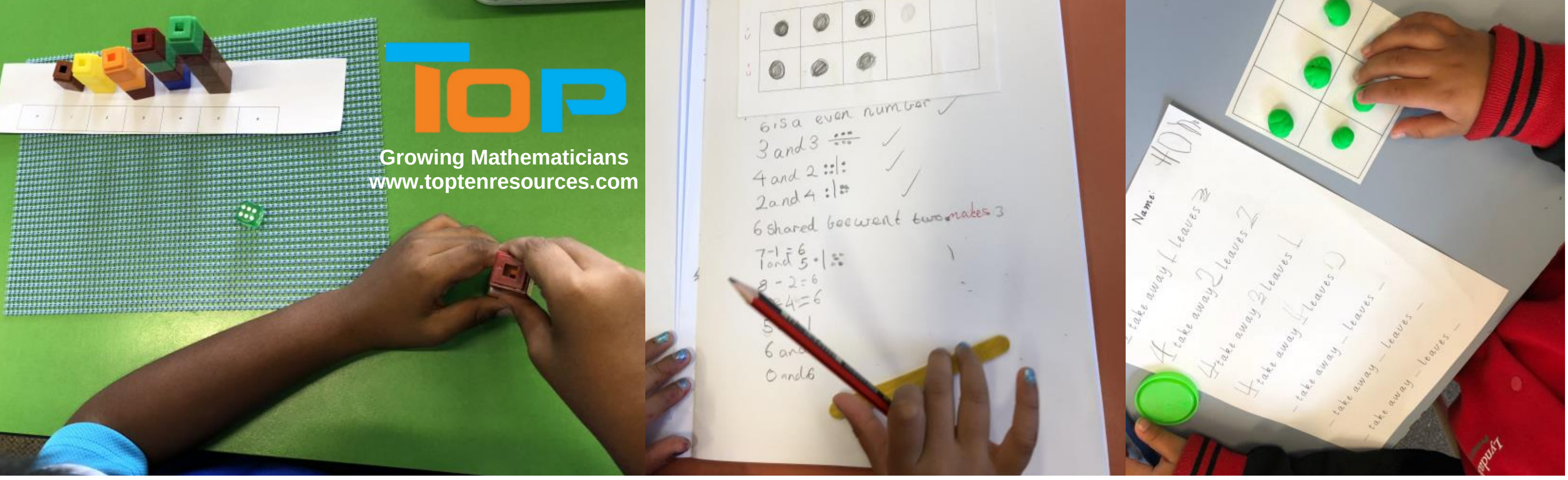

Developmentally Sequenced Materials-Based Mathematics Early Years Package

Sequential units with hands-on mathematics for Foundation, Year 1 and Year 2 students.

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Fractions Unit 1: Understand fractions as 'out of'

1 of 500 Sequential Lessons for the Early Years

Front-loading for Year 2 towards Australian Curriculum Version 9 Year 3 Number: Recognise and represent unit fractions including $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ and $\frac{1}{10}$ and their multiples in different ways; combine fractions with the same denominator to complete the whole AC9M3N02

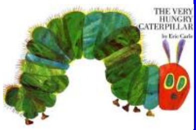
Out of Concept Year 2 Lesson 2

Fraction Caterpillars

Learning intention: Say and write 'out of' sentences. Understand fractions using 'out of' language (not just as halves, quarters and eighths).

Maths vocabulary: out of, fraction (parts of a whole or parts of a collection), numerator (how many of that colour you have), denominator (how many parts it has altogether), spheres, circles

Literacy Link – Numeracy Picture Book: Read *The Very Hungry Caterpillar* by Eric Carle.



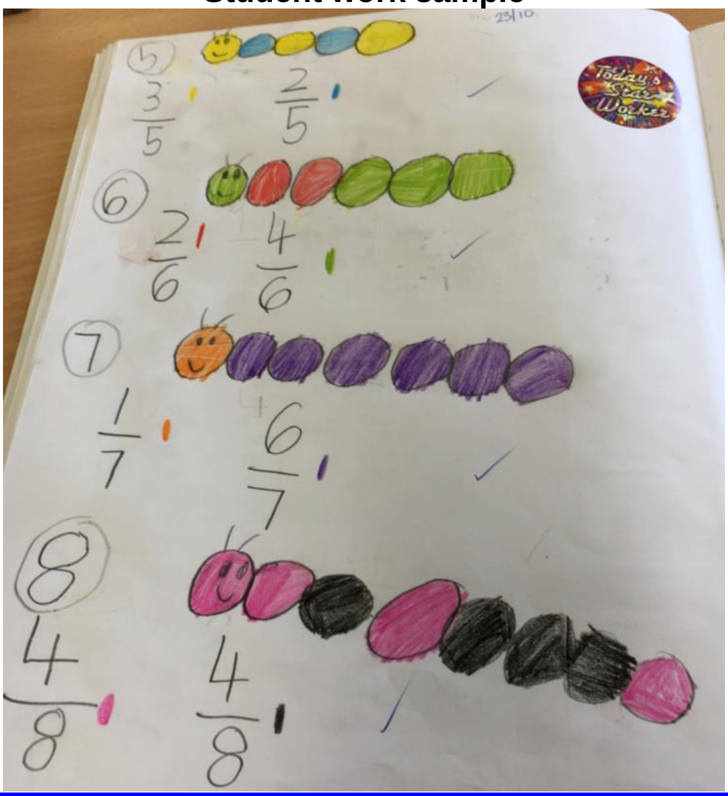
Real-life hook: Have you heard of towel animals? Show students this link. Well, today, we are going to make something equally fun and crazy: fraction pompom animals!

Lesson summary: Students say and write 'out of' sentences about pompom fraction caterpillars, then other evolved creatures. When ready, students also record the fractions using numbers and words.

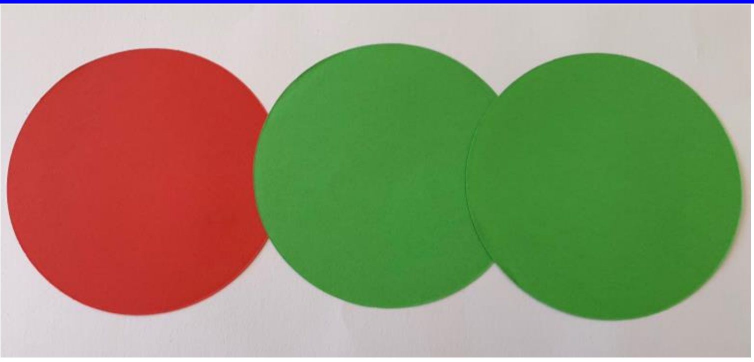
Materials: Pompoms and post-it notes.
Giant teacher modelling materials: Kinder circles to make giant caterpillars around a whole-class circle or desk.

Best set-up: Whole-class circle model with kinder circles, followed by a short at-desk demonstration with pompoms.
Then students work independently, making their own animals and progressing to new fractions when they are confident in naming their current creature. Creatures 'evolve' according to the instructions on pages 14-16. This encourages students to master each fraction to upgrade to the next creature.

Student work sample



Modelling: Whole-class model around a circle, making your own fraction caterpillar using kinder circles.
How many parts of my caterpillar are red?
"1 **out of** 3!"



Misconception alert:
Tell students it is not 1 out of 2, it is 1 (circling your finger around the red part) out of 3 (circling your fingers around the whole body/all the parts).

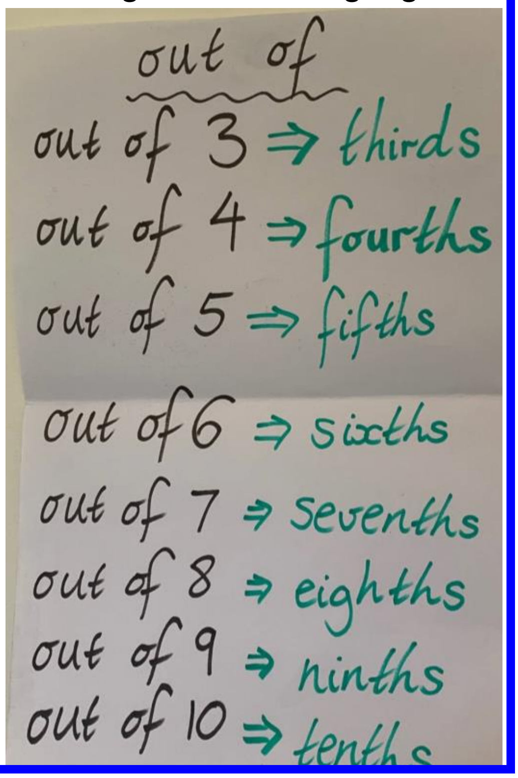
Instruct students to use these fingers movements throughout the lesson as well (circle around the parts, then circle around it all). The last number is how many parts there are altogether. It's not 1 *versus* 2, it's 1 **out of** 3 (the whole caterpillar, all of its body parts).
How many parts of my caterpillar are green? 2 out of 3!
The **numerator** is the *num*ber of parts I am interested in, it goes on top.
The **denominator** is how many parts it has altogether, it's the 'out of' number, it goes on the bottom. De*nom* bo*ttom* (emphasise the rhyme).

Students can keep their caterpillar at only three parts for some time, just changing the colours and attempting to record in all three ways, as below:

1 out of 3 → $\frac{1}{3}$ one *third* (like *The Very Hungry Caterpillar*, 'on the third day')
(say it like you came it in a race – I came 3, I came *third*!)

Read the vinculum (line between the numerator and denominator) as "out of"

