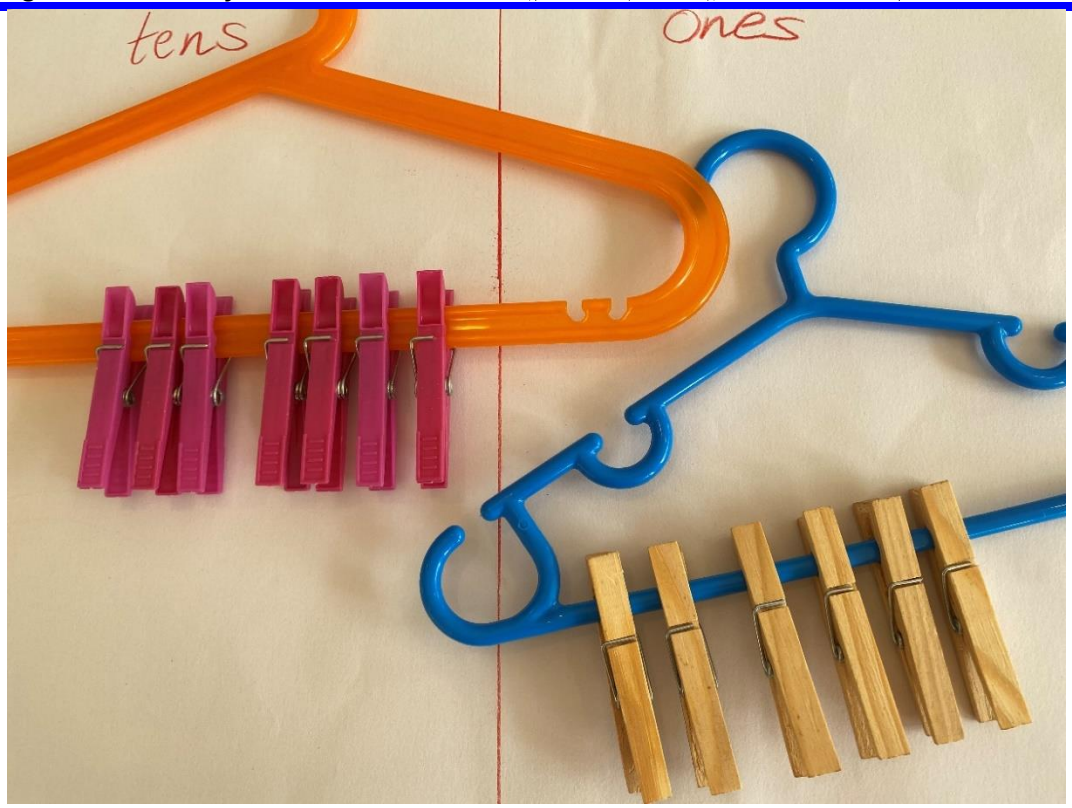
Materials:

- Coat hangers, wooden pegs and coloured pegs. Cheap bulk class sets are available at Bunnings, Kmart or Target. These resources are often also used for commutativity (building an addition using pegs on either side, then dramatically turning it around) and partitioning (all the ways to make the numbers 3 to 9), so it is worth having at least one class set in the school.
- Birds on the Wire recording template.
- Post-it notes to label the coat hangers.
- 10-sided dice and grip mats.

Best set-up: Fishbowl model, then regular like-ability maths buddies.

Tens and Ones Name_____

Drawing		Place value form	Standard and Worded form
T	O	2t 3 ones	23
		20 + 3	twenty-three



7 tens 6 ones 76 seventy-six

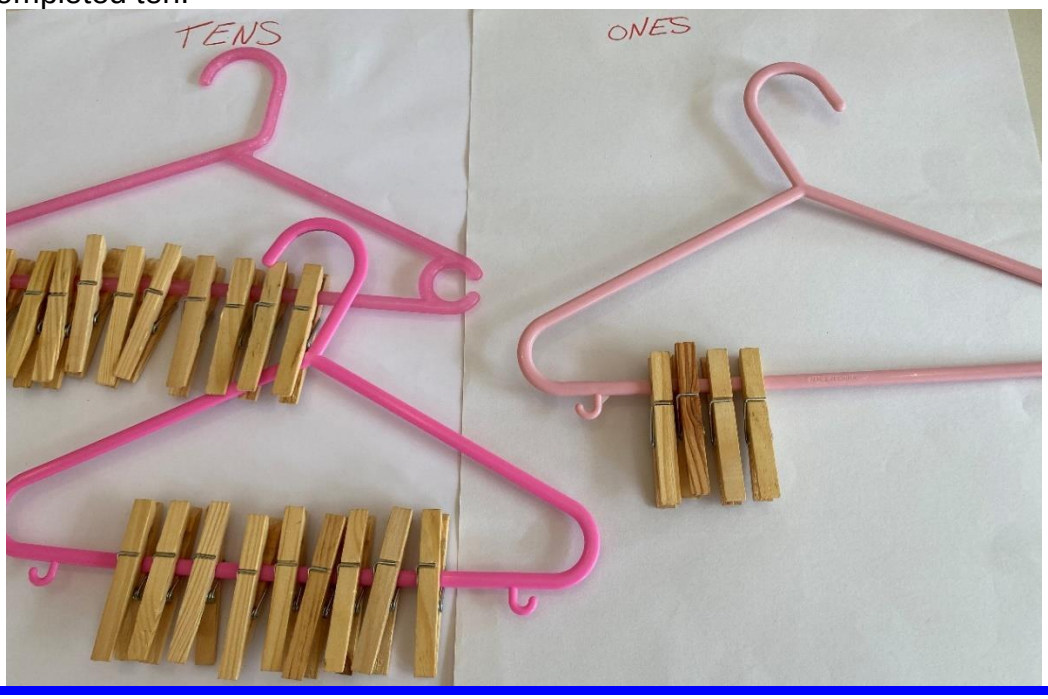
Modelling: Each pair of students has two coat hangers in front of them. The hanger on the left-hand side is labelled tens (with a small post-it note on the hanger, or by being placed in a T-O chart), and the right-hand side hanger is labelled ones. Each wooden peg represents one little bird, just like the little ones in the video clip. Roll a 10-sided die to add to your ones side (the coat hanger to the right, using wooden pegs). When you reach ten birds (10 wooden pegs), the ones wire cannot hold them, so rename the 10 little wooden birds into one big colourful bird, like the big, funny and kind bird in the video clip. Place this coloured bird on the left coat hanger – representing one ten. Say out loud, "10 ones is worth 1 ten."

At the end of each roll, students record the running total in place value form ("2 tens, 3 ones makes 23, or 20 + 3), standard form (digits) and worded form on the recording template. Use the number spelling assistance chart for students who need help with the worded form. A stick and ball font version is available, as well as a cursive font version. There is also this website for more assistance with worded forms, particularly to provide immediate feedback for students after they first attempt the worded form each turn: lingojam.com/NumbersToWords

Tens and Ones Name_____

Drawing		Place value form	Standard and Worded form
T	O	2t 3 ones	23
		20 + 3	twenty-three

Support: Use the wooden pegs only. Instead of renaming the ten pegs into a coloured peg, simply move the completed coat hangers of ten into the tens place on their chart. This ensures students can visualise the full quantity, rather than having to use the coloured peg as an abstract representation of a completed ten.



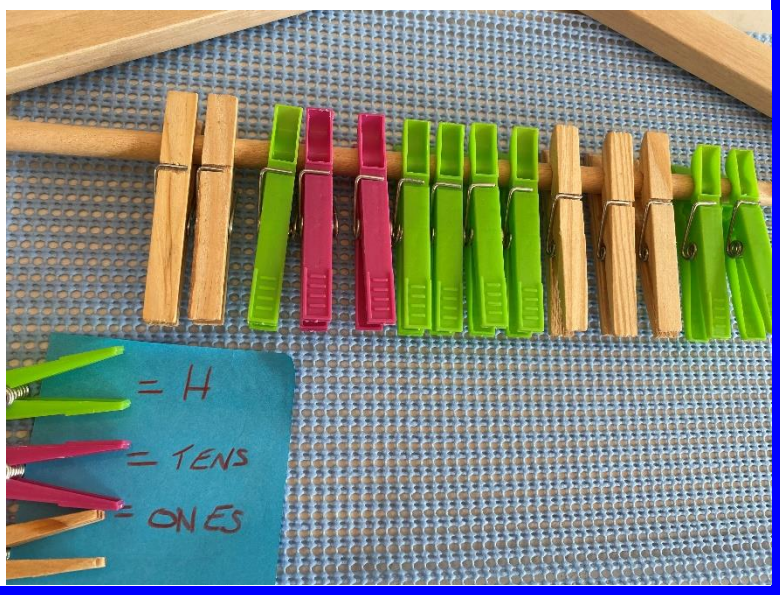
Extension 1: Use one colour of peg for tens (e.g. red) and another for hundreds (e.g. green). The wooden pegs still represent the ones. Create a key/legend to show which colours represent which place values.

Now make a number on three coat hangers – for example, 3 green pegs on the coat hanger furthest to the left (hundreds), 5 red pegs on the middle coat hanger (tens) and 8 wooden pegs on the coat hanger to the right (ones).

Swap spots with their extension partner, who then works out the total:

3h + 5t + 8 = 358 three hundred and fifty-eight

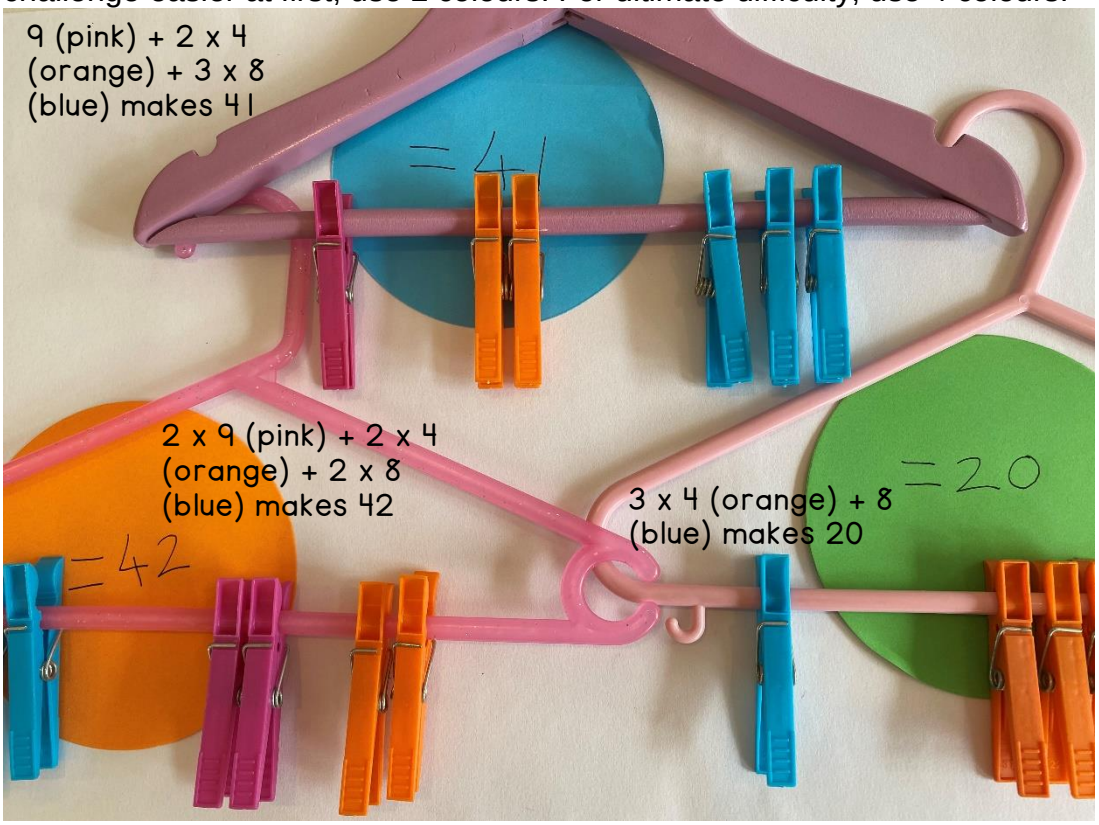
Once students are confident in this, use all three types of coloured pegs on the one coat hanger. For example, 7 green, 2 red and 5 wooden all the one hanger = 7h + 2t + 5 = 725, even if the pegs are not ordered from left to right in their place values. Remember to use a key/legend to remind students which colours represent which place values, which is particularly important for this challenge (where the pegs can be placed on the hanger in any order).



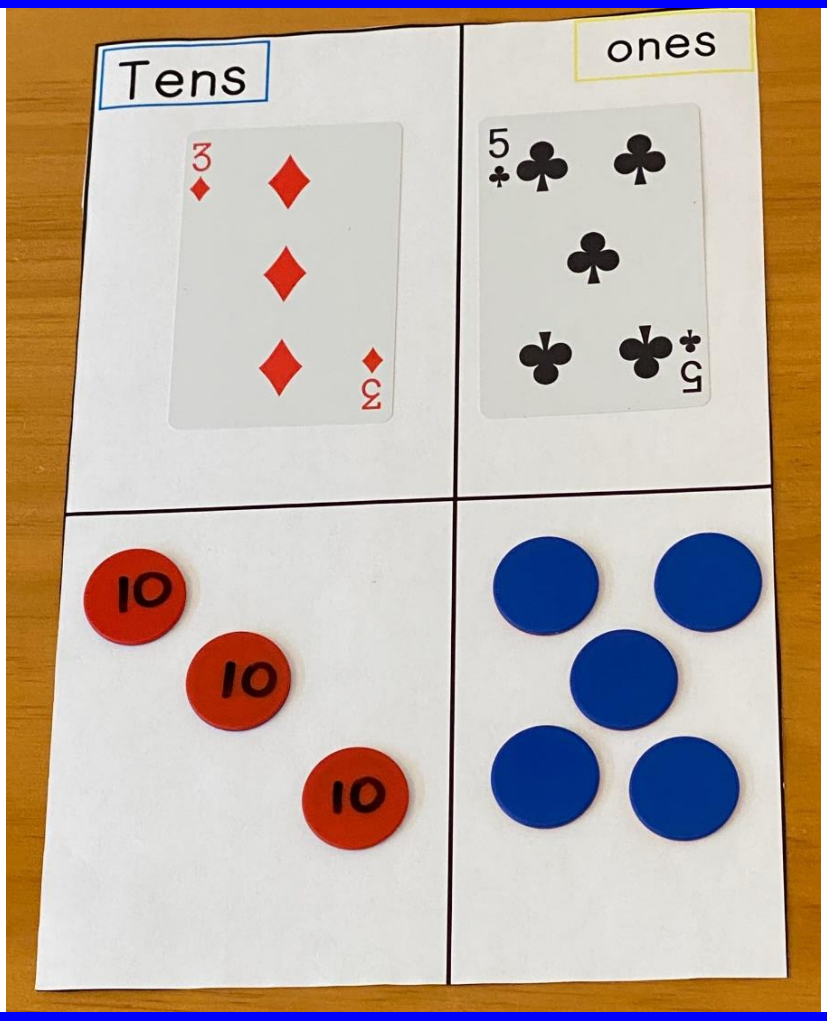
Extension 2: Take the place value element away and make it more of an algebraic challenge. For example, the extension student creates a code, such that orange pegs are worth 4, blue are 8 and pink are 9. Student A puts 2 orange pegs (2 x 4 since orange are worth 4), 3 blue (3 x 8 since blue are worth 8) and 1 pink (1 x 9) on a coat hanger. Student A then writes that that coat hanger is worth 41 (8 + 24 + 9).

Student A then makes at least 2 more coat hangers that use the same code (each colour is worth the same as it was, so orange is still worth 4, blue is 8 and pink is 9), and writes their totals beside them as well. It is important to have at least three examples, in order to make it possible for another extension student to work out the code.

However, student A does not tell extension student B what the code is. Student A swaps places with student B, who has also created their own code, and they both aim to work out each other's codes. To make the challenge easier at first, use 2 colours. For ultimate difficulty, use 4 colours.

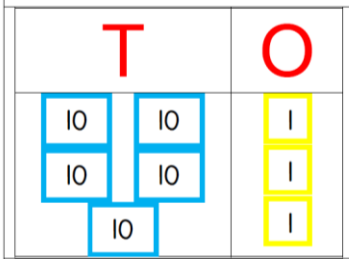


Tip: Encourage the use of trial and error and substitution (substituting a proposed value for a colour into the 3 equations and adjusting as needed). Also focus on what changed between two coat hangers. For example, for the two largest coat hangers above (42 and 41), what changed was one pink was added and one blue was taken away. This can be written algebraically, using 'R' for 'oRange' to avoid 'O' being confused with zero, as:
1P (pink) + 2R (orange) + 3B (blue) = 41
2P + 2R + **2**B = 42 ∴ (3 dots means 'therefore') P is worth 1 more than B

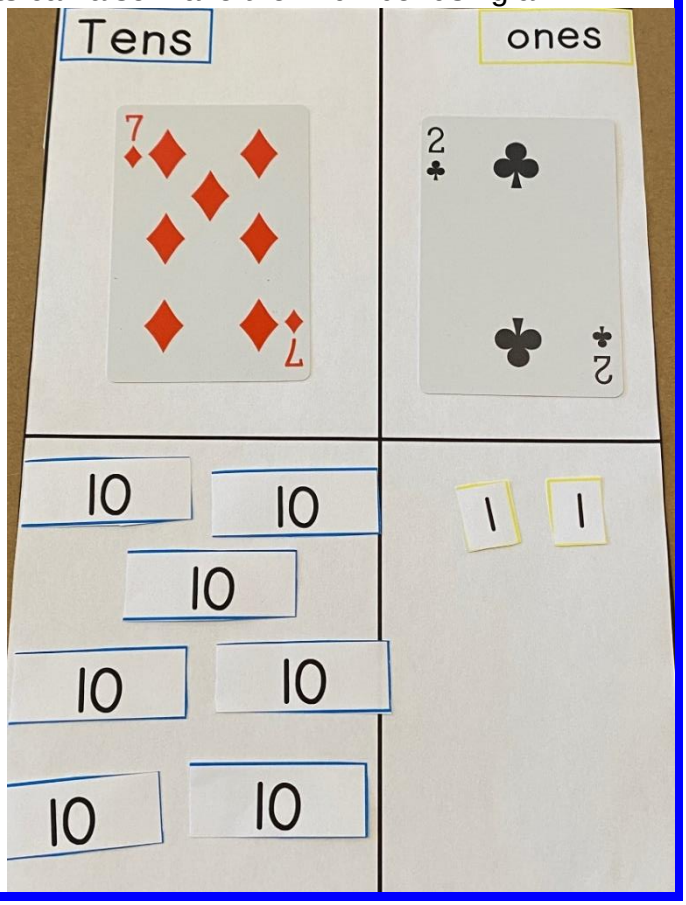
Tens-ones Lesson 16	**Expanded Form Cards** **Learning intention: Make two-digit numbers using expanded form cards, working out and recording the running total in its standard and worded form** **Maths vocabulary: ten (ten ones), 't' and 'ty' for tens, expanded form, standard form, worded form**
Link to humour*:* Since this session is focused on expanded form cards, first browse and scroll through some of these cartoons and memes on the concept of 'expanding': cartoonstock.com/directory/e/expanding.asp	**Lesson summary: Students race to 100, then 200 or 300 using expanded form cards in a T-O chart, recording the expanded, standard and worded form of their running total each turn.** **Materials:** • Expanded form cards and T-O chart template. **Alternative:** Instead of slicing up all the tens and ones in their paper form, just use counters. Ones could be blue and tens could be red. If possible, use counters where '10' or 't' can be written onto each for the tens, as shown in the photos. Use water-based whiteboard markers, which just rub off. • Expanded form cards recording template. • Playing cards (regular red and black versions, picture cards removed). • *Optional:* Abacus or place value blocks. **Best set-up:** Fishbowl model, then regular like-ability maths buddies.
	