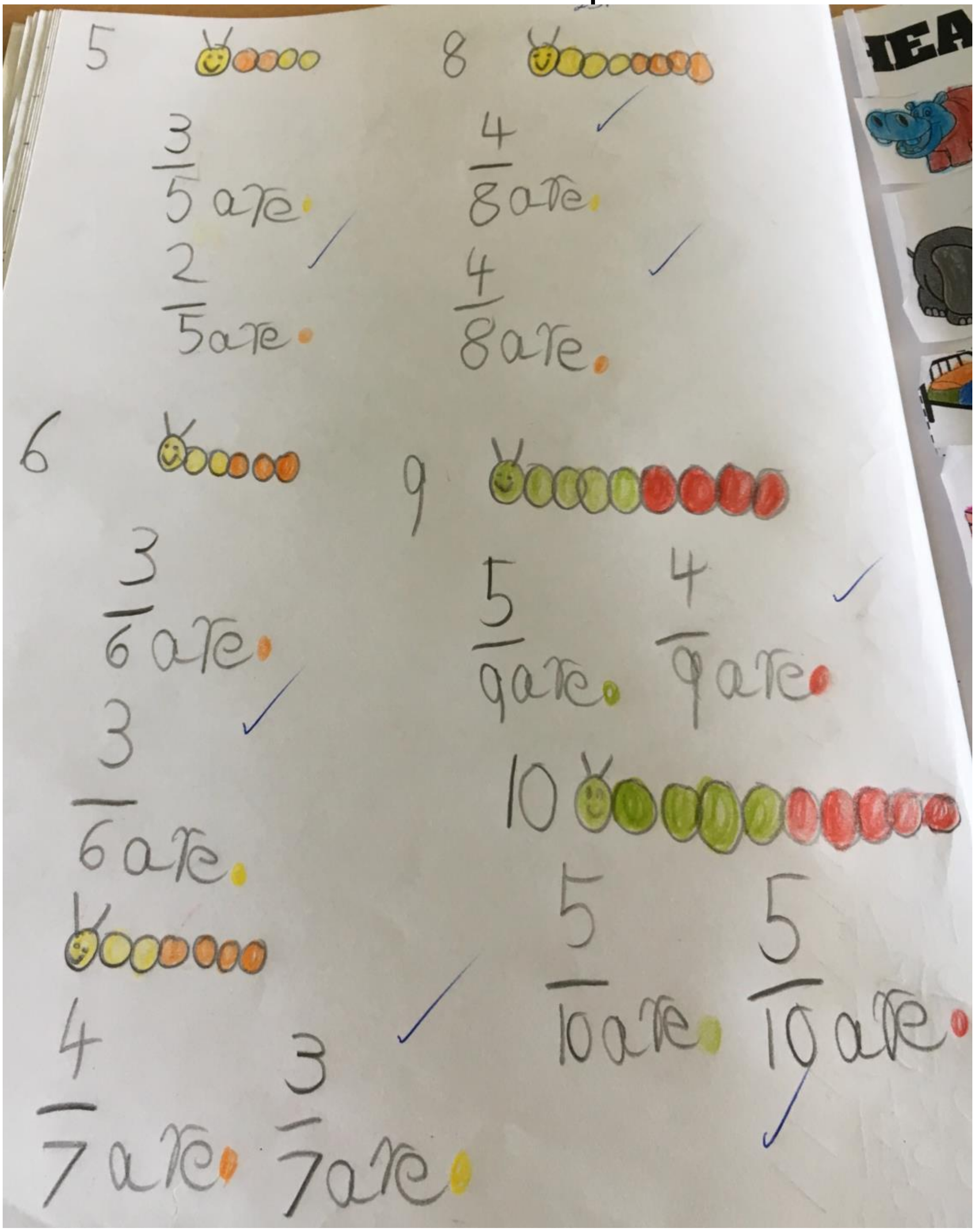
Anchor chart for support to name fractions using the same language pattern as ordinal numbers for the denominator.



Questioning:

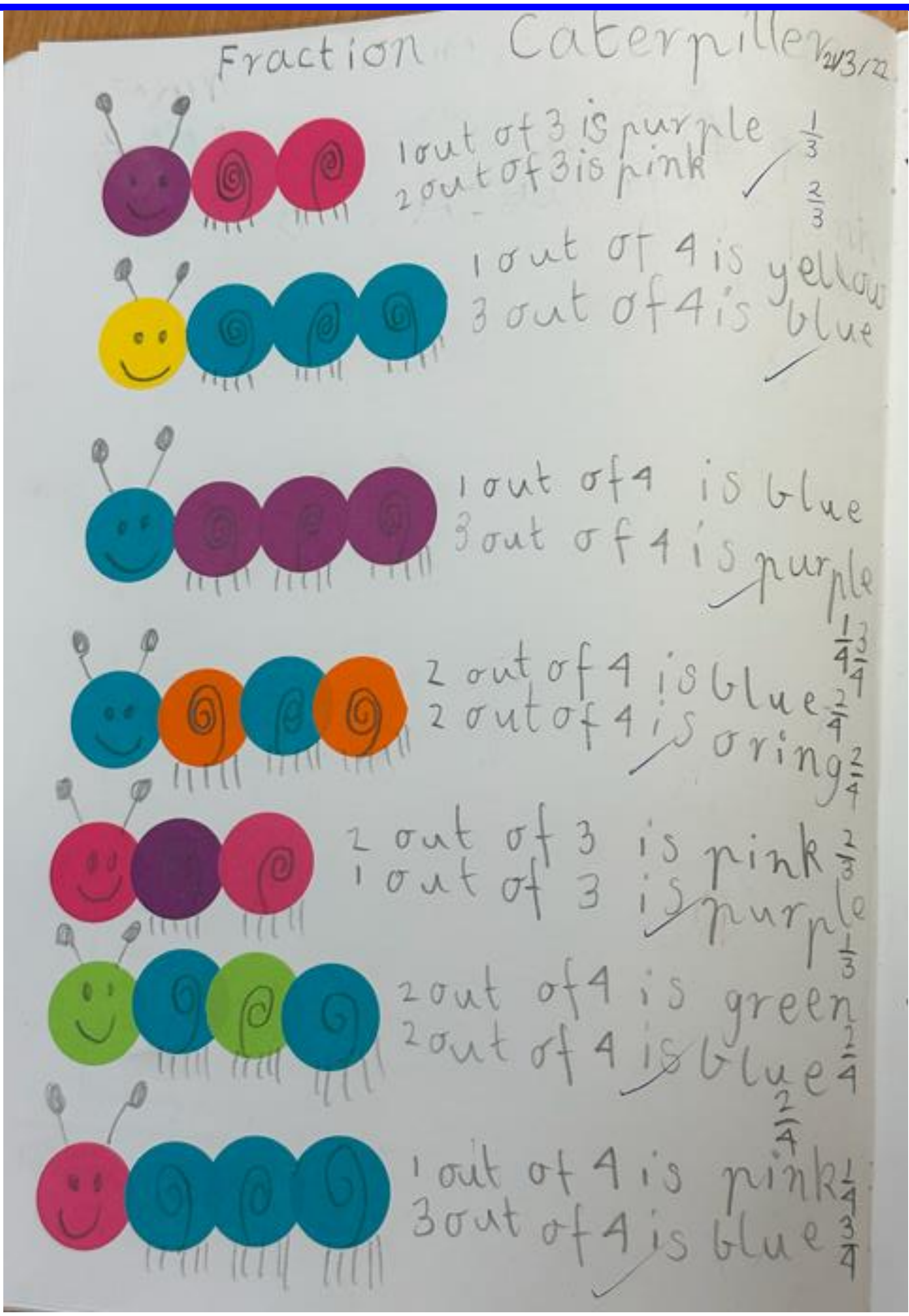
- What fraction of your caterpillar is red/blue/green?
- If it had two of the same colour, what would we call that? TWO thirds!
- What if all the parts were the same colour? THREE thirds. How else could we say that? The WHOLE caterpillar is pink!
- *Extension 1 question:* What if 2 out of 4 parts of your butterfly are yellow? How much of the butterfly is that? (Put your hand down the middle of it, so it literally looks like half of the butterfly).

Student work sample

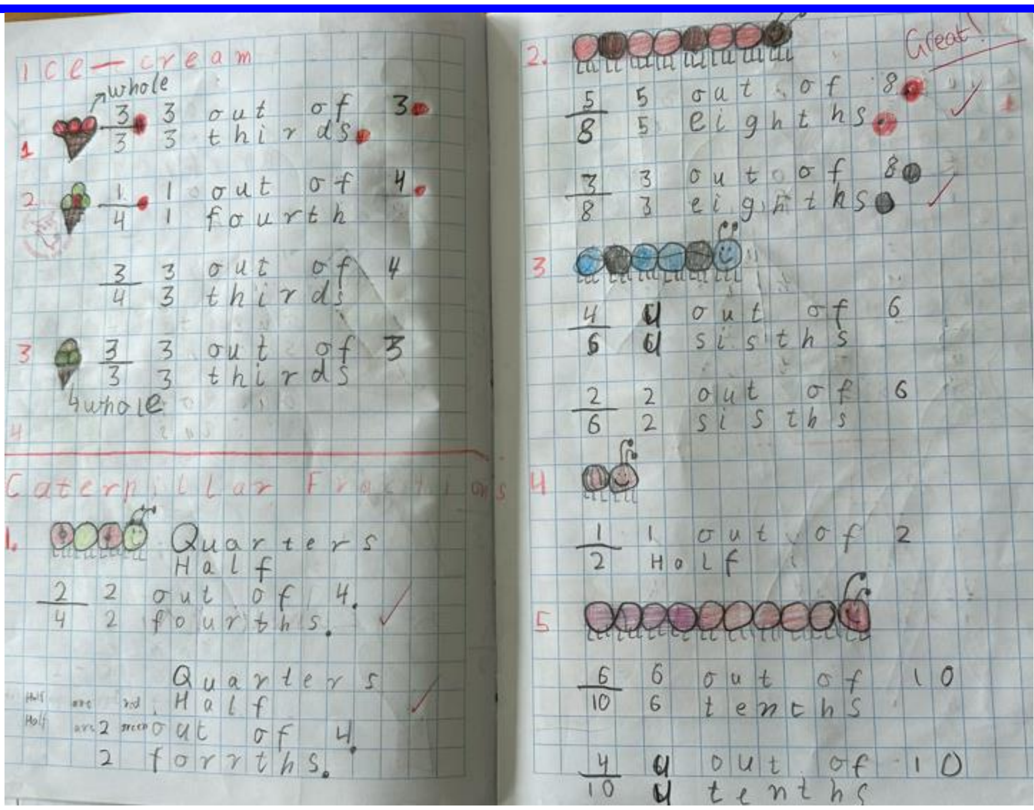


Cross-content link – 2D and 3D shapes: What shape are the pompoms? Spheres – all balls (soccer balls, basketballs) are spheres! When you draw them flat in your book, what do they look like? Circles.

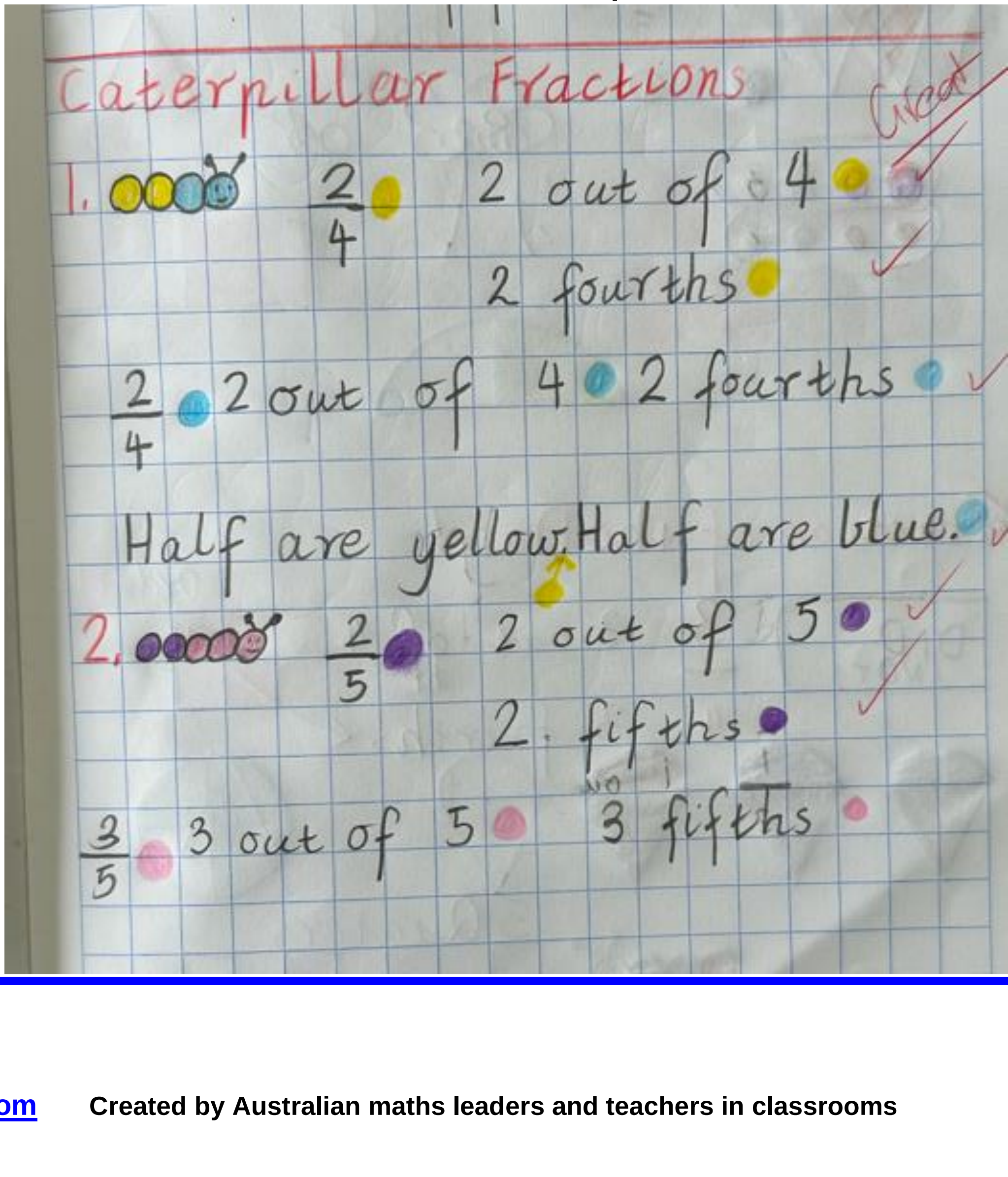
Class numeracy wall display and 10 minute exit ticket for formative assessment: Students make a display of their favourite caterpillar using 3 kinder circles that they stick down to an A4 piece of paper. Record their fraction in as many ways as possible on their end-of-session poster, which can function as an exit ticket and formative assessment piece. Allow students to use more than 3 kinder circles if they wish to show a more impressive fraction – "Show me the fraction creature that challenged you the most."

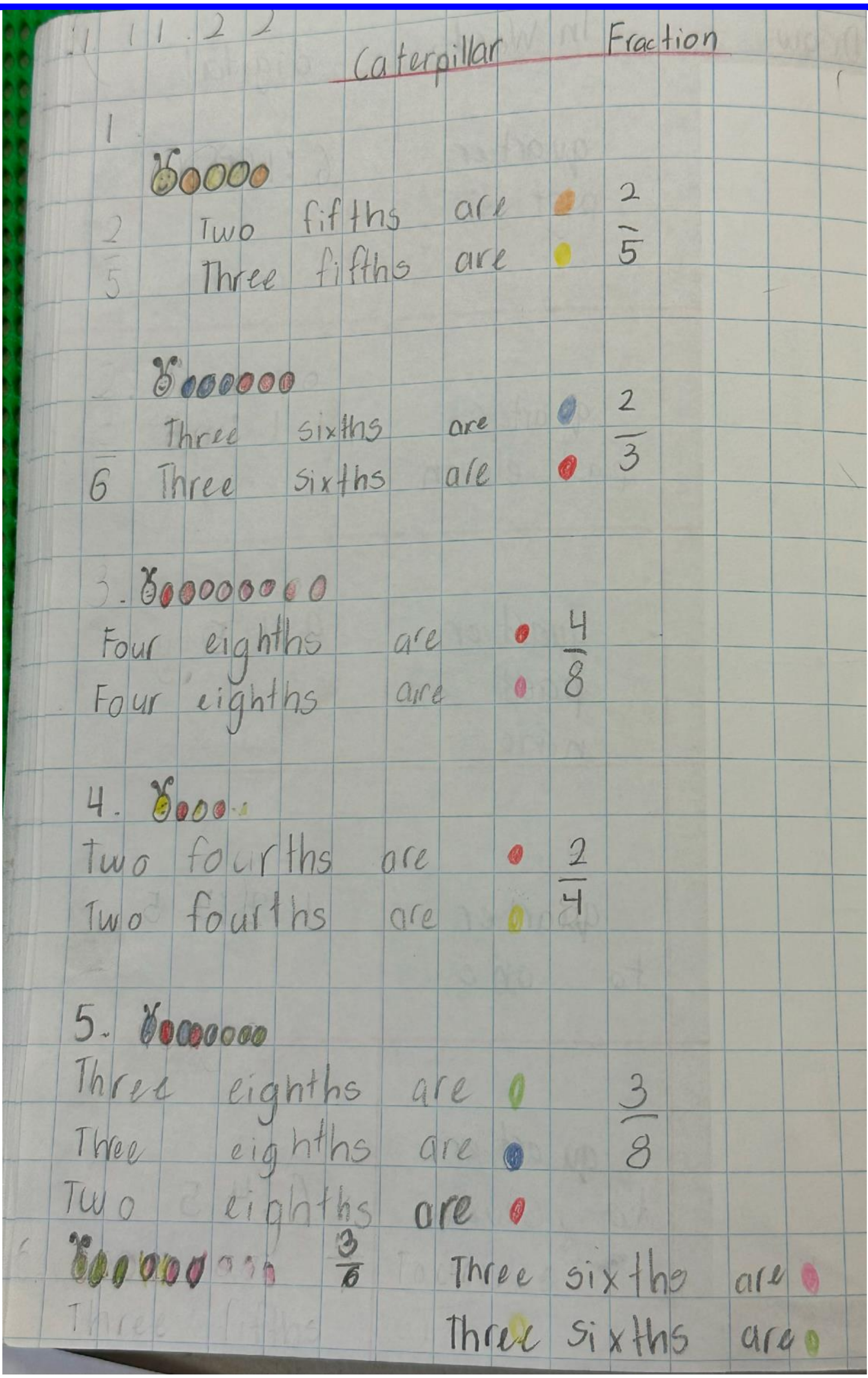


Student work samples



Student work samples



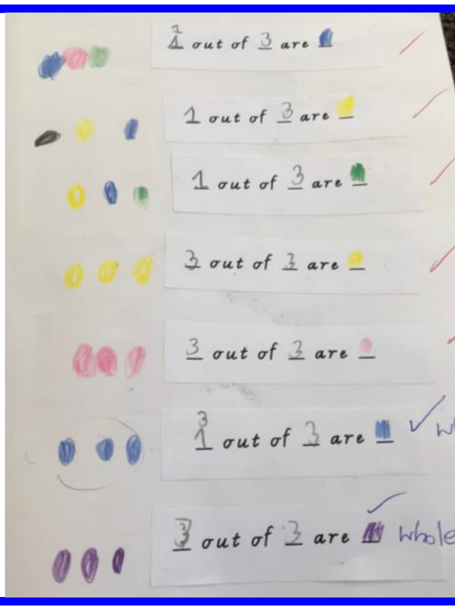


Student work samples

Support: Use just 3 parts for the whole session, constantly varying the colours of these.

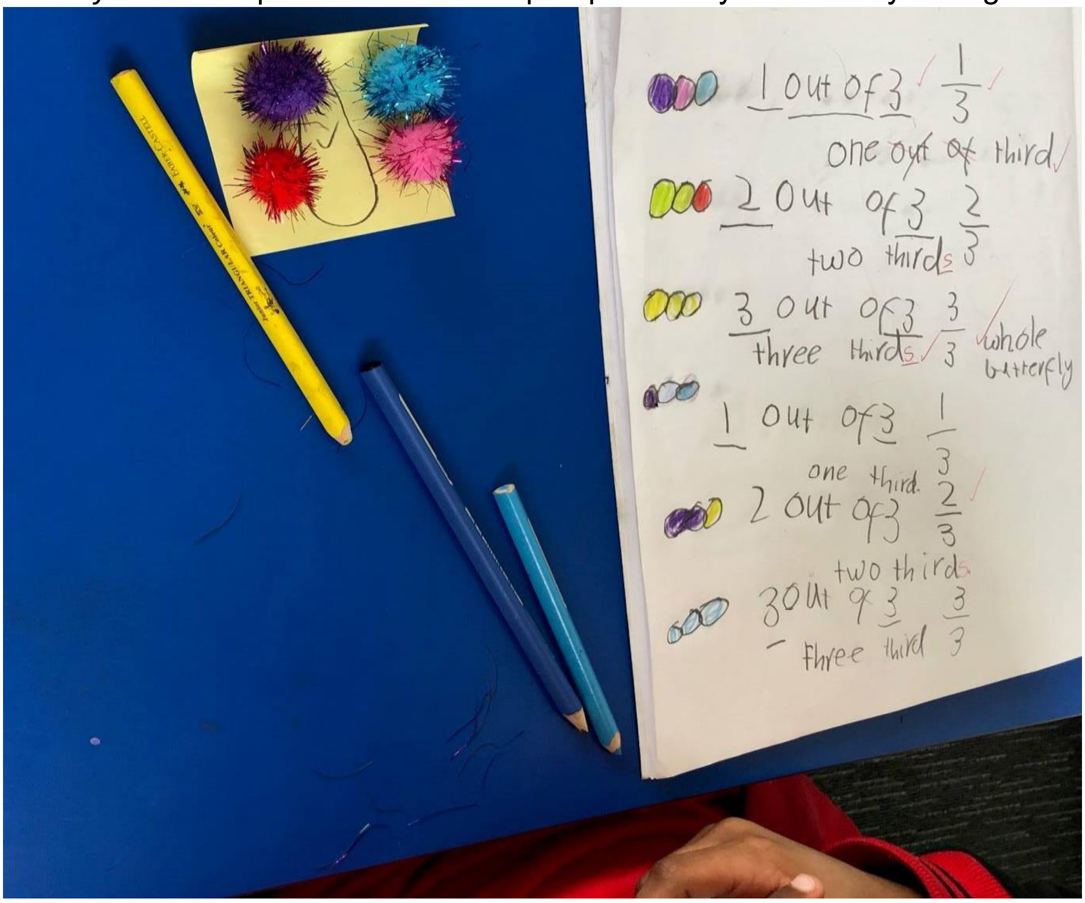
Record using pre-sliced '_out of_' templates from this unit's folder. These remove any literacy barriers from the recording.

Focus entirely on the 'out of' recording (1 out of 3), not recording the fraction in words or numbers.



Extension 1 – use with mid-range students, after they develop confidence with the first part of the task: Your caterpillar grew overnight – just like in *The Very Hungry Caterpillar* story! Now it can evolve…

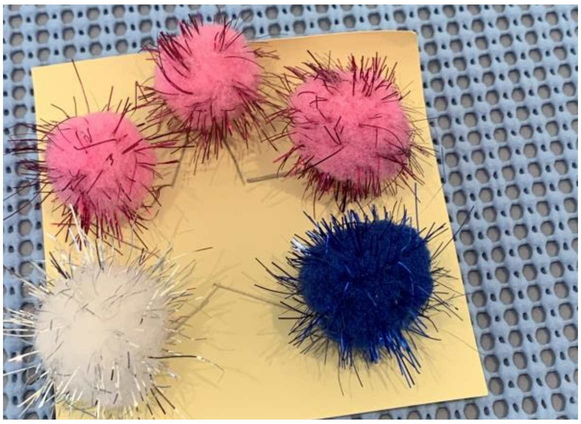
Creature evolutions for the following sessions (or within that same session for students who grow confident at 'out of 3'): What if the caterpillar had 4 parts? Turn it into a butterfly by drawing a butterfly body with a smiley face on a post-it note. Use 4 pompoms as your butterfly's wings!