Modelling: Whenever students pull a black card, they add it to their ones place. Whenever students pull a red card, they add it to their tens place. For example, let's say student A pulls a black (ones) 3. Add 3 ones expanded form cards, or blue counters, to their ones place. On their next turn, student A pulls a red 5. Red represents tens, so this is worth '5 tens.' Student A adds 5 tens expanded form cards, or red counters, to their tens place. Their running total is now 5t3 or 53.

Each turn, students record the expanded, standard and worded forms of their number using the recording template:

Drawing	Expanded form	Standard and Worded form
	5t 3 ones 50 + 3	53 fifty-three

As an extra challenge, students can also make their number using an abacus: 5 rows and 3 extras (53), and use this to work out how many more they need until they reach 100. This will be shown by the number of beads on the other side of the abacus – 4 rows and 7 extras (47), so 53 + 47 makes 100 (not 53 + 57, which is a common misconception for students).



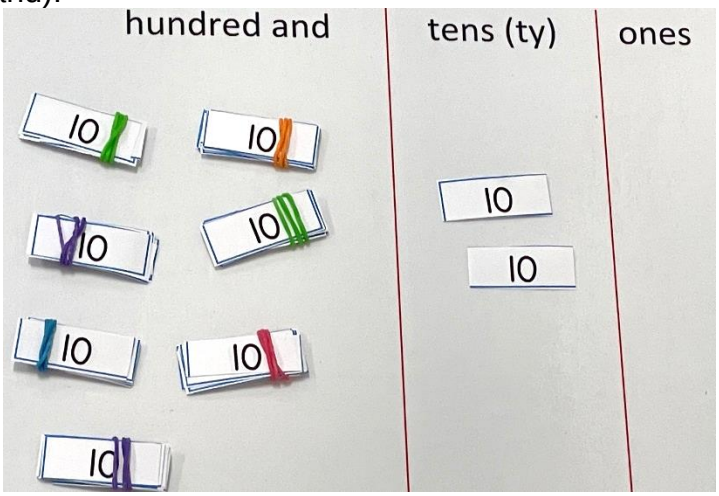
For the first game, students can race to 100, aiming to reach it before their partner. Next, students can aim to make 200 (or 300) before their partner does. For these higher targets, use a H-T-O chart (cursive) or stick and ball version, bundling 10 tens cards with a rubber band to create each set of 100.

Support: Use an abacus alongside to make the cards less abstract, but without the challenge of working out complements to 100.

Extension: Race to 1000 using the expanded form cards (students will need 4 pages of the templates to create at least 100 tens cards, but do not tell them precisely how many they will need, as this is part of the investigation).

Questioning:

- How many tens will you need to make 1 thousand?
- Estimate how many rolls it will take (just roll for the tens using a 10-sided dice, racing against their partner to be the first to reach 1 thousand).



Roll one 6-sided die to collect tens. Record: 72 tens makes 720, 72t = 720, as well as regular place value form recording: 7h + 2t + 0 ones = 720

Continue to use only tens expanded form cards for extension students who are racing to 1000 (do not make hundreds cards), so that these students need to figure out if they currently have 72 tens, that is the same as 720.

Each turn, work out how far off you are from 1000. Students can use the place value blocks to assist with this, for example, building the number as hundreds, tens and ones into a tower, then placing a 1 thousand block next to this. Build up – how many more ones to complete the next ten? How many tens until the next hundred? How many hundreds to get to 1000?

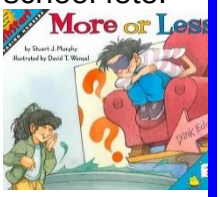
Tens-ones Lesson 17

Guess my number…

Learning intention: Problem-solve using strategic questions to work out your partner's mystery two-digit number

Maths vocabulary: strategic (thinking) questions, even/odd, more/greater/larger than, less/fewer/lower than

Literacy link – Numeracy Picture Book: *Read More or Less* by S. Murphy, a book about guessing numbers to avoid being dunked in a bucket of water at the school fete.



Become a detective: This session, you are going to become a detective and use clues to figure out your partner's mystery number! Who has played battleship before? Well today, we are searching for a mystery

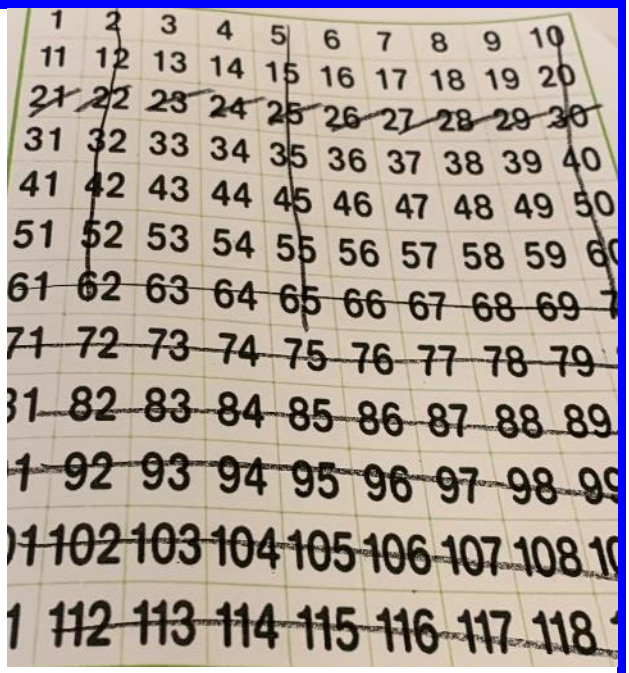
Lesson summary: Students try to guess each other's mystery numbers using strategic questions.

Materials:

- Laminated 120 charts (or place these in write and wipe boards) so that students can cross out eliminated options, as they ask each other questions.
- *Note:* Many interactive versions of this game only allow 'greater/less than question types,' so reserve these for reflection or whole-class teamwork at the end, as the ICT versions are more closed and less rich in nature than the questions students can ask one another in real-life.
- Whiteboard markers.

Best set-up: Fishbowl model, then regular like-ability maths buddies.

Modelling: Using their 120 charts, students play the number version of the game Battleship. Students choose their number and secretively record it on the back of their chart (or on a post-it note, hidden from their partner). Taking turns, they ask each other questions about their number, crossing out eliminated options on their chart, until they guess their partner's number.



Model effective questions to ask using a whole-class game of 'teacher versus all students.' When versing the students, model these **questions:**

- Is your number more/greater/larger than 60? Is your number smaller/less/lower than 60? Half the 120 chart can be eliminated with this single question.
- Is your number odd or even? Another half of the options are eliminated! *Extension version of this question:* Is your number a multiple of 2? Is 2 a factor of your number?
- Does your number have any hundreds?
- Does your number have 5 tens?

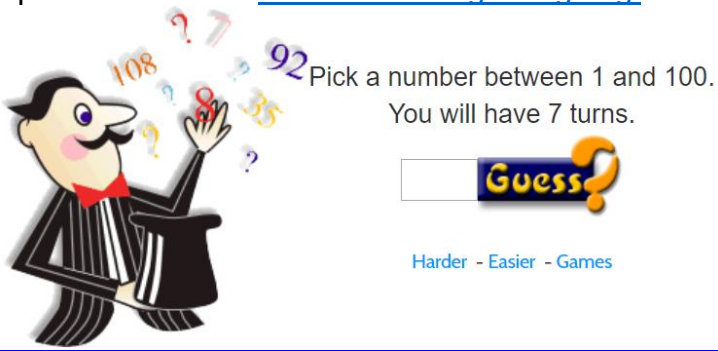
Midway variation: Limit the number of questions to 10, then 5, before students must have their final guess at the actual number.

number that your partner is going to hide, just like a mystery boat in the game of battleship, and you will need to find it using strategic (thinking) questions.	**Critical tip!** Ensure that students think carefully about their partner's answer, *before* crossing out the options from their 120 chart. It greatly assist if you model for students to **answer in full sentences.** For example, if student A asked, "Is your number greater than 60?" Student B answers, "My number is less than 60," (rather than simply 'yes' or 'no'). Therefore, student A would cross out all the numbers above 60. Student A can also clarify if 60 is included or excluded (allow clarifying questions). Student B would then check student A's chart and say, "Yes," verifying that student A crossed out the numbers correctly and has not actually eliminated the correct answer. **Critical tip!** If students are only asking 'greater/less than question types,' ban these types of questions for particular pairs, or the whole class. Alternatively, limit them (you can only ask two of them per round).
	Support: Slice their chart off, in like-ability pairs, so that it is 1-40 at first. Encourage partner assistance to ensure they cross out the correct numbers and do not cross out the mystery number.
	Extension 1: • Is your number a multiple of 5 (in the 5 times tables)? Is 5 a factor of your number? • Is your number divisible by 2 (even)? Is your number divisible by 10? • Is the digit in the tens place a multiple of 3? • *Very high:* Is your number prime/composite?
	Extension 2: Use printouts of the Extension 1-1549 MS Excel charts from this unit's folder so that these students need to use their questions to eliminate from a larger set of numbers.
	End-of-session reflection: Play a whole-class game at the end of the session and observe the improvement in questions from the beginning game. Also play: abcya.com/guess_the_number.htm interactive game with easy (1-10), medium (1-100) and challenging (-500 to 500) options you can play as a class.
	Variation 1: In pairs, students stick a post-it note with a mystery number on their partner's back (or make a headband and put it on their partner, as in the photograph). Then students take turns to ask questions about their own number, aiming to guess it before their partner. This is more challenging as it is entirely mental (requiring students to keep track of eliminated options in their head), although the 120 chart could still be used to record eliminated options for students who need this added support. 

Variation 2: Students read these number riddles to one another: lakeshorelearning.com/media/images/free_resources/teachers_corner/activities/guessNumber.pdf (click 'ok' to the pop-up box)
Student A reads out the riddle, one sentence at a time and in full. Student B uses their 120 chart to keep track and cross out eliminated options. Then roles switch.

Variation 3: What's the best strategy when you ask greater/less than questions? (Go for the middle). Use a 1m measuring tape to scaffold finding the halfway mark of the remaining options, e.g. 0-100. Start in the middle: 50 (or 60 for a 120 chart). If they say lower, fold the measuring tape and go in the middle again (between 50 and 0): 25.
To model this, lay the measuring tape down on the table, fold it and put a popsicle stick at the halfway mark. Ask whether the number is greater or less than the halfway number. Fold the measuring tape so that the eliminated numbers are hidden, mark the halfway mark with a popsicle stick by cutting it in half, and ask again.

For this interactive game, only greater/less than questions are allowed and students have a limit of 7 questions. Emphasise that it is always good to go in the middle of the leftover options, to maximise your chance of guessing the mystery number with a limit of 7 questions. Students could use their measuring tapes for assistance to find the new halfway mark each time and verse the computer as a team: funbrain.com/cgi-bin/gn.cgi



Giant teacher modelling materials:
For the whole-class start, make a *Guess Who* number gameboard,' then give it to extension students for the rest of the session (since this is less supported than the 120 chart):

Tens-Ones Lesson 18

One More/Less, then Ten More/Less

Learning intention: Work out one more and one less for any two-digit number, then ten more and ten less by exploring and applying place value patterns (what changes and what stays the same when you add or subtract a ten)
Maths Vocabulary: more, less, next, before, tens place, ones place, pattern

Game: Use a hundreds flip board

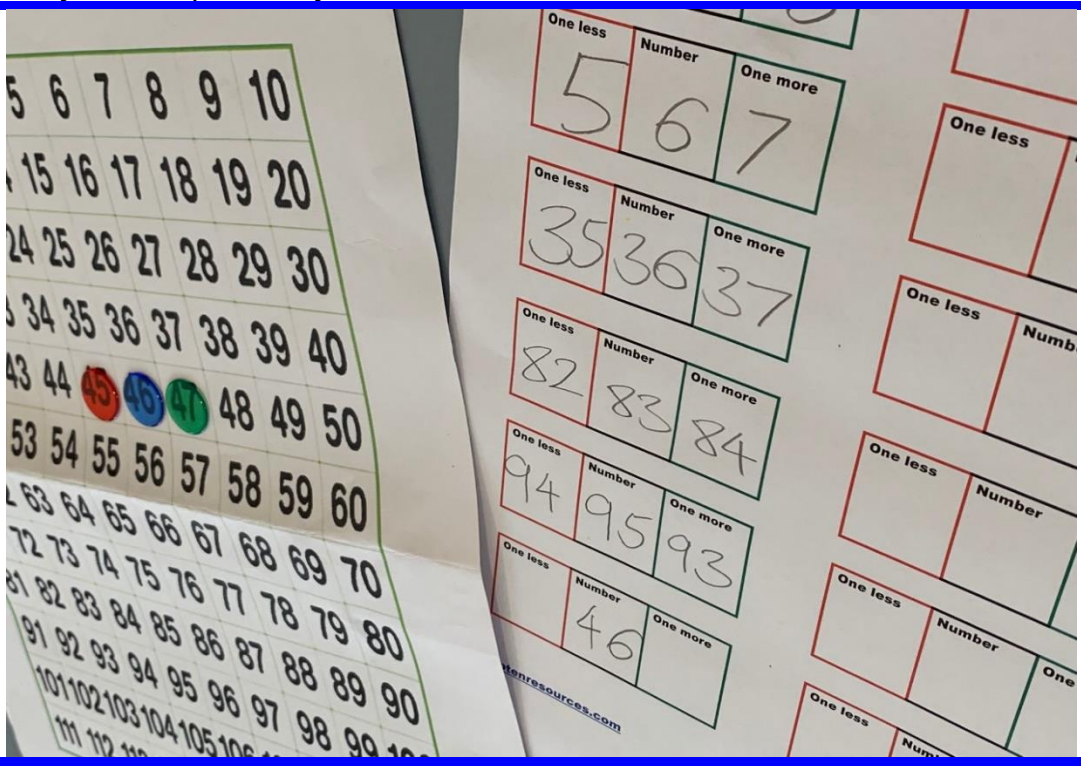
Flip all squares to blank, then flip one number up. Students answer what number they think will come next and will come before that number. Interactive charts are also available here: toytheater.com/120-chart/ (120 version available, where you can black out some numbers).

Lesson summary: Students work out one more/less using the 120 chart. Students put a blue counter on any starting number, for example, simply by dropping their blue counter anywhere onto the 120 chart. Their partner then works out one less (red counter) and one more (green counter) than the starting number.
Students then practise working out ten more and ten less than their starting numbers. During part 1 of ten more/less, students use peek-a-boo flaps on a 120 chart. During part 2, students use place value blocks on the mini place value charts, recording one more/less and ten more/less. Throughout, students aim to discover the critical place value pattern (when adding/subtracting tens, the ones stay the same).

Materials:

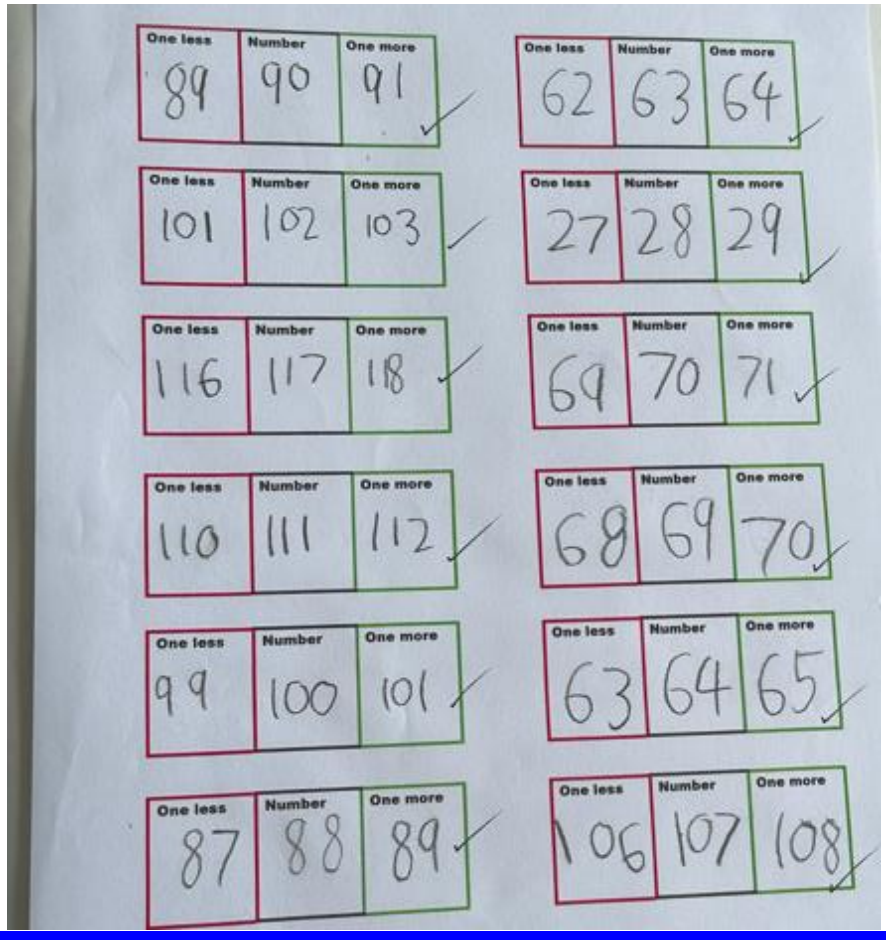
- 120 charts.
- Blue, red and green counter for each pair.
- One more/less boxes recording templates.
- *Ten more/less parts 1 and 2:* Ten more/less recording templates.
- Mini place value charts.
- Place value blocks (MAB).