Butterfly version in action and recording for their caterpillar work

Progressions for students who show readiness:

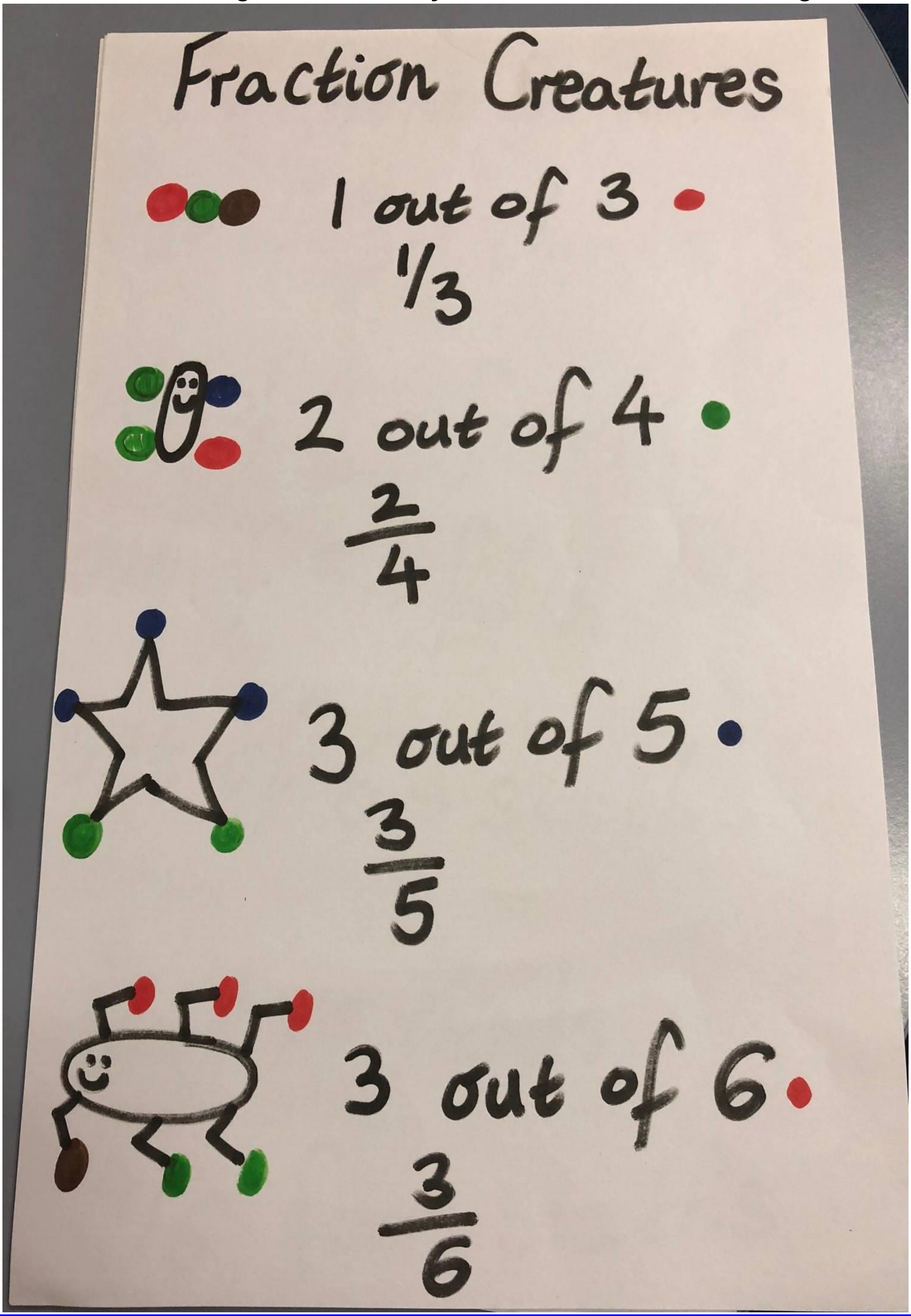
- It becomes a starfish, with 5 pointy ends. Out of 5 (5 as a race number, fifths):



- It's a bug, with 6 icky legs! Out of 6, sixths:

- Now it has turned into a spider with a smiley face for the head and eight legs! Out of 8, eighths:

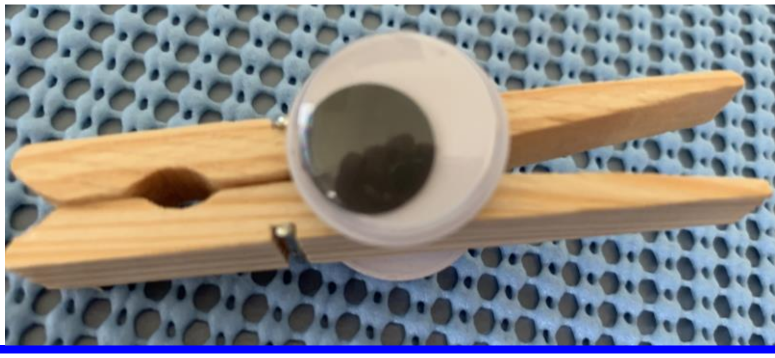
Create an anchor chart so that students know the progression and how their caterpillar can evolve throughout the session (after checking their progress with you). Roam to question and check-in with students, formatively assessing readiness to progress to the next fraction from both their recording and their orally demonstrated understanding:



Interesting fact: Ground feeding birds are more attracted to camouflage colours, such as brown, grey or green.

Extension 2: Compare the two fractions/colours in their creature and decide which is the largest and smallest fraction. If a bird was diving down from the sky to eat your spider, would it aim at the red or green part? The green because it is 6/8 versus 2/8, so draw 6/8 **>** 2/8 like a bird's mouth about to eat the larger fraction of your spider.
This 'bird's mouth' is what maths calls the greater/less than symbol.

Extension students can make a greater/less than sign using two popsicle sticks, or even just a peg with a googly eye stuck on both sides.



Extension 3: Identify whether each fraction is more or less than half. Is 3/4 (3 out of 4) more or less than half of your butterfly? More, because half of 4 is 2, so 2/4 is half and 3/4 is more than half. Is 2 out of 6 more or less than half? Less than 1/2, because 3/6 would be equal or equivalent to half, since 3 is half of 6. Record this as 2/6 < 1/2, and ¾ > ½, since the greater/less than sign (or mouth) eats the larger fraction.

This becomes one of the strategies to use to solve comparisons of fractions in the upper years. For example, compare 4/9 to 3/5, which is larger?

- 4/9 is less than half, since 4.5 is half of 9
- 3/5 is more than half, since 2.5 is half of 5
- So, 3/5 is larger than 4/9 (without needing to create visual models).

Cross-content link – graphing:
Guide the class through this graphing investigation one step at a time.

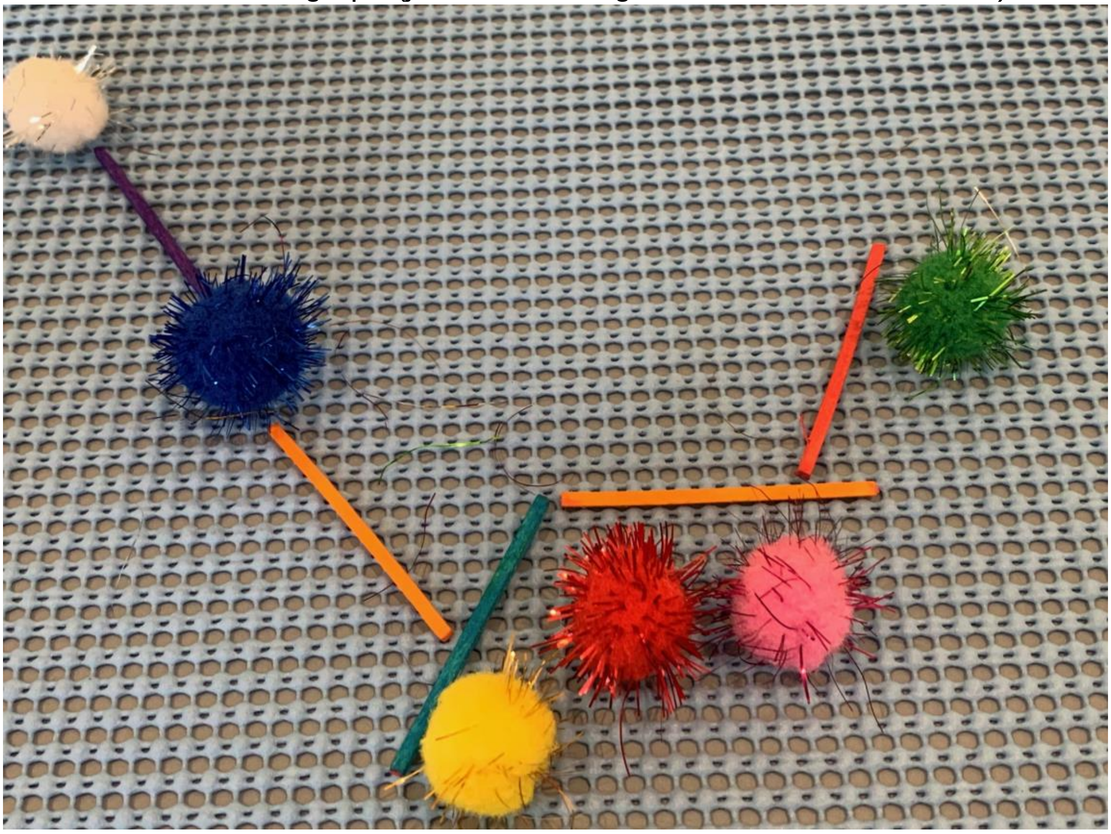
Each student uses 10 or more pompoms with a range of different colours. This becomes the data.

Create a bar graph of your pompoms (setting up the pompoms sideways into rows):

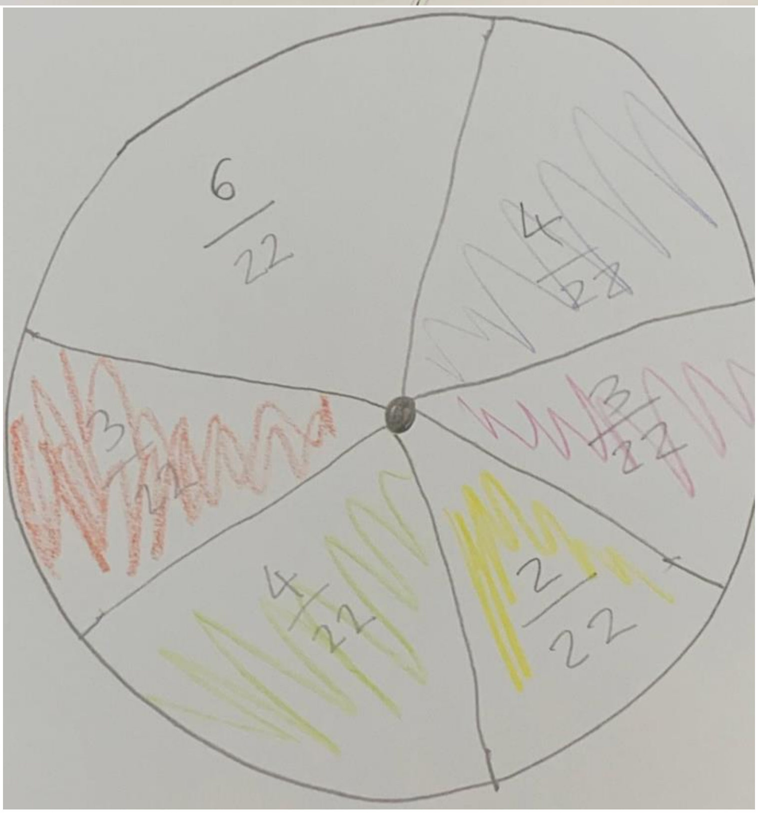
Turn it into a column (standing up) graph by rotating the grip mat:

Make the column graph into a dot graph (simply remove all the pompoms from the columns, except the top pompom in each column).