Best set-up: Fishbowl model, then students work with a like-ability maths buddy, or independently.



Challenge the students: By the end of this session, your goal is to come up with a cool pattern that works when you need to add just one place value (e.g. 1 ten, 1 hundred) or subtract just one place value from a number.	**Modelling – one more/one less:** Model using a giant 120 chart (enlarge to A3 on the photocopier). Place giant counters on the chart (or kinder circles with the middles cut out), using blue for the starting number, green for one more and red for one less.  If you have a painted 100 or 120 chart in an outside area of your school, take students to this. Ask one student to stand on the starting number with a blue sash (from the P.E. storeroom). Then ask the 'one less' student (red sash) to stand on one less, and the green sash student to stand on the number that is one more. Model that the 'one more' student simply starts where the blue student is and takes one step forward. Likewise, the one less student stands where the blue student is and takes one step back. Do this in your head, start at 56 and go one back – what number comes just before you say 56? Model what happens when we are at 9 – it goes to the next ten, and what happens at 0 – it goes back to the ten that came before. **Questioning:** • How is one more/less with large numbers similar to what you learnt practising one more/less with small numbers (Place Value Unit 8)?
	Support 1: Use an A3 120 chart that is cut off at 30 – a large 0 to 30 chart to practise one more/one less with the red and green counters (blue as the base number).
	Support 2: When using the mini place value chart during the next part, start by focusing on 'one more, one less' first just using the ones blocks. Concentrate on building the numbers on top of the mini charts by figuring out how many tens and ones to collect, showing this in place value form. F or example, "I made using 3 of the tens and 4 of the ones": 34 = 3t 4u.

Student work sample for one more, one less from a changing base number – Thomastown East PS



Place Value Scrolls

Students use calculators and split each grid page into 4 columns, with these headings:

Page 1:

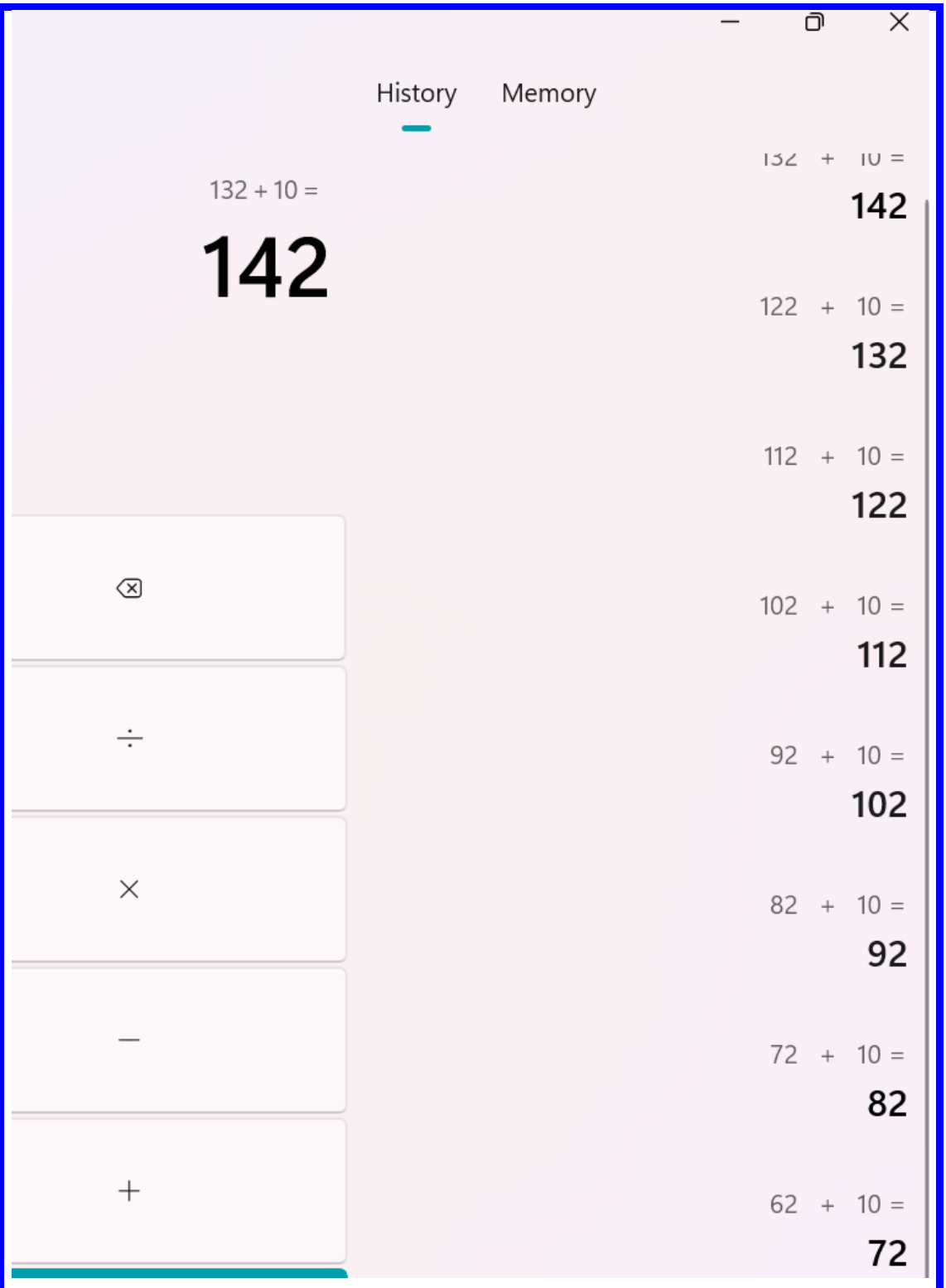
+10 from	+ 10 from	- 10 from	- 10 from
8	62	529	1204

Page 2:

+100 from	+ 100 from	- 100 from	- 100 from
806	1902	2205	10003

Students start with column 1 (page 1), typing in '8' to the calculator then using the constant function to push +10 = = = =. Record the answers down their column, and underline the place value that is changing each time.

What place value keeps changing? What places are staying the same? Aim to notice patterns, particularly that when you add or subtract tens, the ones stay the exact same.

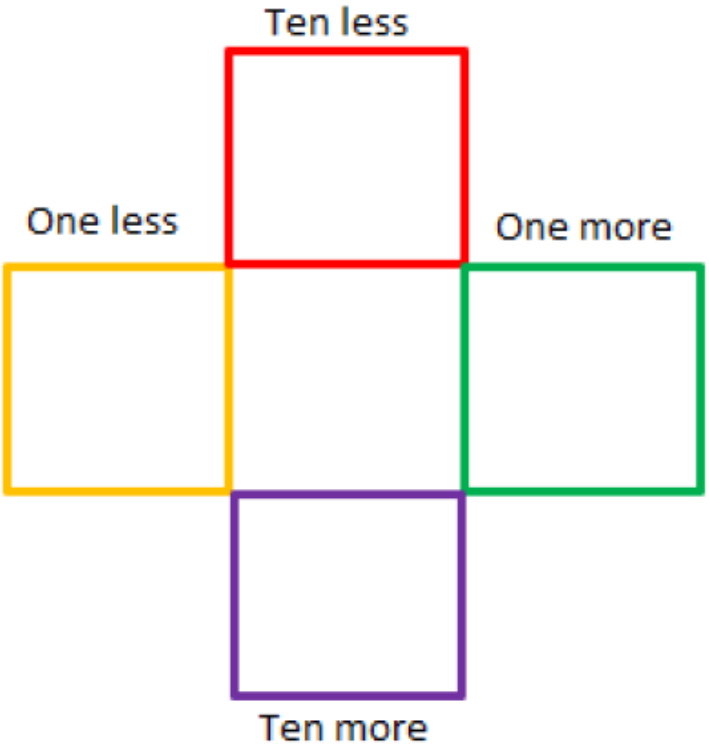


The regular PC calculator – Ideal for immediate feedback for students when used whole-class after each student first guesses what will come next and underlines which place they believe will change.

Real-life link: Who likes playing four square or down-ball? Well, this session is all about figuring out what happens to numbers when they go down by one, or down one ten, or up by one or one ten. The recording template is just like when you have to go around all four squares to become the king or queen during a game of down-ball, except today you will become the king or queen of ten more and ten fewer!

Ten More and Ten Less

Students work out ten more, ten less using the 120 chart and place value flaps. The flaps are made by cutting up one of the templates, so the middle box is bare/transparent and its edges can flap, as shown on the next page.

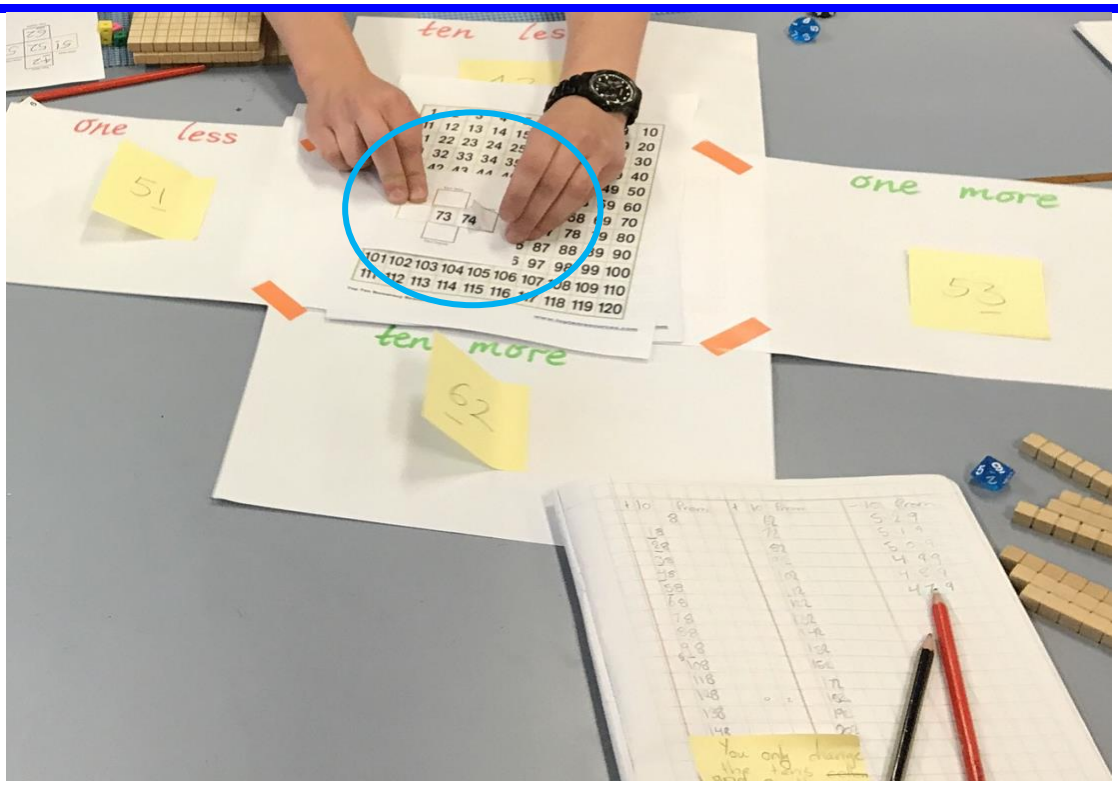


What pattern do you notice? When you add/take away ten, what place value changes? What place stays the same?

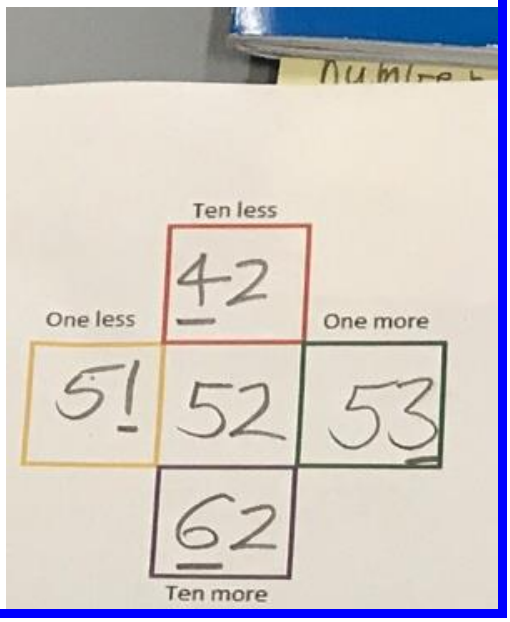
Students who become confident with the pattern and can explain that only the tens change (45, 55, 65, the ones stays the same and the tens go up or down by one), can stop using the flaps, or turn the 120 chart upside down and use it as a checking device only.

Emphasise that, for most two-digit numbers, the tens stays the same and students simply need to apply their understanding of what comes before/next for the smaller numbers in the ones place. Big numbers work the same way as the small numbers you already know! If you know one more than 3 is 4, you know one more than 23 is 24!

Extension 1: As a mini extension, students can try to figure out 20 more/less than their starting number, using the blank templates. Later, roll a 6- or 10-sided dice, and add/subtract that number of tens. For example, 46 and rolled 5, solve 46 + 5 more tens. 46 and roll 3, take away 3 tens. If ready, extension students can go into negative numbers, or just write 'negative' for any answer below 0.



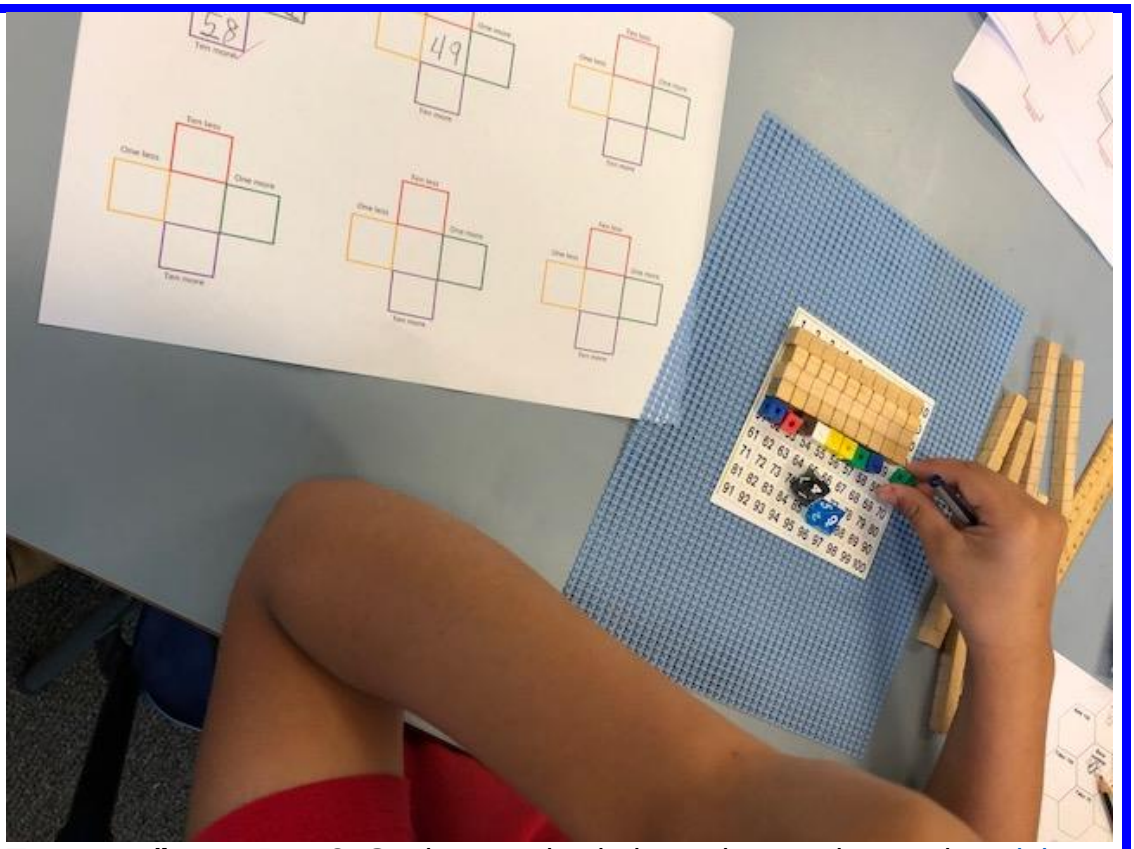
You can cut these ten more/less recording templates into flaps, so that students can literally see what is ten more and ten less on the 120 chart, by flipping the sides up as a kind of peek-a-boo. The size of the flaps matches the size of the regular A4 120 chart templates, as shown in the photo. ***Tip:*** Print the ten more/less templates for the flaps on thick paper, or coloured paper, to reduce transparency and increase durability. Show students how to cut the flaps with scissors (or, alternatively, prepare these in advance to reduce cut and paste delays). Cut out the middle square completely, then from the middle snip the two sides of each square, so that each perimeter square can fold upwards.