Transform it to a line graph (join the dots together with mini craft sticks):



Arrange the pompoms into a circle and draw lines into the centre (using matching colours) to create a pie graph:



Remove the pompoms and shade in the relevant colours for each part.

Draw a hollow circle in the middle of your pie graph to transform it into a donut graph.

Place Value Unit 4: Digit Formation

1 of 500 Sequential Lessons for the Early Years

Recommended throughout the first year of school to develop muscle memories and avoid digit reversals becoming ingrained for later years. Australian Curriculum Version 9 Foundation Number: Name, represent and order numbers, including zero to at least 20, using physical and virtual materials and **numerals** AC9MFN01

Digit Formation Foundation Lesson 1

Digit Roads

Learning intention: Correctly form digits without reversals.

Maths vocabulary: digit, top-to-bottom, left, right

Excite the students: Who likes cars? Well today you are going to drive around the digits! Plus, if you work really hard, I have a set of toy cars that you can drive around the digits for the final part of the lesson. *Note:* It is best not to use toy cars at the start, as these are harder to manipulate (students need to reverse, go sideways). Use their pointer finger on a green counter instead.

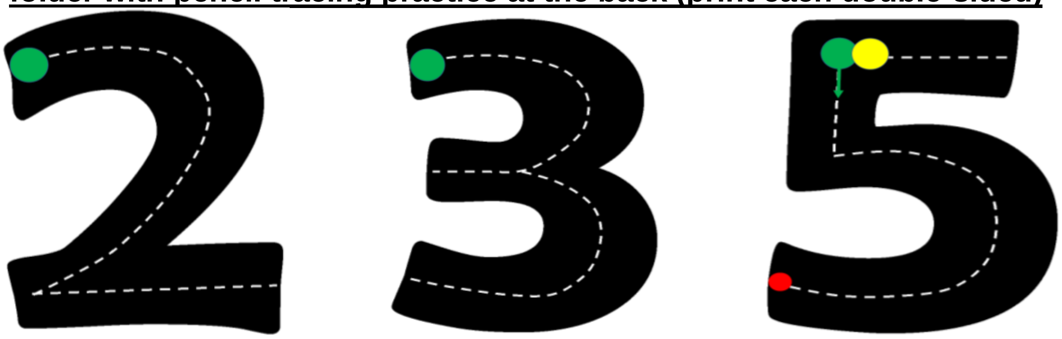
Lesson summary: Students trace a green counter around each digit road (templates are in this unit's folder) while singing each digit's song.

Materials: Use for maths warm-ups and warm-downs throughout the year:

- ***Digit Formation Songs PowerPoint*** – **There is a short, easy-to-remember song for each digit.** Many schools publish these in transition-to-school packs for parents, and make them consistent across teams to combat digit reversals school-wide.
- ***Digit Road Templates*** **from this unit's folder** – Focus on each digit for at least three days in a row. **Use these consistently throughout Foundation; every day during term one and at least twice a week throughout the rest of the year, based on whole-class or small group points-of-need, building long-lasting muscle memories.**
- Green counters for students to start from the green traffic lights.
- *Optional:* Set of toy cars for celebration.

Best set-up: Students sing and practise around a whole-class circle.

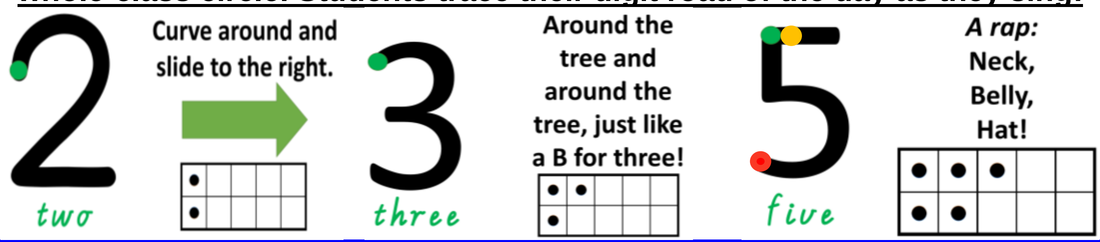
Digit Road Templates – A4 full-size versions printable from this unit's folder with pencil tracing practice at the back (print each double-sided)



For all digits: Start at the top – at the green light!

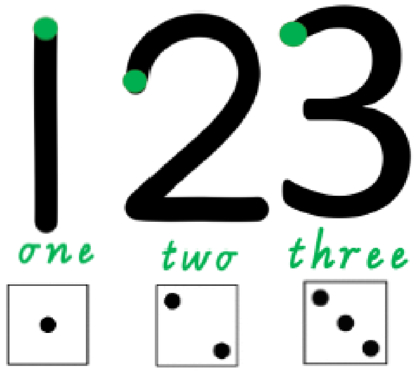
For '4' and '5': Start at green. Stop and lift at red. Restart slowly at amber.

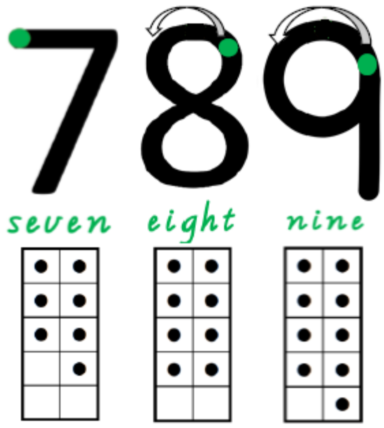
Digit Formation Songs – PowerPoint in this unit's folder, sing one around a whole-class circle. Students trace their digit road of the day as they sing:



YouTube hook: Cars cartoon movie trailer youtube.com/watch?v=SbXIj2T-_uk	**Modelling:** Students sit on the floor with their digit roads and green counter. Model starting the counter from the green dot on each digit template. **Sing together as a whole class.** The teacher can model with an A3 version at the front, leading the 'digit choir.'  Ask students to join in the song after you have sung it through a few times. Watch students as they make their way around the digit in sync with the class (lifting the green counter and putting it back to the starting dot on your, "Go!"). **Do not allow students to slide backwards up the digit – they must lift their counter to restart!** **Students return to their desks with the digit, whisper singing the song to themselves as they trace the entire back page using pencil.** Teacher modelling YouTube for the tune of the songs: youtube.com/watch?v=BOThXyG_svk **Top-to-bottom formation:** Did this digit start at the top or the bottom? When you are riding your bike, is it more fun to start from the top of the hill or the bottom? The top! ALL digits are the same – they all like being at the top of the hill and riding their bike down! Where do you put food in your body? The top or the bottom? Digits are the same, don't feed your digit from its bottom! **Traffic lights show where to start:** Explain that the dots are like traffic lights. Green means go. Red means stop and lift your pencil. Yellow means slowly, so you slowly start with your pencil again. For the digit 4, green is the starting point, red is where you lift your pencil, yellow is where you draw the last part of the digit. **Rubber bands for right and left directionality:** Students can also wear left and right wristbands, red on the right and lemon-coloured for the left.  Students could wear these many times throughout the year to build right/left awareness. These mostly help with lessons on positional language, but also assist with instructions about which way to move their hand. For example, even though all digits work from top-to-bottom, some move left first (like 6, 8, 9), while those that are most commonly reversed move right first (like 2, 7, 3, 5).

Tip: The digits that are most often reversed (2, 3, 5, 7) all move to the right first, so should be taught together in close sequence.





Recommended desks charts are available in this unit's folder.

Common misconception: The digit 'l' should be a straight line, it does not wear a 'hat' or 'shoes' – **not 1.** l is 'naked,' just one movement for l. Often, errors are perpetuated by desk charts that show some digits incorrectly.

Questioning:

- Does this digit have straight lines, curved lines or a bit of both? Are the straight lines horizontal, vertical or diagonal?



Vertical Horizontal Diagonal

Model this language using your bodies as a whole-class maths vocabulary dance:

- Students stand up straight like a soldier when you say 'vertical.'
- Students put their arms out sideways like a plane flying along the horizon for 'horizontal.'
- Students make ninja fighting arms for 'diagonal.'

This lays great foundations for the language of angles and transformations.

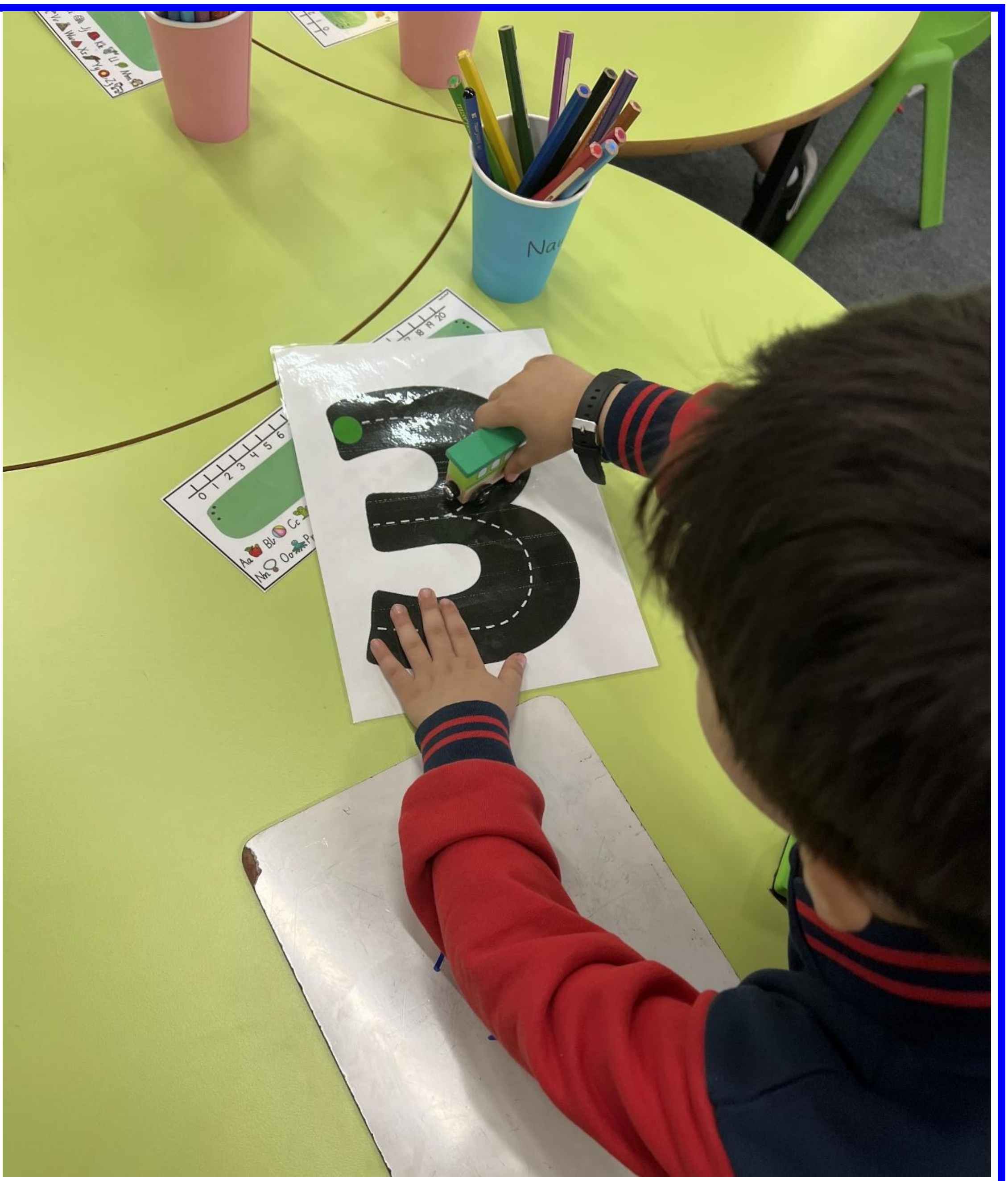
Support 1: Move any students who are struggling (or any who you anticipate may struggle) closest to you in the whole-class circle, so that you can model to them one-to-one and keep them focused, as you continue to sing along with the class.