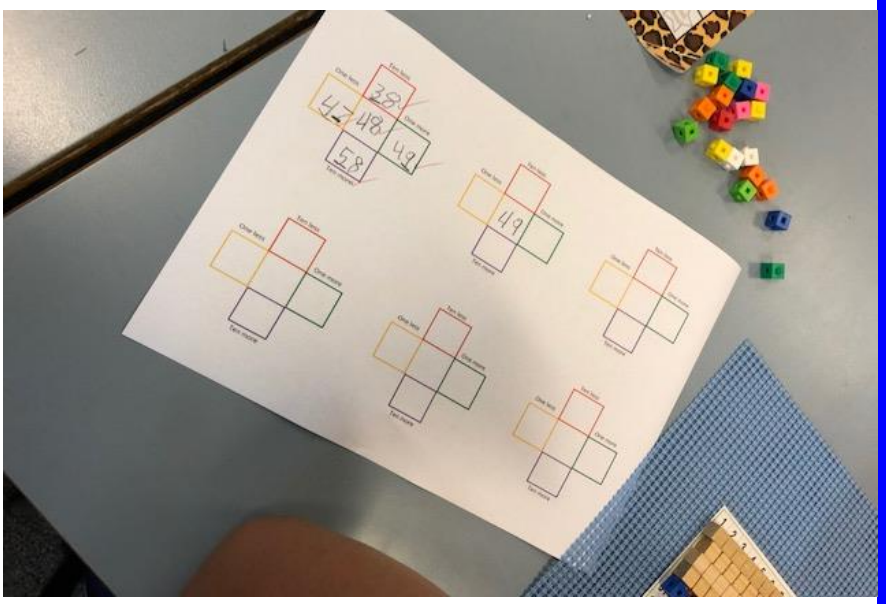
Students record in the templates too, underlining the place value that has changed each time, as shown here:

For an extra challenge, record what they think will be in each box first (ten more/less, one more/less) on a recording template, with their 120 chart flipped upside down. Then use the flapping peek-a-boo template on top of the 120 chart (shown above) to check their answers for immediate feedback.

End of session real-life link: Compare the square format of the recording templates to a frog jumping on lily pads. When the frog jumps from the centre square, one place value jumps up or down, all the others stay the same.



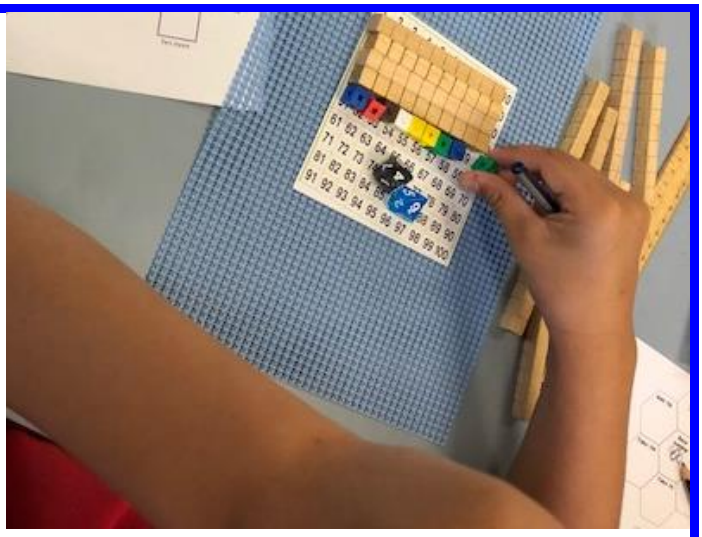
Ten more/less – Part 2: Students make their starting number on the mini place value chart with place value blocks. Push an extra ten onto it from the top of the chart. Students record 'ten more.' Now remember to go back to your starting number – make it on the mini chart by getting rid of the extra ten you just added. Now take away ten by pushing the blocks up to remove a ten. Record 'ten less.' Also record one more/less.



Critical questions and pattern for students to discover:

- What place is changing? What place is staying the same?
- What is an easy way to solve 10 more/+10 or 10 less/-10?

Modelling instructions for ten more/less on the mini place value charts:
Model making a 'base number,' for example 34.



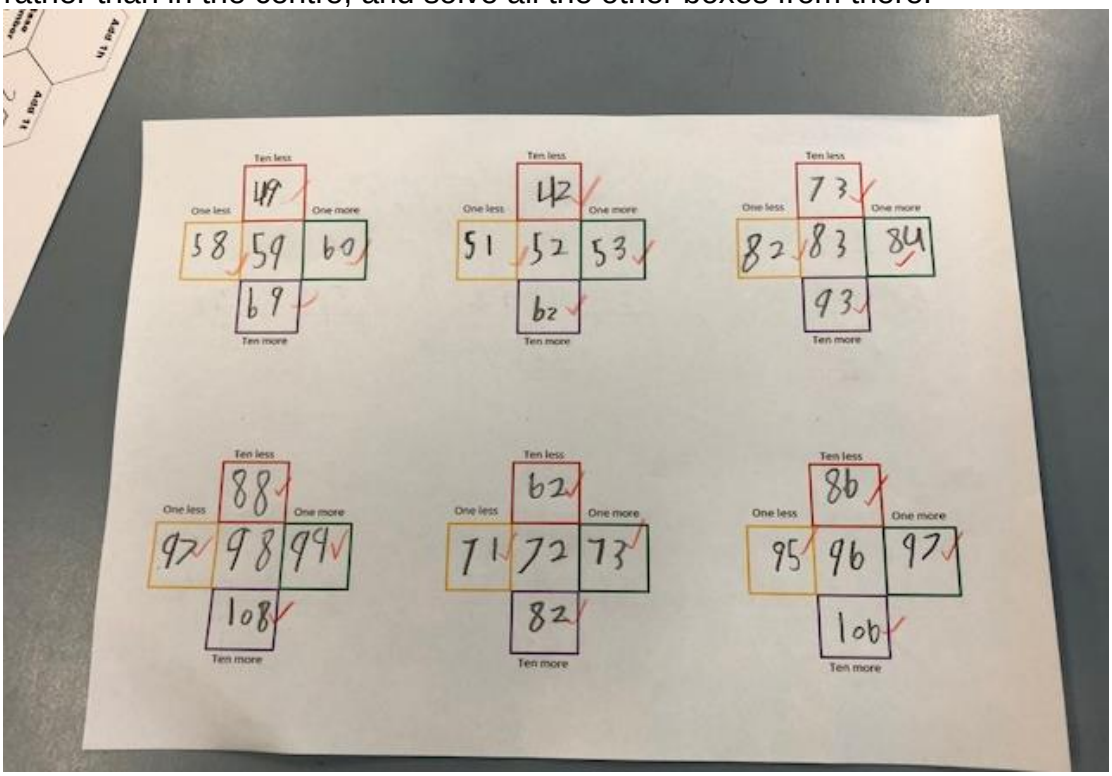
1. Make 34 on top of the chart by collecting 3 tens and 4 ones. Lift the last block, underneath it says '34' so you know you have made it correctly.
2. Add a ones block. What do you have now? Lift and check: 35! Record it in the 'one more' square.
3. Now go back to your base number: 34. Always go back to your base number, don't forget!
4. Take away a ones block. What do you have now? Lift and check: 33! Record it in the 'one less' square.
5. Go back to your base number: 34.
6. Add a tens block by pushing it onto the chart, pushing all the other tens down. Now what do we have, let's lift and check: 44! Record it in the 'ten more' square.
7. Go back to your base number: 34.
8. Take away a ten. Push the other blocks up, now lift the last block and check what we have: 24. Record it in the 'ten less' square.

Questioning:

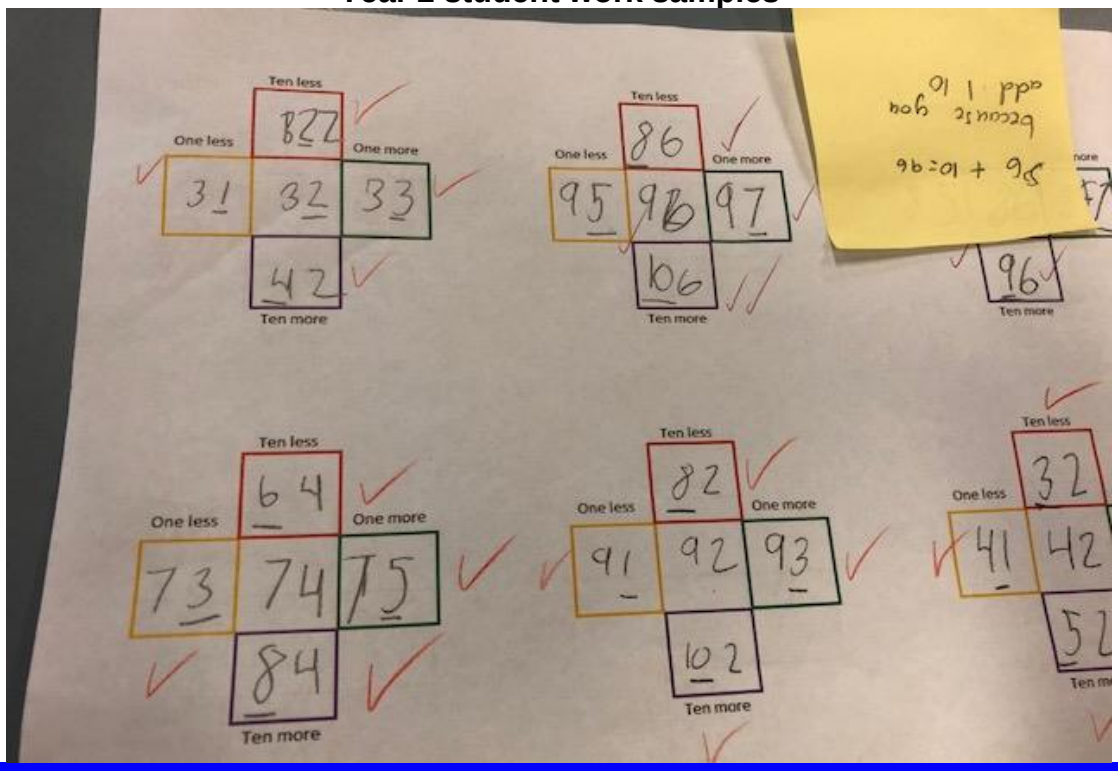
- When you did that, which place value changed? What stayed the same? ***Can you underline the place value that changed as you record your answers.*** Hmm, that's interesting, let's see if that keeps happening or not. See if you can come up with a pattern/trick/cheat code that makes it easy to add ten or take away ten to any number. By the end of the lesson, I want you to be able to explain what you discovered and if you noticed anything that keeps happening when you put on one more ten or take away a ten.

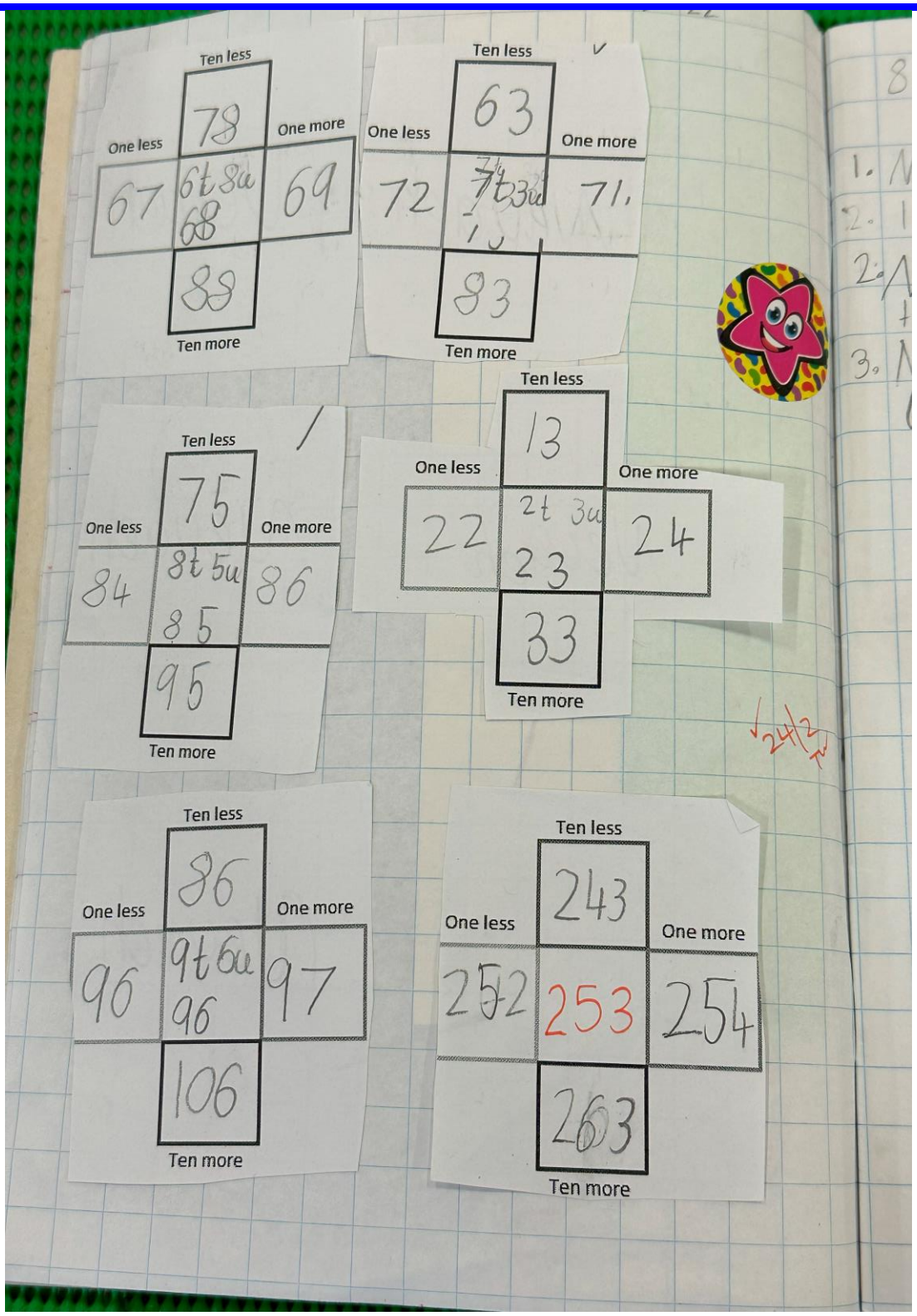
- What do you think would happen if you took away 2 tens? 3 tens?

Extension 2: As an extra challenge, a student could place their starting number in a different box. For example, start with '42' in the bottom box, rather than in the centre, and solve all the other boxes from there.