Support 2: Print extra copies for further practice at home with parents. When these students run out of stamina in the final 5-10 minutes of a maths lesson, use this time to focus on their points-of-need, with the student practising their digit road as a consistent daily maths warm-down activity. Particularly focus on any point-of-need digits that these students often reverse or need assistance to write.

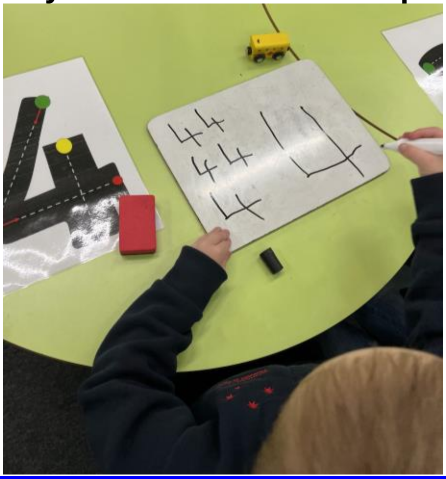
Extension 1: Make patterns using two or more digits. For example, 3 3 3 7 3 3 3 7. Ask a like-ability partner to continue their pattern and explain its rule.

Extension 2: Become a secret agent by solving skip-counting mission code sticks. Use a [120 chart] to help solve these, placing transparent counters on the numbers that are on the stick to try to decipher the missing numbers in the pattern.

Lesson in action and celebration/reflection with toys cars at the end



Daily 5-minute warm-down practice in action at Southern Cross PS



Addition Unit 4: Partition the Numbers 3 to 9

1 of 500 Sequential Lessons for the Early Years

Recommended throughout the first year of school as an ongoing warm-up and home learning link. Australian Curriculum Version 9 Foundation Number: Partition and combine collections up to 10 using part-part-whole relationships and subitising to recognise and name the parts AC9MFN04

Partition Foundation Lesson 1

Ninja Number Sliders

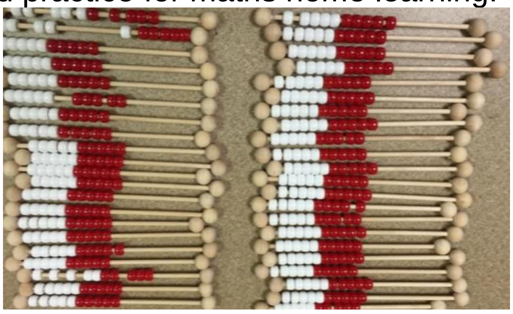
Learning intention: Learn all the ways to make 3 to 9.

Maths vocabulary: ways to make (combinations), parts, total (all/altogether), turnaround (halfway turn, 180 degrees), left, right

Lesson summary: Students use a bead number slider to discover all the ways to break apart a number and make its total. *Teacher note:* Partition means to break a number into parts (not necessarily equal parts).

Materials:

- Beads.
- Pipe cleaners or dowel rods. Pipe cleaners are easiest to source and can be sent home for continued practice for maths home learning:

- _ and _ makes _ recording template from this unit's folder.

Best set-up: Model at a demonstration desk, then students work independently to be able to progress to each new total at their own pace.

Modelling: Model your own example number slider, focusing on all the combinations you can discover that make one total. Put 5 beads on the slider. Push some to the **right** and some to the **left**. "4 and 1 makes 5."

Turnaround the slider (a halfway turn or 180 degrees) so that now 1 and 4 makes 5. That's the turnaround fact! Push the beads back to the centre and create another way or **combination** that makes 5 – "3 to the left, 2 to the right makes 5." Turn the slider around – "2 and 3 makes 5." Instruct students to make as many combinations as they can before upgrading to a new total. Don't forget about 0! 0 and 5 makes 5. Turn it around: 5 and 0 makes 5.

Questioning:

- Can you make it another way? What's a new combination?
- Can you see a pattern? 8 and 1 makes 9, 7 and 2 makes 9, 6 and 3 makes 9, 5 and 4 makes 9, 4 and 5 makes 9, 3 and 6 makes 9. Some students will describe this as: "I can see that every time one side loses a bead, the other has an extra bead, and it's still the same number." This is a great foundation for later compensation strategies, used mostly for addition, subtraction and multiplication in years 3-6.

Teacher professional learning: Dianne Siemon – *The Big Ideas in Number,* drawing lines in the sand https://www.youtube.com/watch?v=nPLWAzK0QSQ

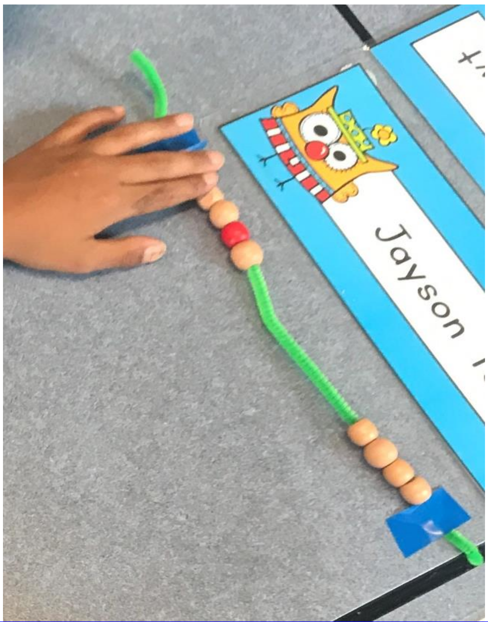
Ninjago theme: https://www.youtube.com/watch?v=jUkzGE7CIds Now you are going to become number ninjas!

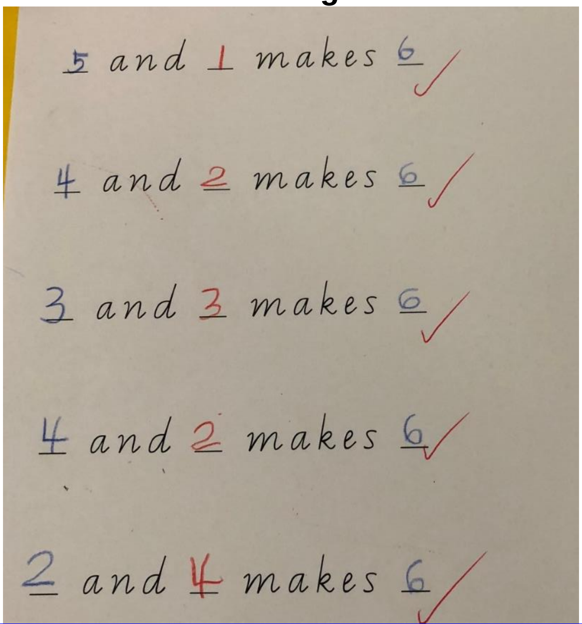
The power of an idea: Read about the Beads for Wildlife Program, run by Werribee Zoo, which has raised over one million dollars to support communities in Kenya and helped to save an endangered species of zebra at the same time: zoo.org.au/beads/#:~:text=Zoos%20Victoria%20is%20working%20with,artisans%20are%20paid%20each%20month

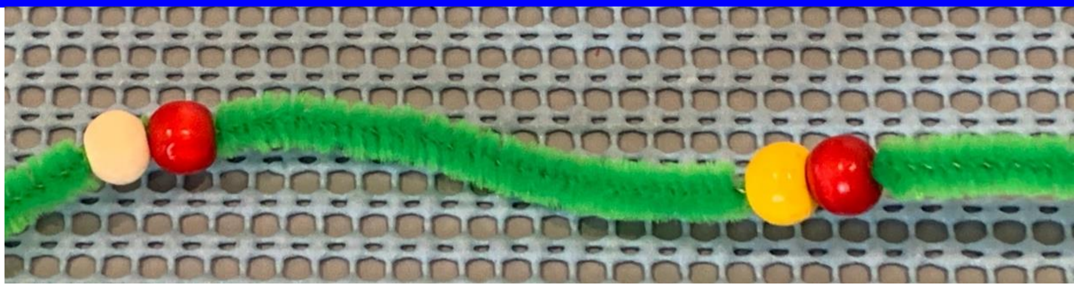
Home learning link: At the end of this series of sessions, allow students to take their bead number slider home, with a photocopy of their best work. Students can continue to use the bead sliders at home to practise creating different combinations that make the same total.

Whole-class modelling: For extra visibility, at the start of the session model with sport balls, shifting these to either side of a long piece of string or rope. When fishbowl modelling, it is often beneficial to supersize your materials for extra visibility, but then also model with students' materials so it looks the same as what they will be experiencing when they return to their desks.

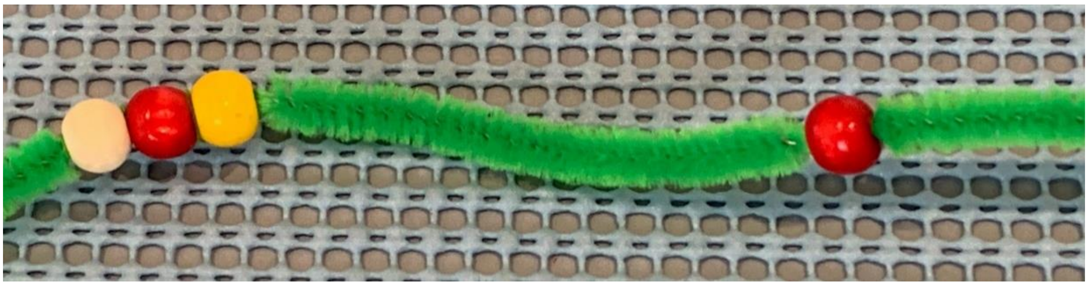
Lesson in action and student recording



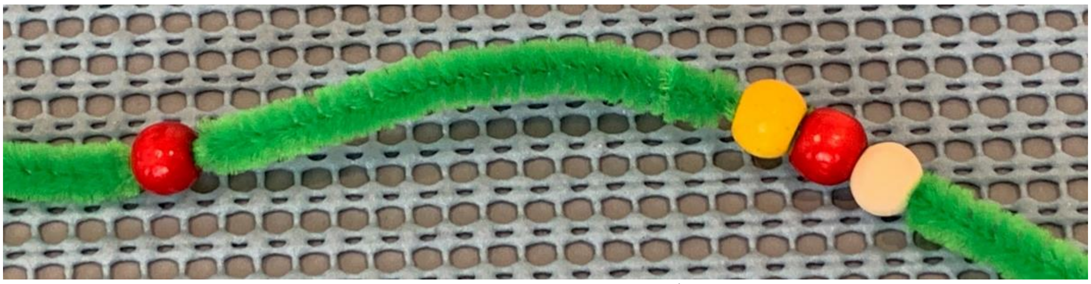




2 and 2 makes 4



3 and 1 makes 4



Turn it around (turnaround fact): 1 and 3 makes 4

Quick formative tip: Allocate students starting numbers based on their points-of-need, for example, support students might start with just 3 beads. Mid-level students can mostly start from 5, but will progress quite quickly as they find all the combinations that make each total and earn an extra bead.