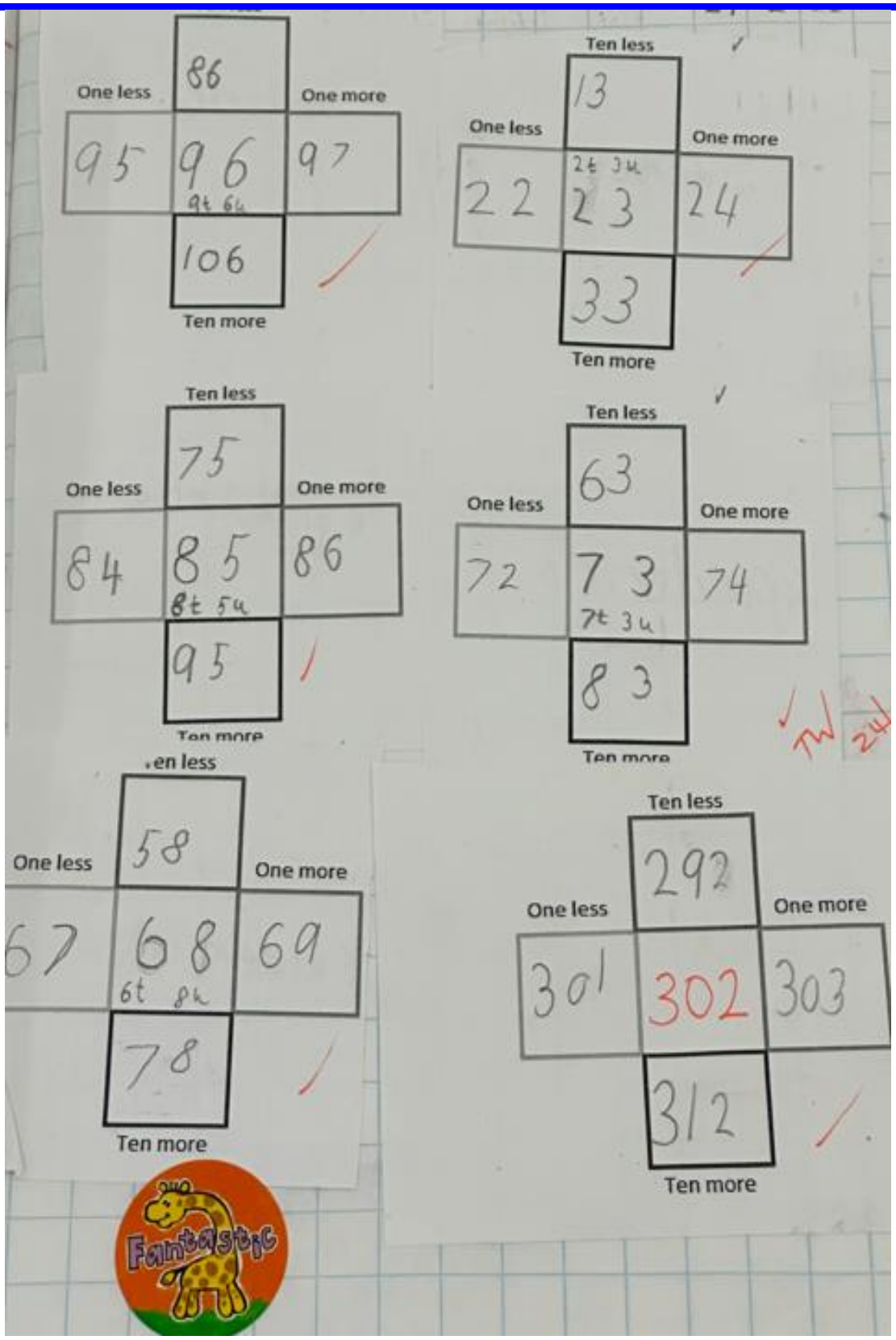


Year 2 student work samples

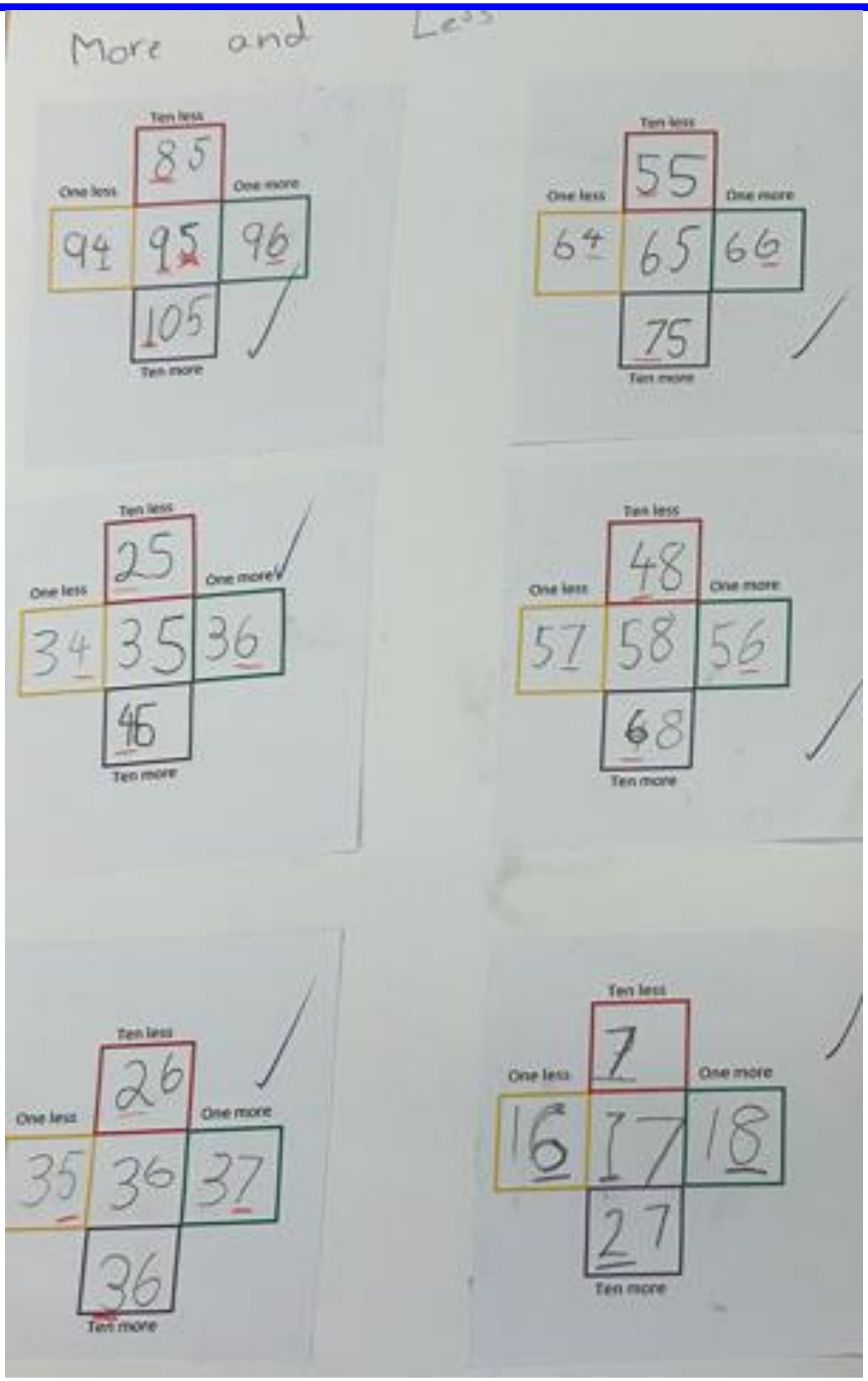




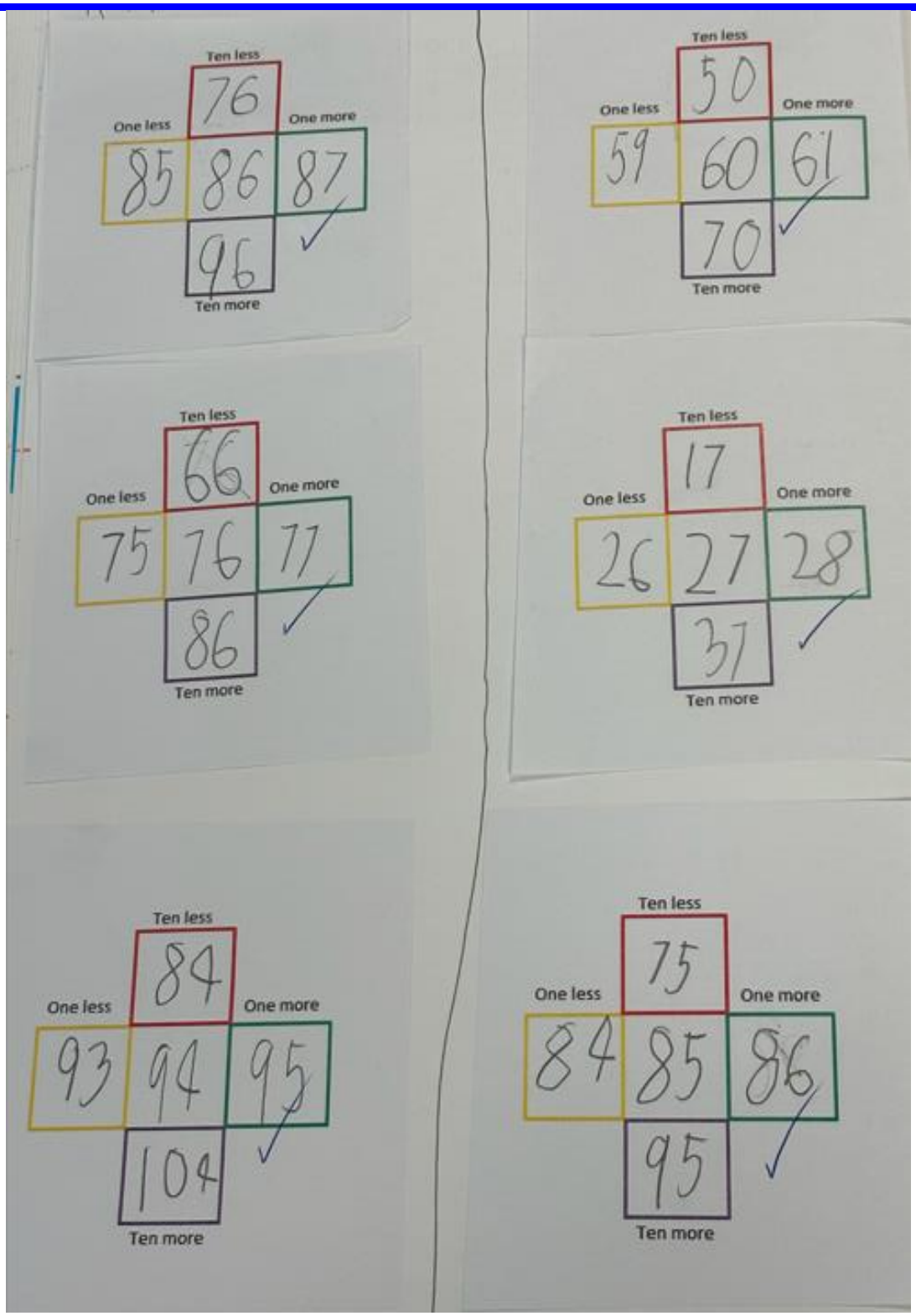
Student work sample from Tamworth South PS



Student work sample from Tamworth South PS

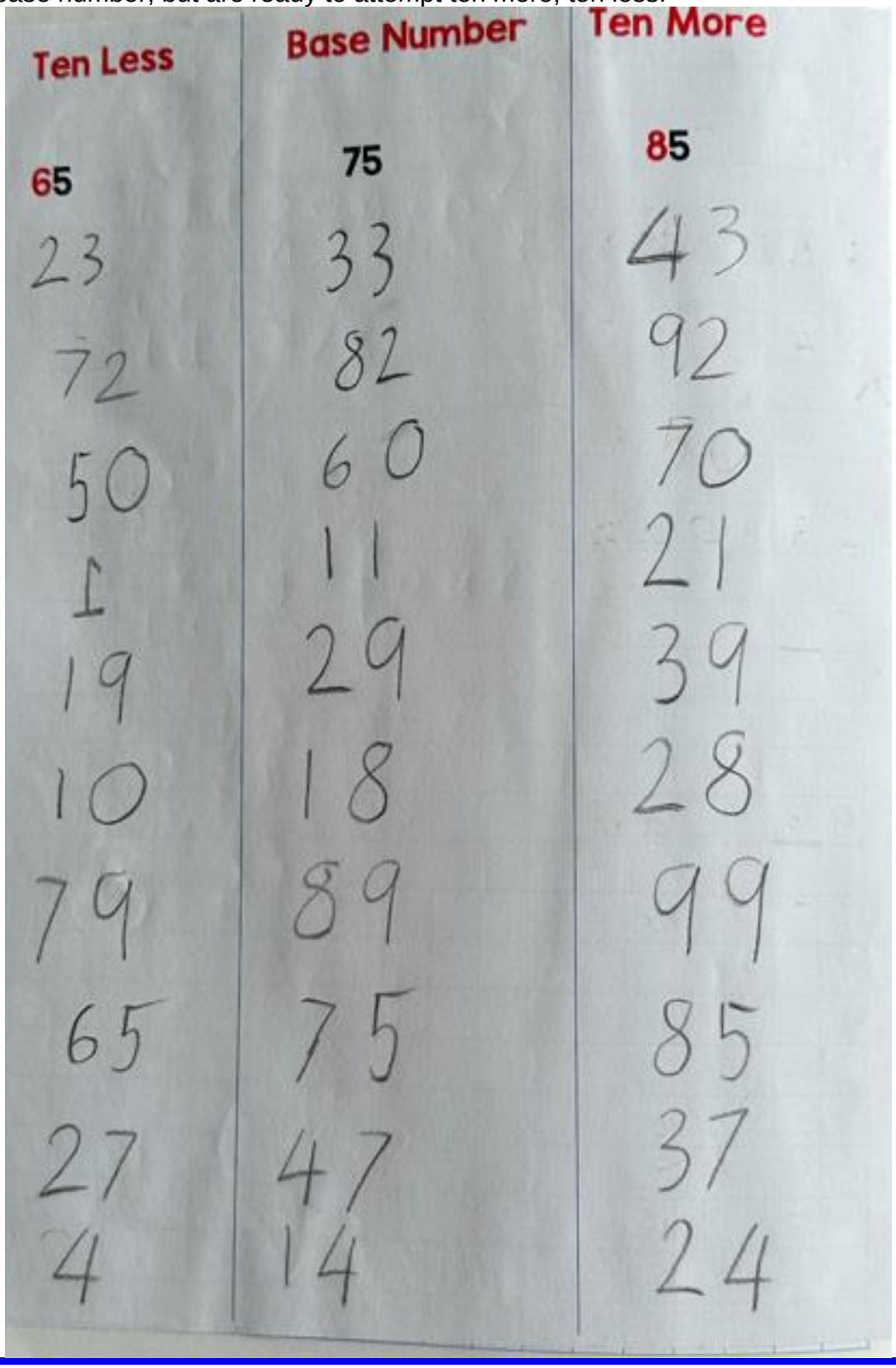


Note how the place that changed has been underlined by this student.



This work sample is correct and very neat; however, it lacks place value form recording and the underline the place that changed element, so is not ideal compared to the work samples from the previous pages.

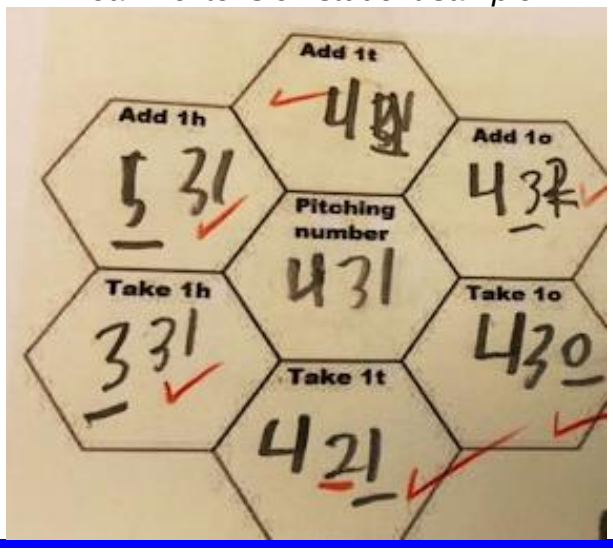
Support: Simplify the template if students cannot remember to go back to the base number, but are ready to attempt ten more, ten less:



Ten Less	Base Number	Ten More
65	75	85
23	33	43
72	82	92
50	60	70
1	11	21
19	29	39
10	18	28
79	89	99
65	75	85
27	47	37
4	14	24

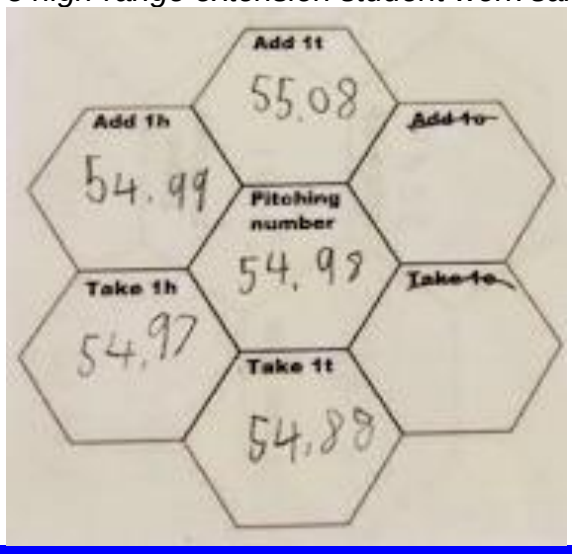
Extension 3: Use the hexagon templates, building hundreds, tens and ones numbers. Add to and subtract from these 3-digit numbers without the mini-charts simply by adding or subtracting the relevant place value block and recording the new total. Underline the place value that changed.
As the student grows in confidence, challenge them to start with base numbers that lead to difficult bridging, such as 909 or 492.
Students can then add or subtract multiples of the hundreds, tens or ones by rolling the dice (take away _ hundreds, roll '7' so take away 7 hundreds from the base number).

Year 2 extension student sample:



Extension 4: Use the hexagon templates, but start with a decimal base number, adding and subtracting tenths and hundredths. Change tens to 'tenths' and hundreds to 'hundredths.' Build the decimal number using coins, with hundredths represented as 1cm^2 tiles.

Year 3 high-range extension student work sample:

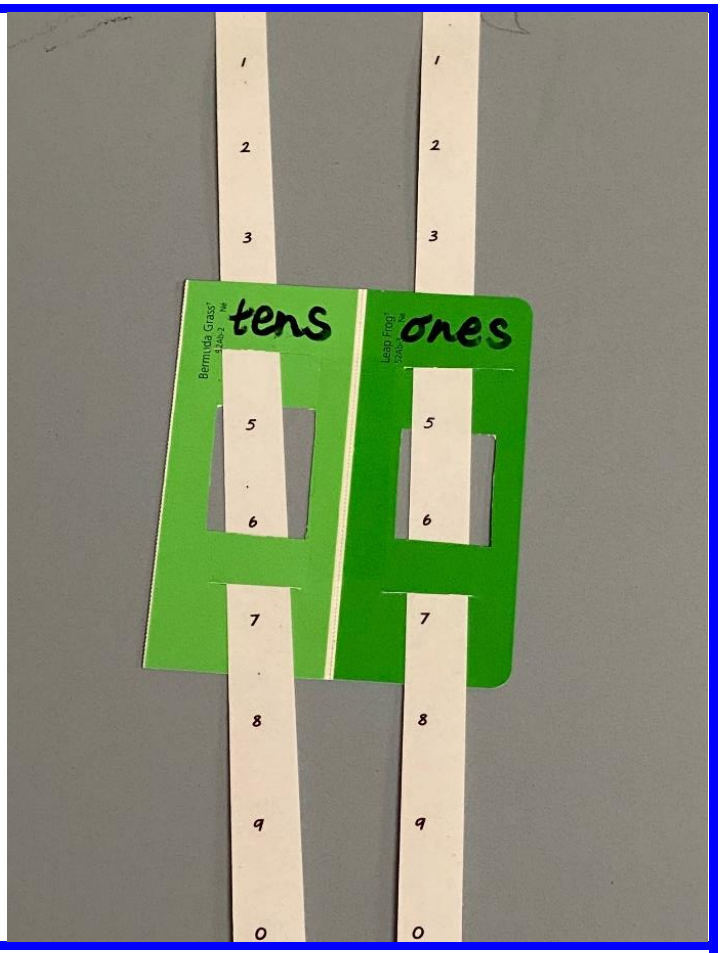


Follow-on for all students: Use the two-digit place value paint sliders made during an earlier lesson in this unit.

Students can literally move the tens place to figure out ten more/less of their two-digit starting number.

Make a starting number, then fill in the entire recording template, before you touch the paint slider. Next, use the paint slider to check your answers.

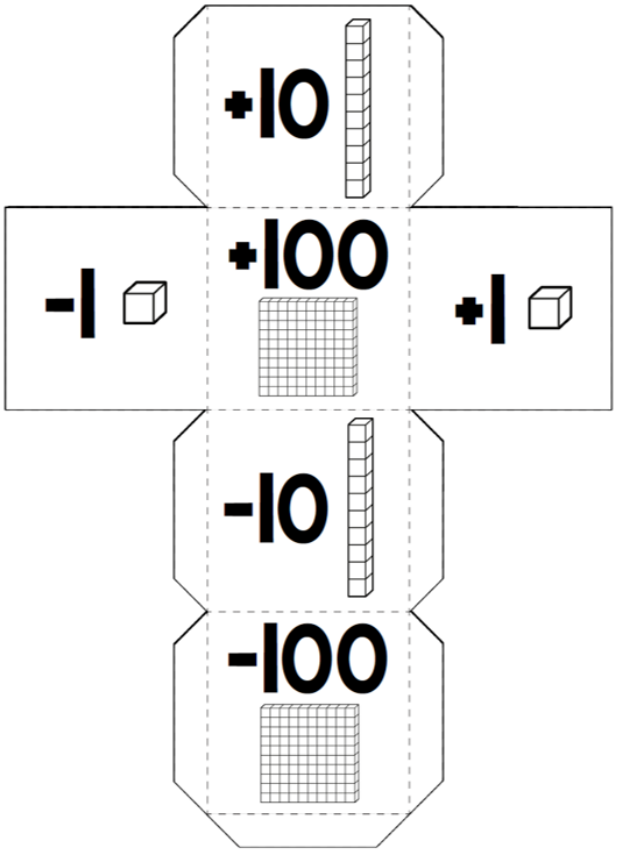
Remember to keep going back to your starting number each time; for example, after you work out ten more, go back to your starting number, then work out ten less.