Extension students may start with 8, but only if they can already tell you all the combinations that make 5, 6 and 7 fluently and without materials. As students begin, do a quick oral formative check on extension students: “Can you tell me all the ways to make 5?” If they cannot give lots of combinations, start them at 5. “How can you make 6?” and so on until there is a number that they cannot provide quick combinations for orally (without materials).

After students finish a number, having found all the ways to make it, add an extra bead to their slider and find all the ways to make the new total. Set this up as a video-game-style challenge – see what level/number you can reach by working hard throughout the lesson!

Support: If students cannot subitise (instantly see) the parts on either side, encourage them to count the beads one-by-one using the touch and say counting strategy. For this reason, keep their starting total very small (3 or 4).

3 + 4 + 1 + 2 = 10

Extension 1: Model breaking the number into 3 or 4 distinct parts along the length of the line, for example, 3 and 4 and 1 and 2 makes 10:

Extension 2: Model creating equal groups with the beads, for example, 2 and 2 and 2 makes 6, so 3 groups of 2 makes 6, or 3 twos makes 6

2 + 2 + 2 = 6 so 3 x 2 = 6

Extension 3: Use a few bead sliders at a time, all with equal totals, essentially creating arrays to practise the times tables:

3 groups of 7 makes 21, 3 x 7 = 21

Think about the best strategy to solve it: double 7 and another 7
14 + 7 = 21

[Home learning link](#)

Ninja Number Sliders – The Perfect Bedtime Maths Routine

This week your child will be bringing home a **Ninja Number Slider**. These sliders will support students in learning to partition (break apart) numbers, learning all the ways to make 3-10.

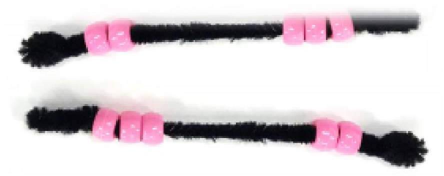
The aim is for children to learn the combinations that make a number. This involves learning to split numbers into smaller parts (decompose a number). Most students will start with 3 beads on their Ninja Number Slider. Once your child can visualise (see in their mind) and reliably remember all the combinations for 3 ("1 and 2 is 3; 2 and 1 is 3; 3 and 0 is 3; 0 and 3 is 3") please bring the slider back to school, demonstrate to their teacher without using the slider for support, and then your child will be move up to the next Ninja Belt.

When using the Ninja Number Sliders, children can move the beads along the pipe cleaner so they can build and see all the different combinations. Students can also flip the slider over to see the commutative/turnaround property (2 and 1 is 3; flip around; 1 and 2 is 3).

We recommend including this as part of a 5-minute bedtime maths routine each day, alongside your child's home reading routines.

"What are all the ways to make 5?"

"2 and 3 is 5"
"3 and 2 is 5" →



"4 and 1 is 5"
"1 and 4 is 5" →

"5 and 0 is 5"
"0 and 5 is 5" →

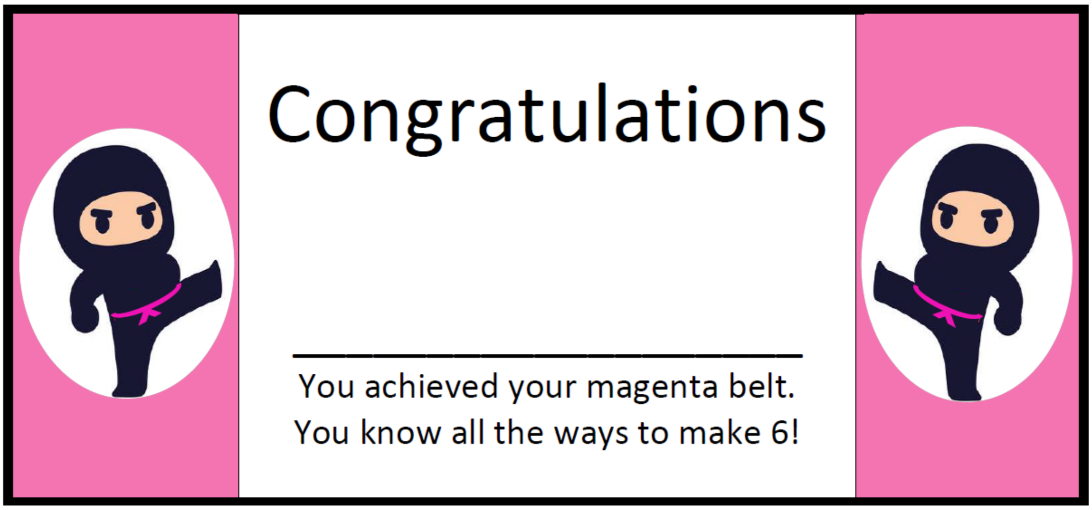
The Ninja Number sliders will be presented to the students as a Ninja Belt challenge where they move up the coloured belts.

Download the parent note [template](#) from this unit's folder.

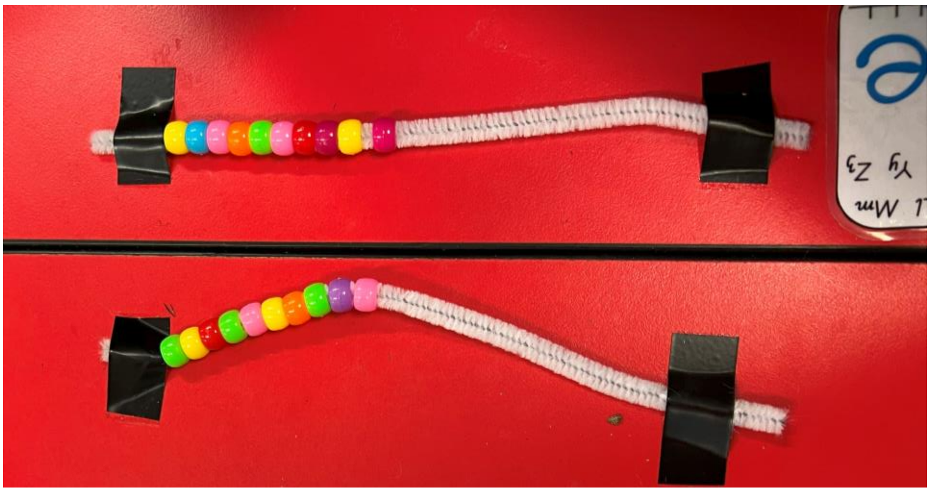
All in the Ninja resources folder (subfolder for this unit plan).

Earning the belts

For example, if the teacher says, “Tell me everything you know about 6 or all the ways to make 6,” the student can articulate, “3 and 3, 4 and 2, 2 2and 4, 5 and 1, 1 and 5, 6 and 0, 0 and 6,” without using the bead slider.



Ninja Certificates



Stuck down to students’ desks ready for daily practice.

Example of a complete set ready to go. Students can make each new slider themselves, immediately after mastering one belt and moving onto the next. Just set up a bucket of pipe cleaners and beads.

Critical set-up tip: It is critical that there are two colours of beads used and that these are used in a 50/50 split, or for odd numbers, a 3-4 split for 7 for example (3 red, 4 green). Try to use complementary or highly contrasting colours for the beads (red/green; blue/orange; yellow/purple, or similar), or alternatively students' favourite footy colours. The two-colour split greatly assists with students to subitise ("I see…, I see…, I see…") the part-part-whole relationship while using the slider.

Assess before beginning the challenge: Assess each student orally before starting the slider challenge. Ask each student, "What are all the ways to make 3?" If the student says something along the lines of, "2 and 1, 1 and 2, 3 and 0, 0 and 3," ask about 4. If not, start the student at the 3 slider. That way, every student starts from their correct level, and does not have to progress slowly through numbers they can already partition fluently. Record each student's results and date these as they complete each new belt using the formative assessment record.

Ninja Number Sliders

	Yellow Belt Partition 3	Orange Belt Partition 4	Pink Belt Partition 5	Dark Pink Belt Partition 6	Red Belt Partition 7	Green Belt Partition 8	Blue Belt Partition 9	Purple Belt Partition 10

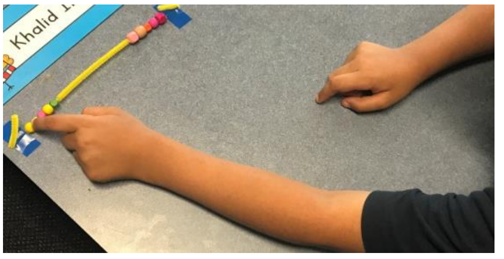
Ongoing extension 1: For any students who already know all the ways to make 3 to 10, focus on fact families (learning all the subtraction/take away facts from 3 to 10). For example, if a student knows 4 and 5 is 9, does the student use this trusted fact to solve 9 take away 4 and 9 take away 5? Assess students on taking away from 3, then 4, then 5, but stop if they start using counting back, rather than a 'known fact family strategy' ("Because I know 4 and 5 is 9, I also know 9 take away 5 is 4").

Ongoing extension 2: For students who know both all the ways to make and all the ways to break (take away), using efficient strategies for addition and subtraction to 10, make the sliders up to 20, starting at 11, or whichever number for which they are not yet using efficient strategies.

Ongoing extension 3: Focus on multiplicative strategies instead, using an ongoing warm-up such as https://mathigon.org/multiply, signing up for a free teacher/student account. This assists extension students as it firstly displays equal groups, then arrays, then factors, using this free virtual resource focused on long-term memory, retention and mastery. **Introduce these multiplicative strategies with extension students as these arise in their daily practice warm-up, in order to avoid skip-counting:**

Strategies for the doubling family	Strategies for the tens family	Other strategies
x2 Double the other number	x 10 Place value pattern/power of 10	x3 Double + group *example* 3 x 6 Double 6 = 12 +6 more = 18
x4 Double double the other number *example* 4 x 7 Double 7 = 14 Double = 28	x9 Place value pattern – group *example* 9 x 7 Think 7 tens (7t) = 70 Take away 7 = 63	x6 Think x3 then double OR think x5 + group *example* 6 x 7 Think 3 x 7 = 21 Double it = 42
x8 Double double double the other number *example* 6 x 8 Double 6 = 12 Double = 24 Double = 48	x5 Place value pattern of 10 then halve it OR halve it then place value pattern of 10 *example* 5 x 8 Think 80 (x 10) then halve it = 40 Think half of 8 is 4, then x 10/tens (4t) = 40 Think the analogue clock minute hand, at 8 it is 40 minutes	x7 Use commutativity so just remember 7x7; the rest you already know! Memory strategies for the hardest facts: 6x6: Think half 6 is 3, so it's 36! 7x8: What comes before 7 and 8, 56! 8x8: Count by 2s backwards, 64!