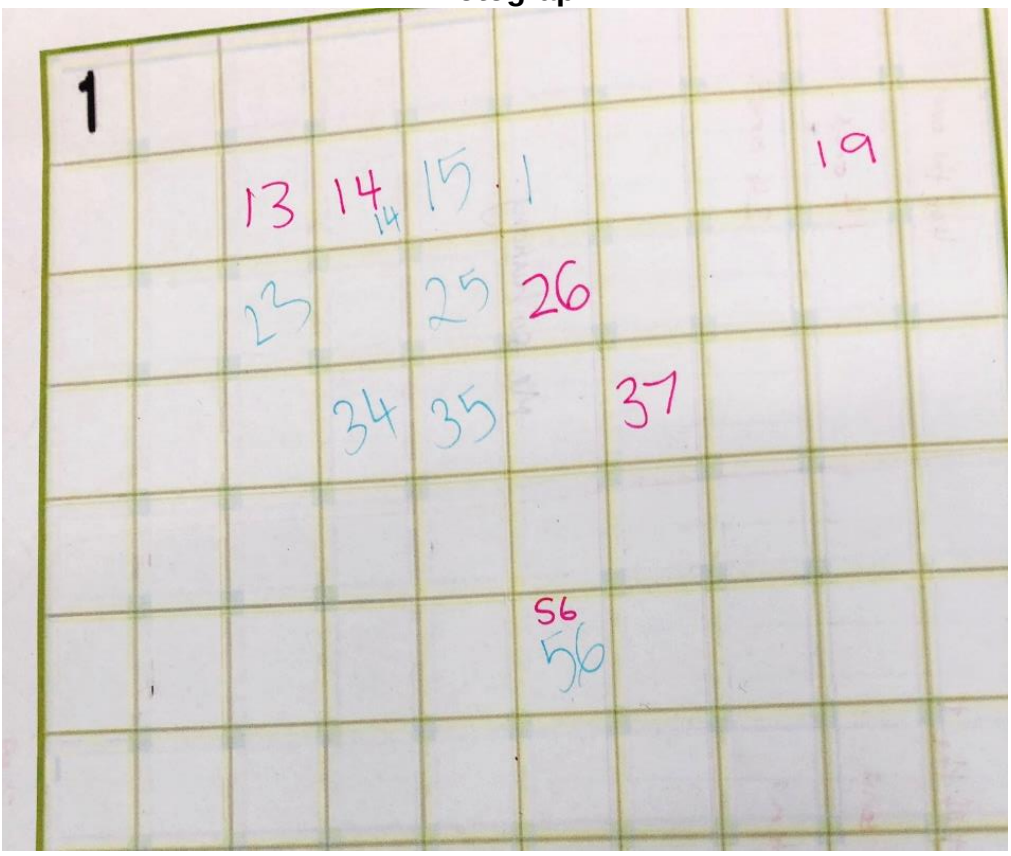


Support student – exit ticket option: Banana split resource published by another author, printable templates available for $3 from this link: teacherspayteachers.com/Product/One-More-One-Less-Station-Banana-Splits-1832309.

Support students could use these with the 120 charts and red (one less)/blue (one more) transparent counters for support, placing a green counter on their starting number, if they cannot attempt the task without this. Whereas, most support students should first attempt to solve each banana split without the visual aide of the 120 chart, after first completing the lesson above.

Follow-on: Make a number using place value blocks, for example, 42. Then roll the place value more/less die template from this unit's folder. Add 10, so it becomes 52. Try to work out the pattern – it just goes up by 1 ten! Can you solve it without using the blocks (just mentally)? Try in your head only, then check your answer with the materials after each roll.



Tens-ones Lesson 19	**Find your number's home** **Learning intention: Problem-solve and use what you know about the values of two-digit numbers to put them in their correct places on the 120 chart** **Maths vocabulary: horizontal, vertical, diagonal, tens place, ones place, ten more/less, one more/less**
Games link: Who has played the game connect 4 before? Well today we are playing the maths version of connect 4!	**Lesson summary: Students try to find the place for a two-digit number on a blank 120 chart, aiming to connect 4 of their own coloured numbers before their partner.** **Materials:** • Blank 120 chart from the next page or this unit's folder – players share the same gameboard. Enlarge one chart to A3 on the photocopier for your teacher fishbowl modelling. Play with a partner for your modelling. There are also extension versions of the template on the pages that follow. • Two 10-sided dice. • Partner A uses a blue coloured pencil, partner B uses red, or similar. **Best set-up:** Fishbowl model, then regular like-ability maths buddies. **Photograph**  These students were playing a version where both could occupy the same square. In other versions, you cannot write your colour in a square that has already been taken. Another version is that you can 'steal' a square from your partner, which helps to block a connect 4 that may be about to happen.

Rules of the game: When students roll their dice, they can choose which number to use as tens and ones. This makes the game more strategic as, towards the end, students will be aiming to roll certain numbers to finish a connect 4 by making a particular number. Students can achieve connect 4 by making 4 numbers of their own colour that connect vertically, horizontally or diagonally. Once partner A has claimed a number, for example 97 in blue, partner B cannot claim it, so it cannot form part of their connect 4.

Modelling: Question students about potential strategies to work out the location of each two-digit number they roll. At first, this can include counting down the right-hand side column by tens, 1 ten, 2 tens, 3 tens, 4 tens, then counting forward by ones, 1 2 3 4 5 6 – 4t6! **Once a few numbers are already on the board, use ten more/less strategies to solve the location of each new number.** For example, if 46 is on the board and you roll 58, start at the 46 and add ten more (1 row down) and 2 ones (2 square across). Emphasise that you expect to hear this kind of reasoning from students as you roam, and that they **must explain this kind of strategy (or another good strategy they used to locate the position of that number) to their partner, in order to score each square.**

Model your own ten more/less reasoning during an example game with a student partner, using a giant blank 120 chart around a demonstration desk (enlarge the template to A3 size for modelling purposes). For example, if you rolled 1 and 4, you could make 14 or 41. Let's say I want to make 41, if 31 is already on there, it will just be one ten more (one row bigger or down) than 31. If I rolled 57, and 54 is already on the board, it is just 3 more ones in the same tens row. If I rolled 87, it is 3 tens more than 57 (3 rows down).

Caution: Always check where your partner has put a number, because if you both start putting numbers in the wrong places, the game will restart, and no one will win that round.

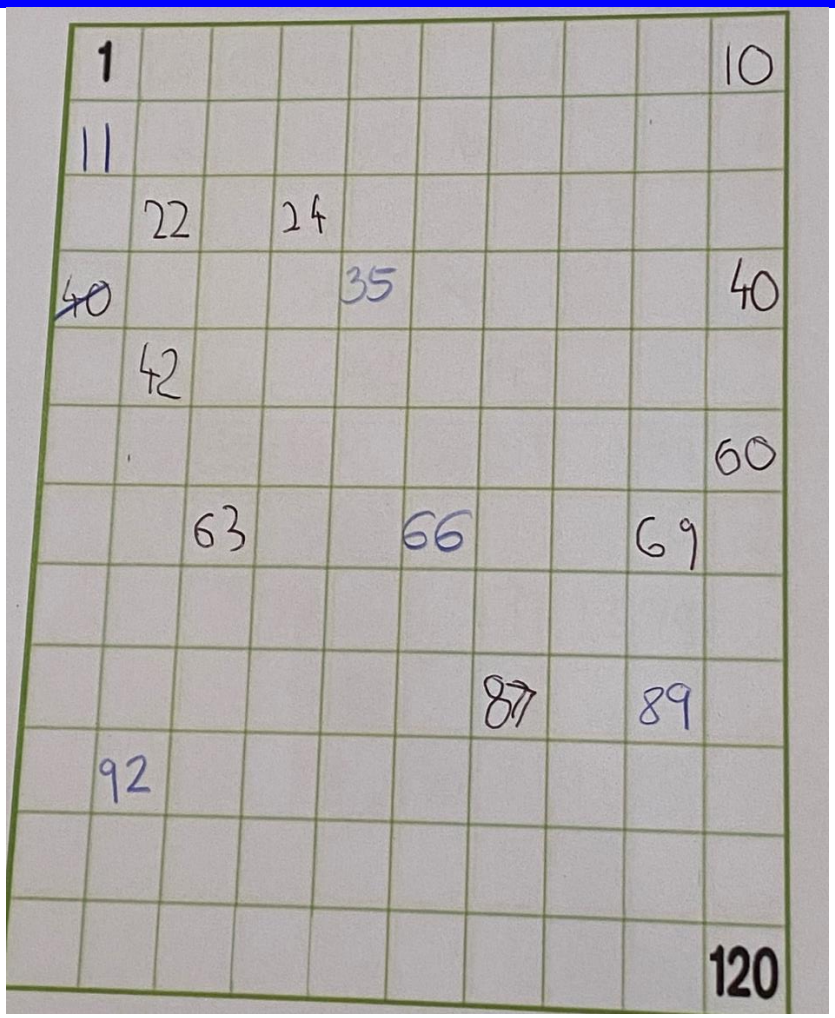
Link to angles vocabulary: Discuss the meaning of vertical, asking students to stand up straight like marching men. Discuss the meaning of horizontal, linking it to the wings of a plane flying across the horizon (arms outstretched). Show diagonal as anything in between the two, with a slant, like the lines in the letter 'x.' Play a Simon says game, saying, "Vertical!" (students stand straight), "Diagonal," (students slant their arms like fighting ninjas), and so on, with students acting out the moves for each vocabulary word called out.

Questioning:

- How are you going to figure out where that number goes? What strategy did you use? What numbers that are already on the board helped you / could have helped you work it out?
- If 61 is here, what will be here? (point to one row down, or one row up, or three rows down, or one row down and a few across)?

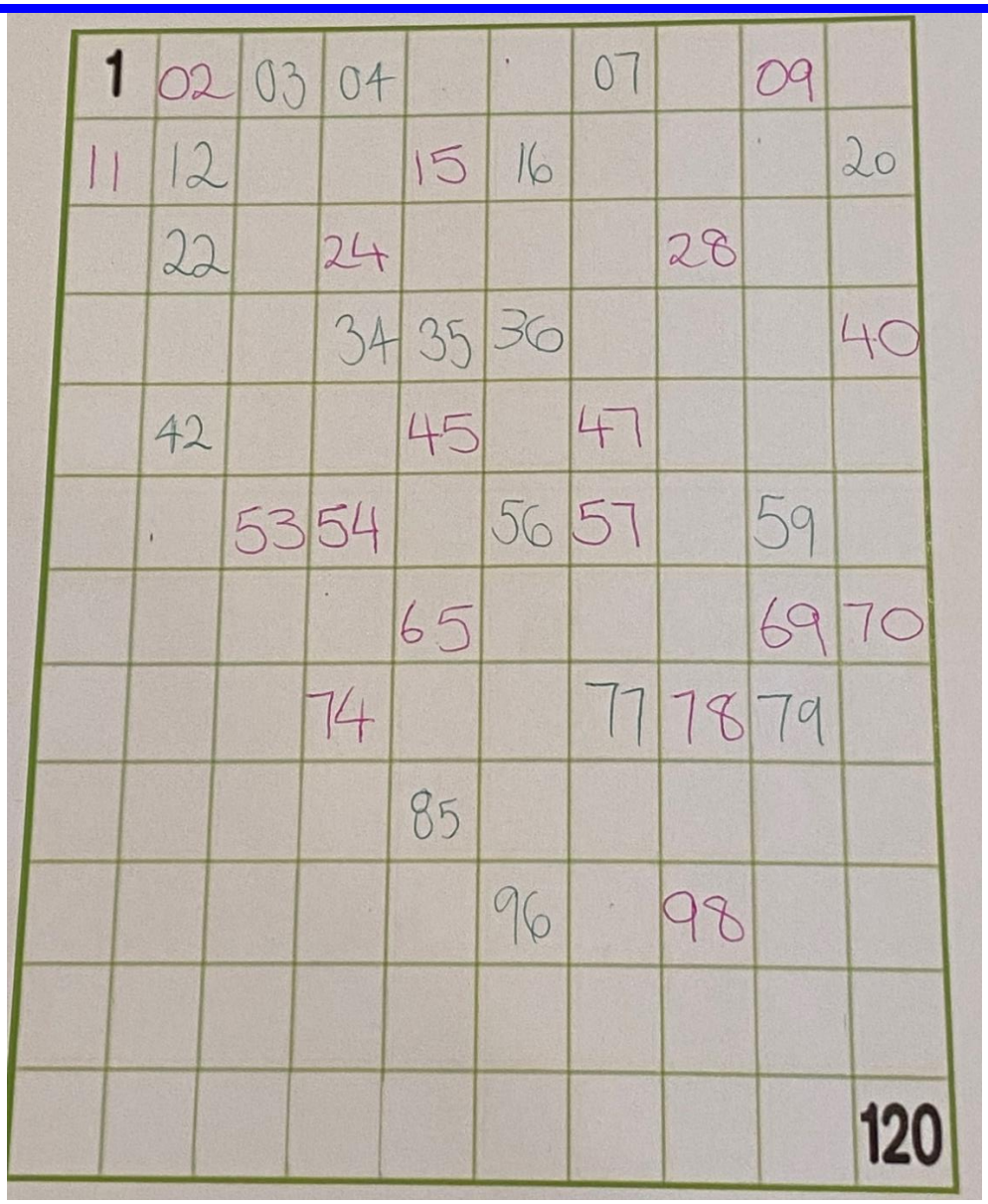
Support: Give these students the filled in 120 chart (from the following pages to ensure the size matches) as well as the blank chart, to use to double-check where they placed a number before continuing. Alternatively, write in the tens numbers and numbers that end in 5 (0, 5, 10, 15) onto their chart for extra assistance, particularly during their first game.

Extension: Use the charts on the following pages, depending on their level of extension. These extension charts span from: 101 to 220, then 421 to 540, then 971 to 1090, finally into decimals 0.01 to 1.20.



The power of this game is in students communicating to each other about how they worked out where a number should go. Encourage students to watch each other closely and, if their partner does not volunteer an explanation, actively ask:

- "How did you think about it?"
- "What other numbers (that are on the board already) did you use to help you?"
- "Can I tell you how I did it – my strategy was a bit different…"

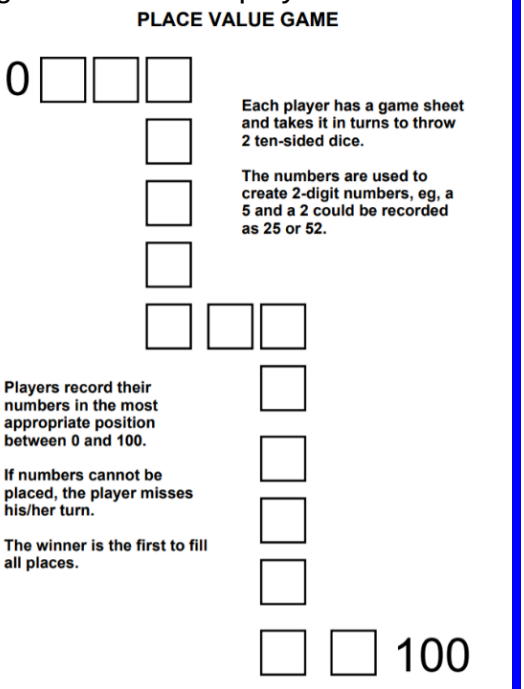


This game can become quite competitive and excitingly close in terms of who wins, so this is ideally continued as an ongoing warm-up following the main session. Any lesson that is easy and quick to set-up, and incorporates a good amount of oral interchange between maths buddies, can become a warm-up.

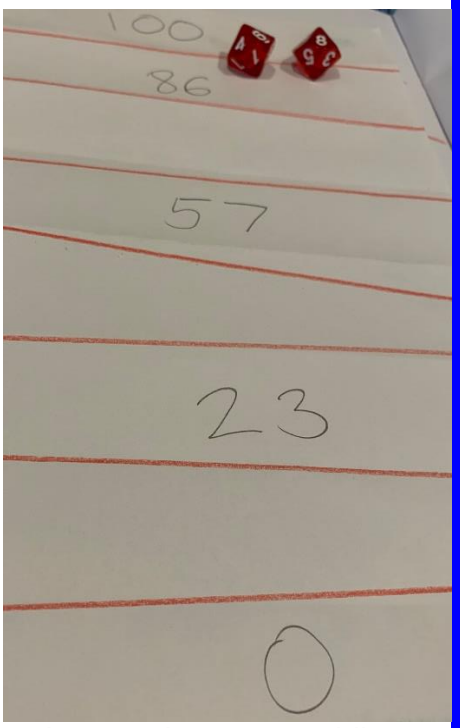
Warm-ups should prioritise points-of-need that have been hard to achieve or that take a long time to master with students, for example, subitising, partitioning (both in terms of all the ways to make the numbers 3 to 9, and the tens-ones concept), skip-counting and (in years 3-6) times tables and related division facts. These skills are most effectively mastered by using long-term dedicated periods of repeated practice in class – daily warm-ups! Daily warm-ups are not purely to build fluency (drill sheets or the like) – they are best used to build a depth of understanding of the most challenging mathematical conceptions.

Real-life link: Discuss mazes students have visited in the past. Read about some of the most elaborate mazes in the world, including one in Australia! booking.com/articles/world-most-magnificent-mazes.html You could also discuss *Maze Runner* if students have any interest in this series. Well, today, you are running a maths maze!

Variation: Number maze gameboard from DET available at: education.vic.gov.au/Documents/school/teachers/teachingresources/discipline/maths/assessment/placevaluegame.pdf. Students aim to fill the boxes of this maze in numerical order by rolling two 10-sided dice to make tens and ones numbers. Each player has their own gameboard. The player can choose which number to create, i.e. 6 and 4 can create 64 or 46. Players record their numbers in the most appropriate position between 0 and 100. If a number cannot be placed in its ascending order, the player misses a turn. The winner is the first to fill all places in their correct order. This makes the game quite strategic in terms of where a student chooses to place a rolled number, as they can easily make their board very difficult to complete.

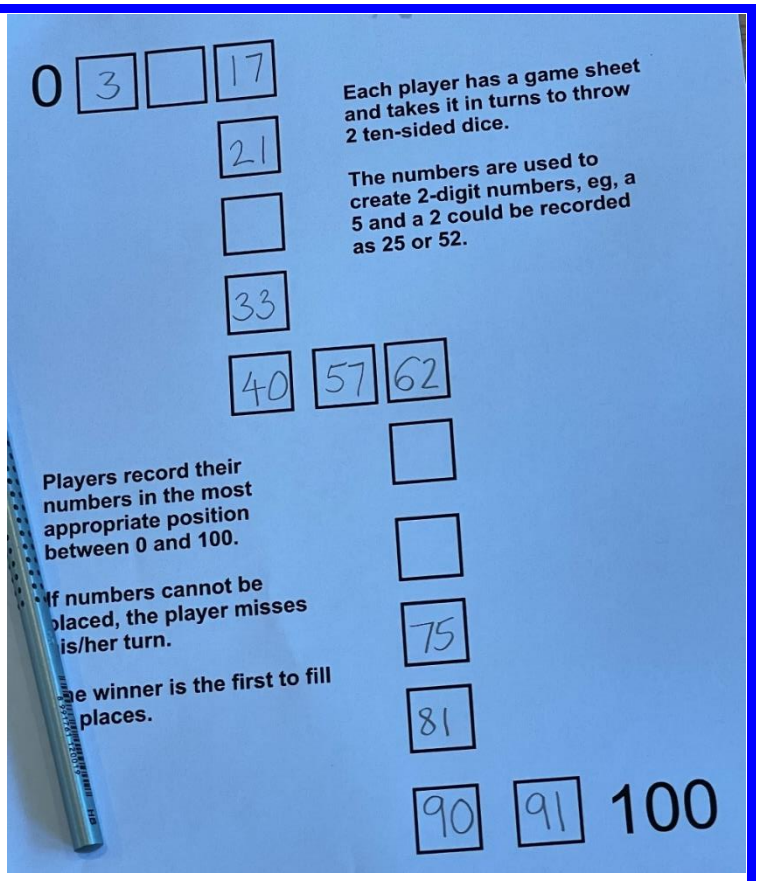


Alternatively, students could just fold an A4 page vertically into eighths, 100 on the top, 0 at the base, and fill the 6 remaining empty boxes. This is easily differentiated by changing the gameboard to 0 to 1000 and using three 10-sided dice, or 0 to 10 000 and using 4 dice, or even 0 to 1 by students rolling decimal numbers using a counter as their decimal point.

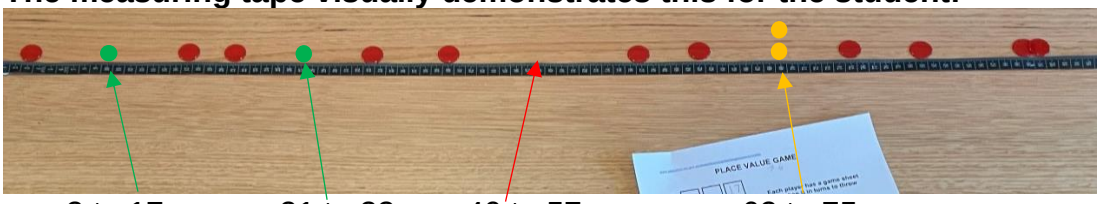


Extension level strategies: Encourage students to use division and skip-counting to help them. For example, in the main template (above right), there are 15 boxes between 0 and 100, so what is 100 shared between 15? Well, it is roughly 7 (6 and 2/3), so each number should be about 7 ones apart. For instance, if you rolled 21, this would ideally be positioned in box 3. Work out the ideal location for each number they roll either by using the times table (7 x *what* = close to the number I rolled), or skip-counting (skip-count by 7s until I am as close as possible to the number rolled). Each round, change the number of boxes students are using in their maze by crossing out or adding a few, or asking them to draw their own maze with a specific number of boxes, which will then alter the calculations they will need to perform.

For immediate feedback, stick down a measuring tape from 0cm to 100cm. Place counters on each number the student rolled and positioned into their number maze. This helps the student visualise the amount of space they left between each number, and how their position choices impacted upon their chances of winning. The best strategy is to place their numbers evenly apart, although luck plays a role in the game as well. For example, in this work sample, the student lost the game, perhaps because he left to many squares blank between 62 and 75, and too few squares between 33 and 57.



The measuring tape visually demonstrates this for the student:



3 to 17 (1 square left)

21 to 33 (1 square left)

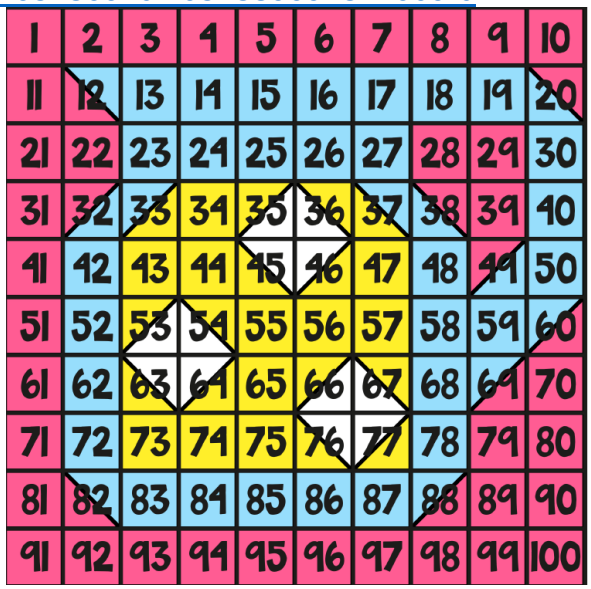
40 to 57 (no squares left)

62 to 75 (2 squares left, ideally should have been 1)

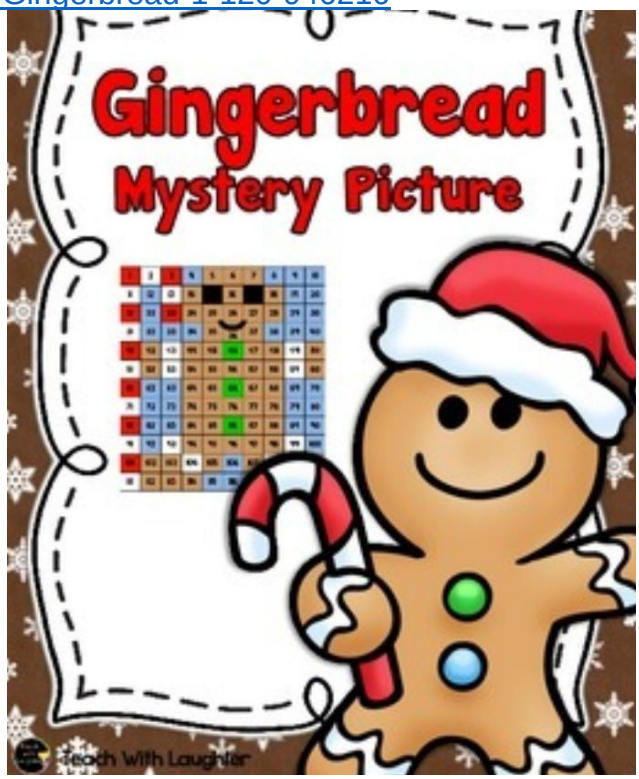
At least one square should have been left between 40 and 57 (the student placed 33 and 57 too close together on their gameboard), which resulted in wasted space on their number line, so a few dice rolls were probably thwarted.

For the other three most visually obvious spaces along the measuring tape (the green and orange arrows), the student had left at least a square or two, and was just waiting for those numbers to be rolled on the dice, which shows a mostly sound strategy. For the green arrows, the single square left blank between these numbers was ideal. For the orange arrow (62 to 75), it probably was ideal to leave one square blank, rather than two.

Exit tickets: Mystery pictures, colouring numbers by their place value descriptions, free download: teacherspayteachers.com/Product/FREE-Place-Value-Mystery-Picture-Tens-and-Ones-Place-Value-Practice-3908018?st=583f465236c4b2f054389694317009fb

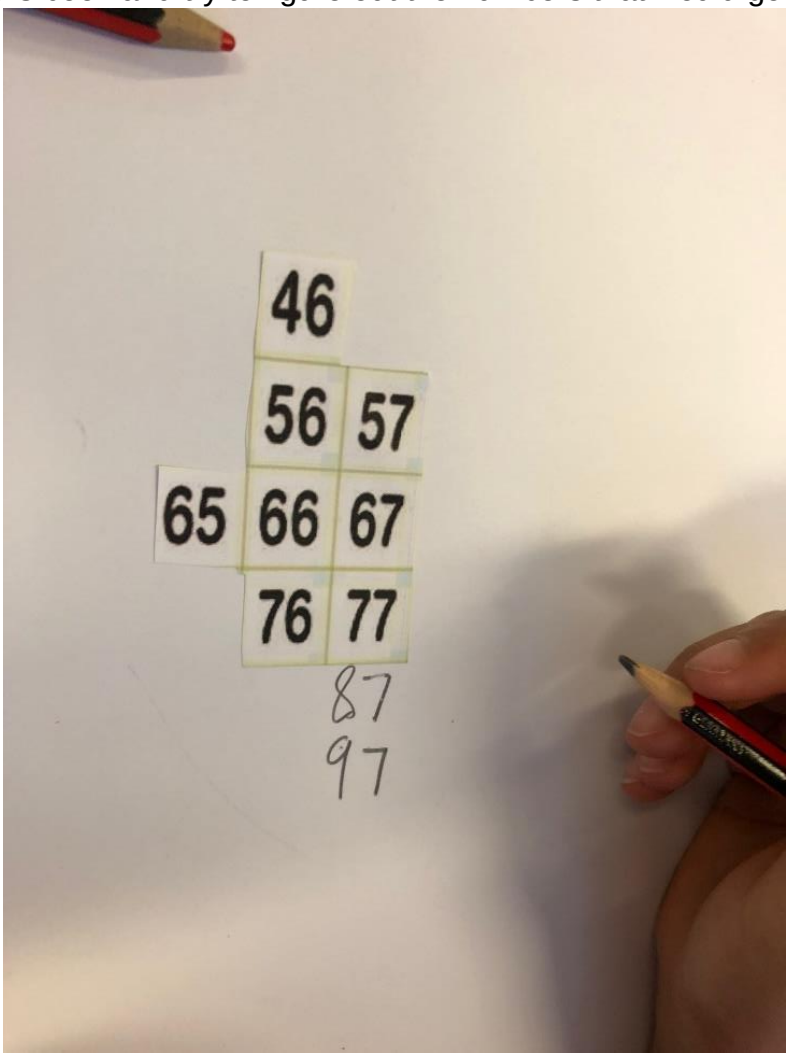


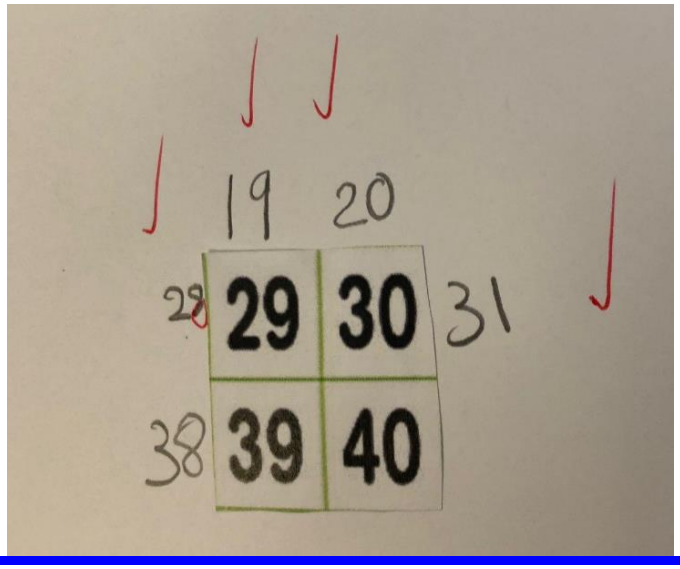
This gingerbread man version is also available for only $1 from another author: teacherspayteachers.com/Product/Tens-and-Ones-Place-Value-Mystery-Picture-Gingerbread-1-120-946216

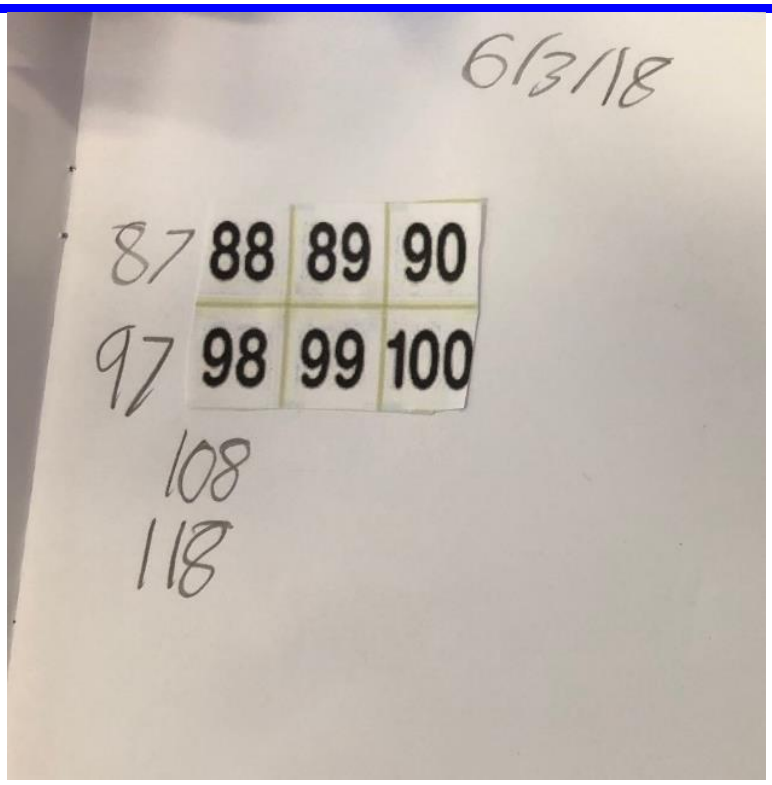


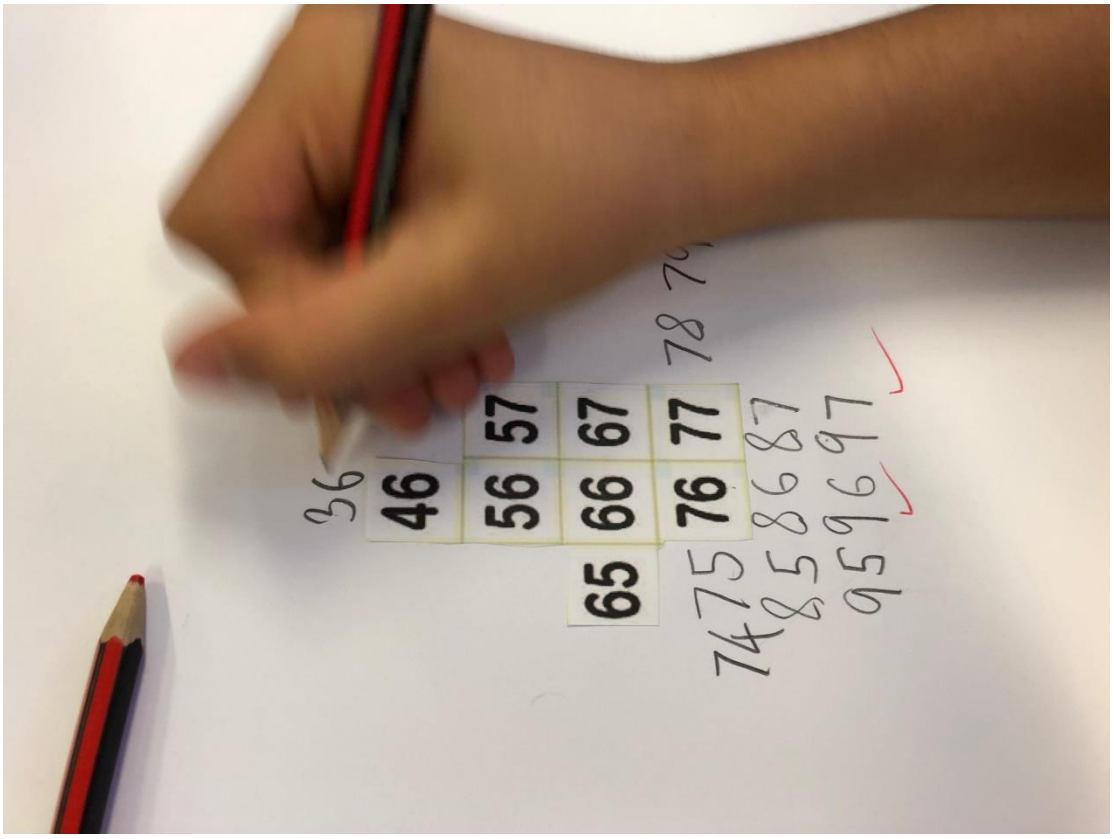
Students follow tens and ones clues to make the picture accurately.

Follow-on, more challenging version: Cut out a piece of a 120 chart, stick it in your maths book and try to figure out the numbers that would go around it:

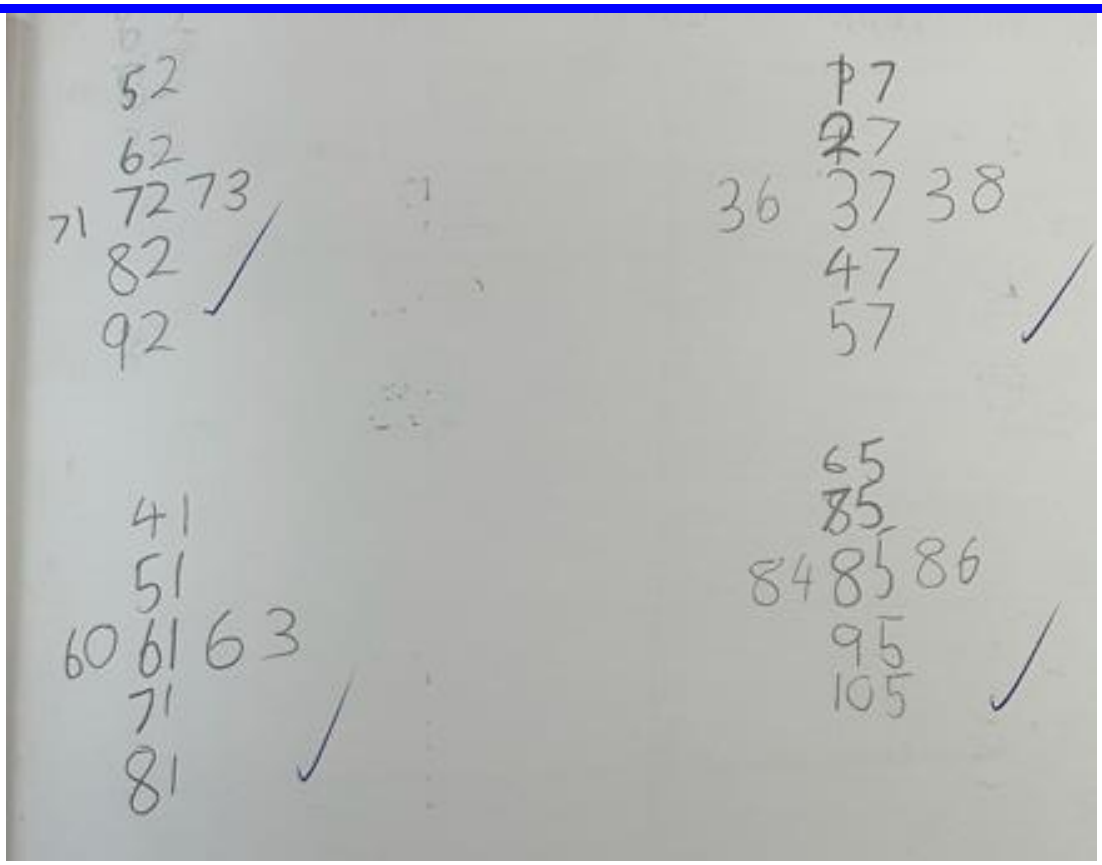




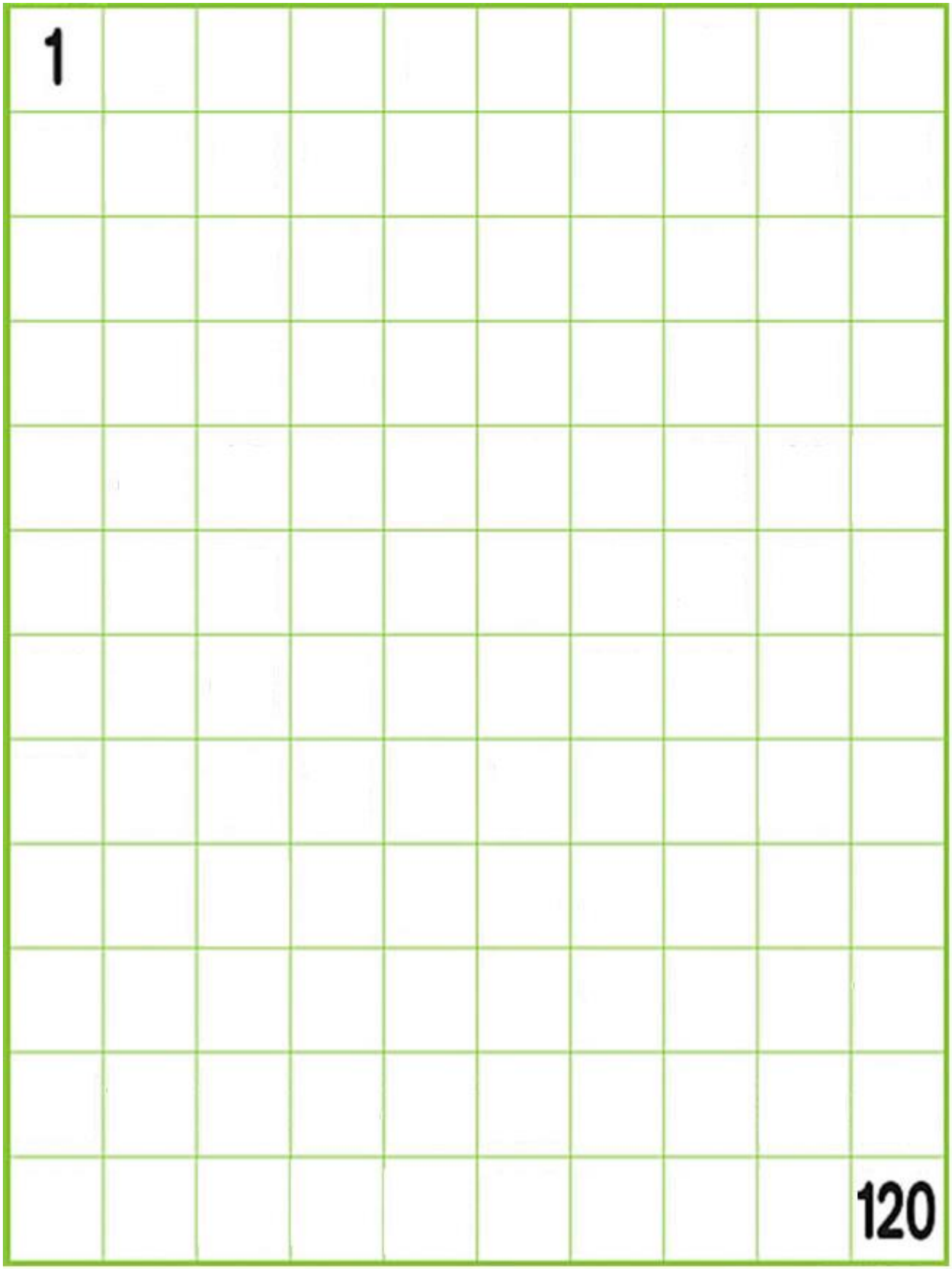




This is a great lead-in to the Years 3-6 Place Value Unit (Aussie Baseball Maths lessons).



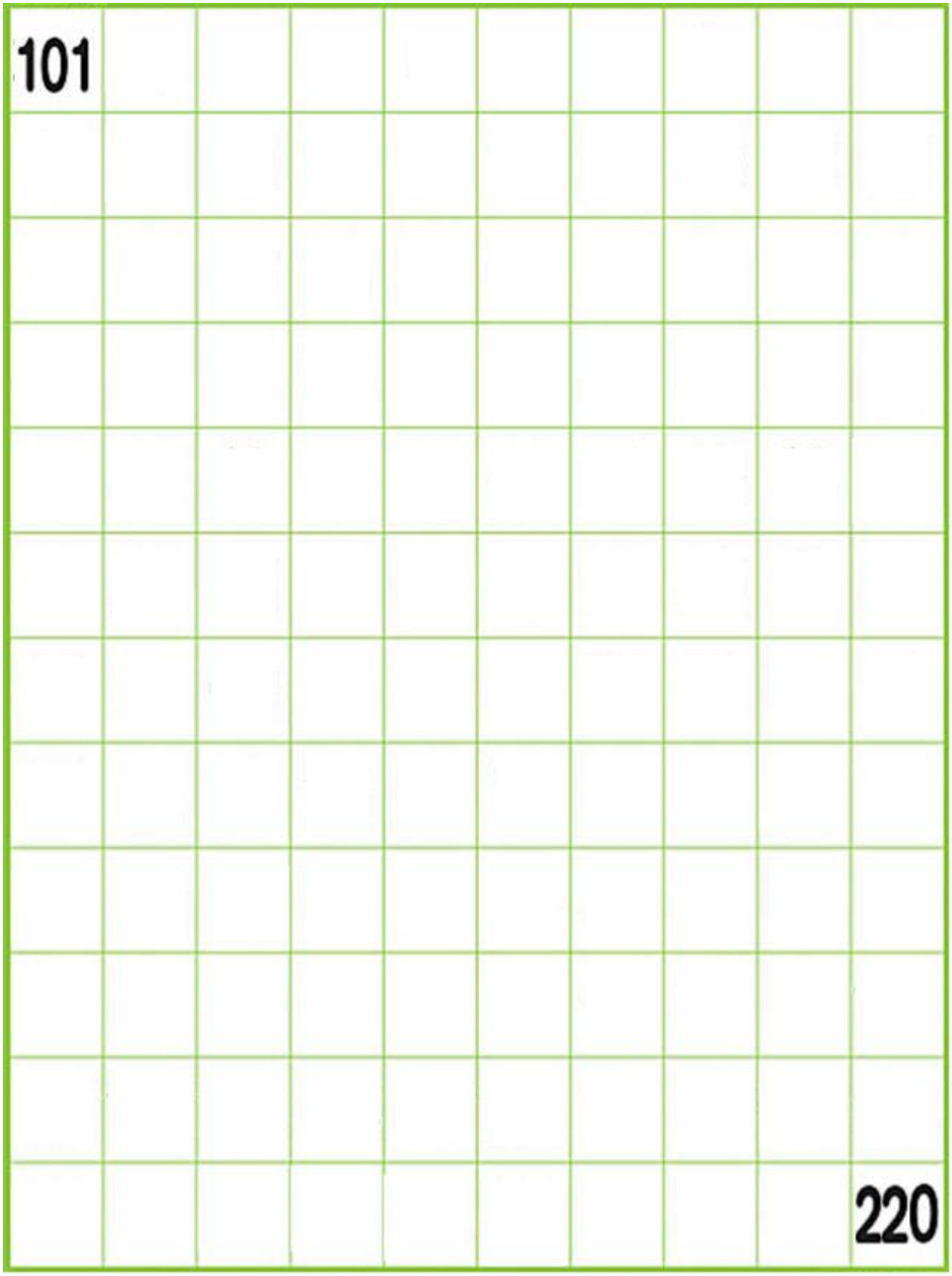
Mini challenge: Can you record two layers around your base number?


1
120

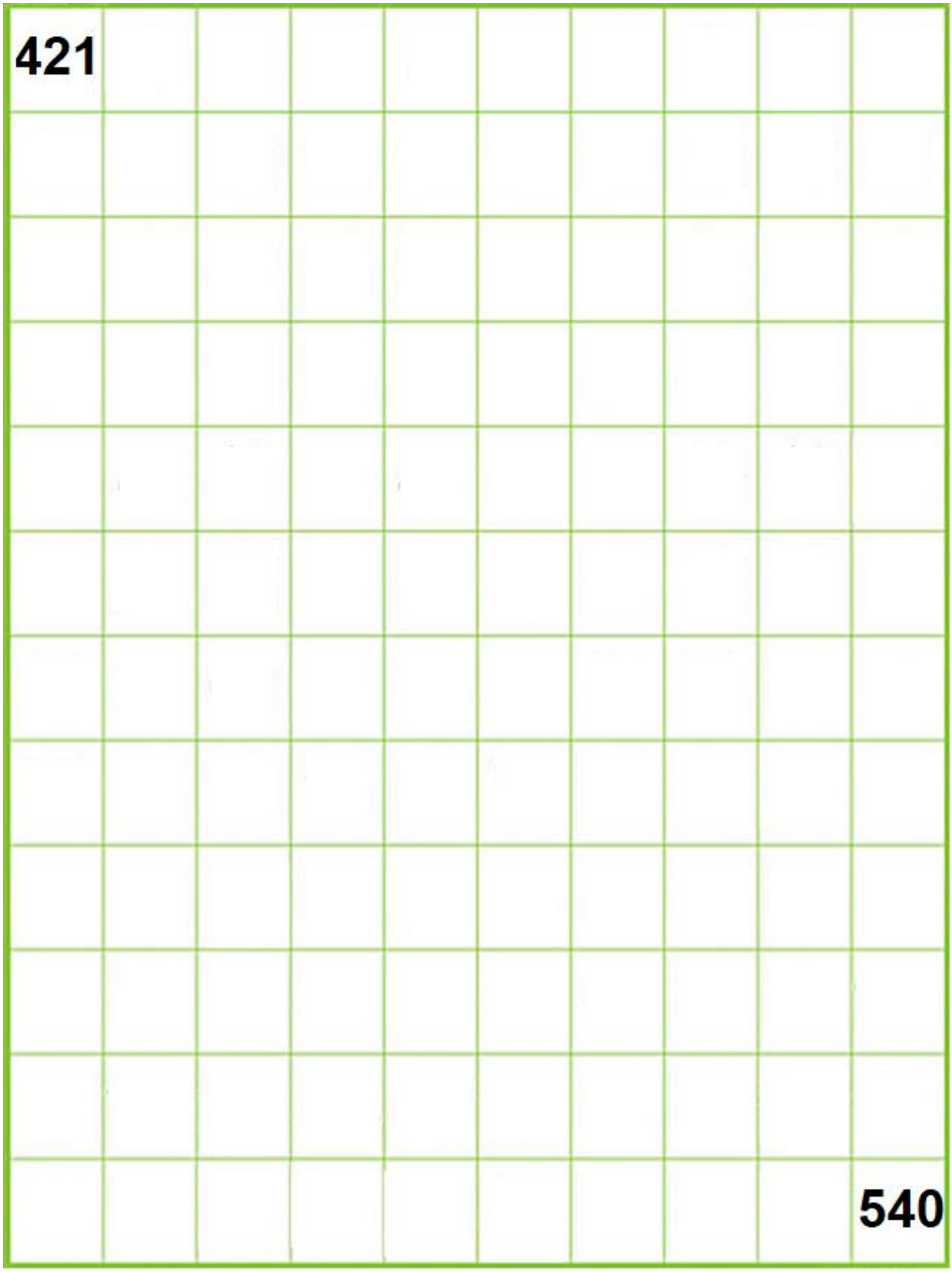
120 chart to double check after you have written your number in its place (hold against a window with the blank chart on top of this):

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

Keep one dice set on the number 1, then roll two others beside it.

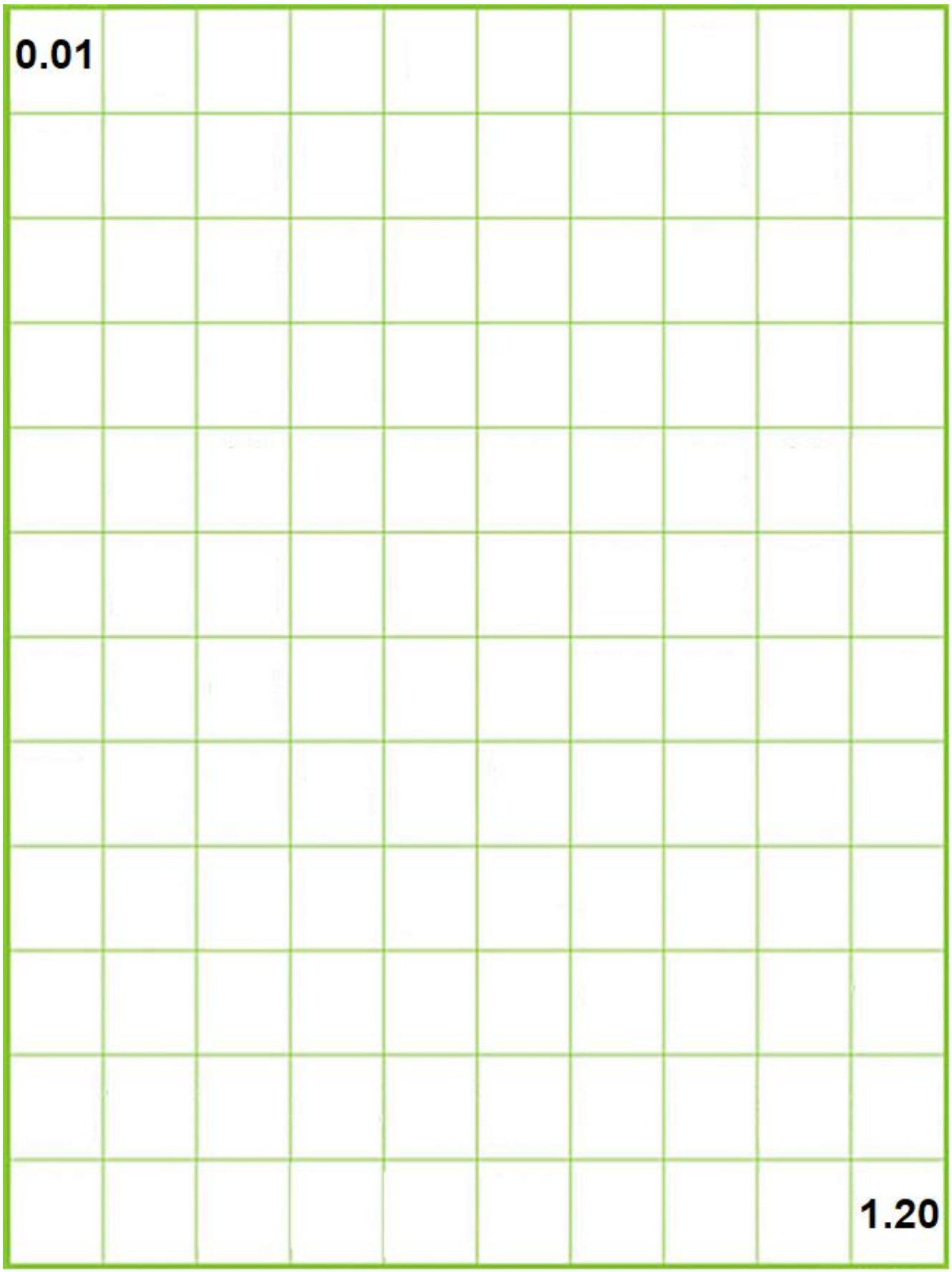


Roll 6 dice, choose 3 to use aiming to connect 4 before your partner:



Roll 12 dice, choose 3 or 4 to use aiming to connect 4 before your partner:

971									
									1090


0.01
1.20