Lesson in action and ongoing warm-up in action in classrooms

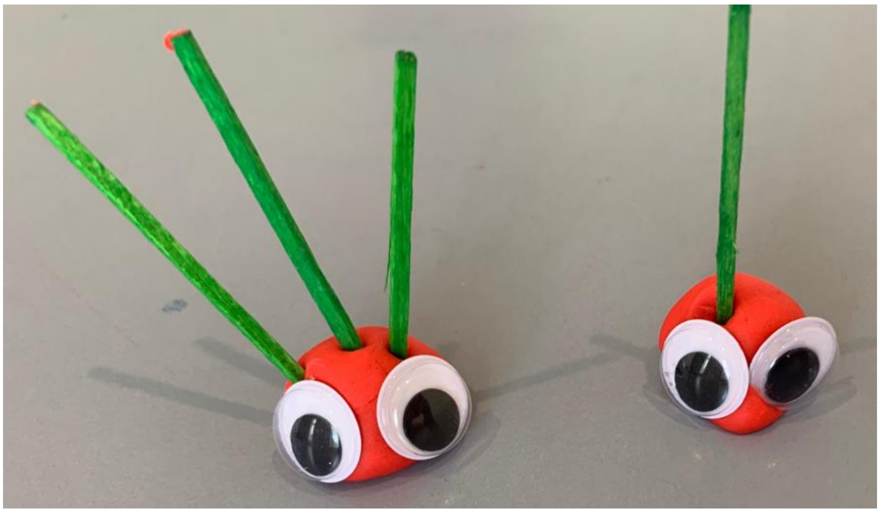


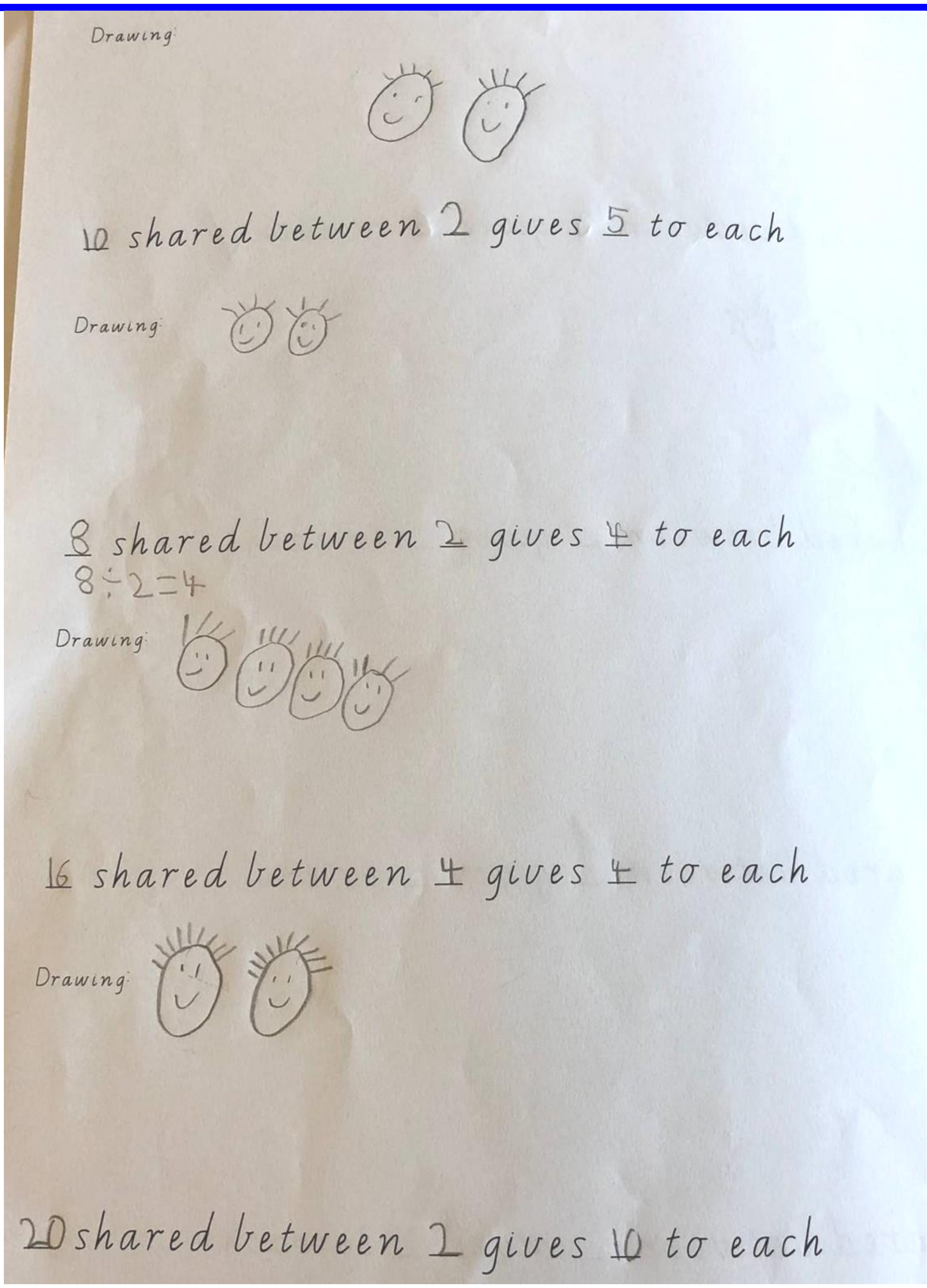
Division Unit 2: Create equal shares with materials

1 of 500 Sequential Lessons for the Early Years

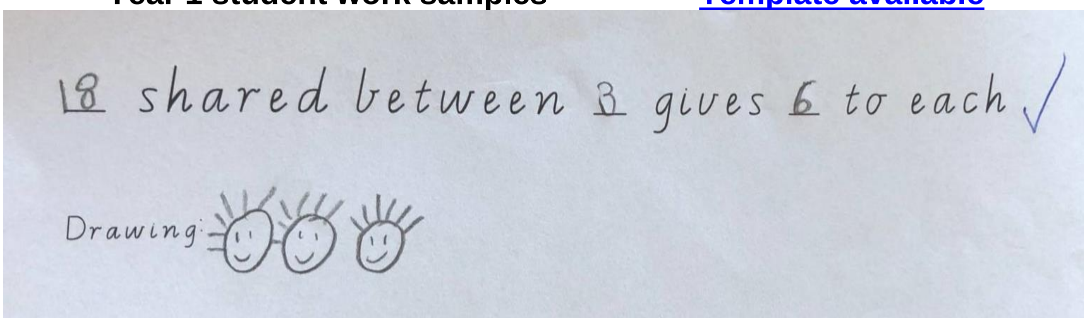
Australian Curriculum Version 9 Year 1 Number: Use mathematical modelling to solve practical problems involving equal sharing and grouping; represent the situations with diagrams, physical and virtual materials, and use calculation strategies to solve the problem AC9M1N06

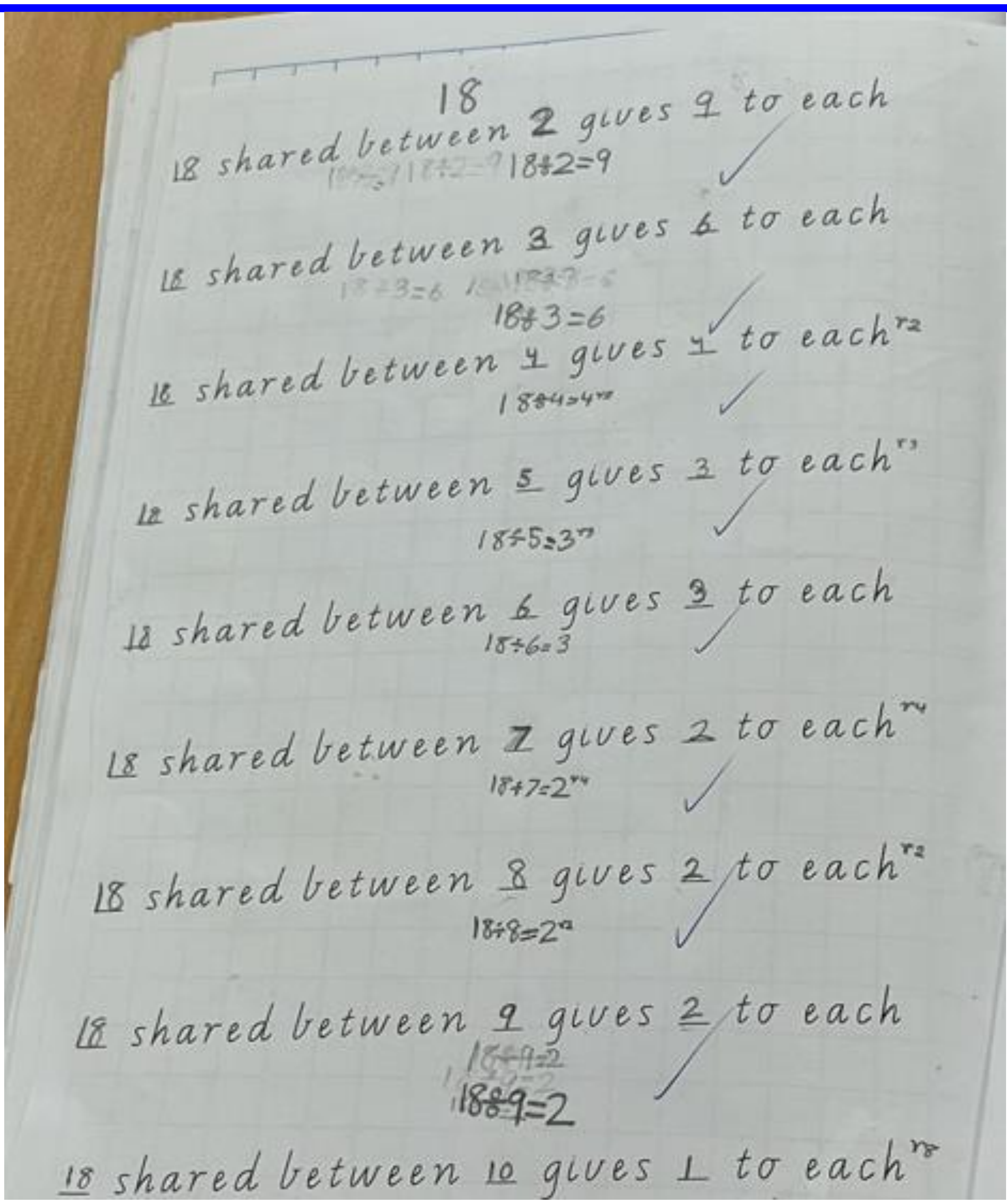
Equal Shares Year 1 Lesson 9	**Sharing Spikes** **Learning intention: Make equal shares and record matching division sentences, including any remainders.** **Maths vocabulary: shared between ÷, starting number, remainder**
Real-life link: Meet the most resilient echidna in Australia – Matilda, who is allergic to ants: link. Matilda and her keepers show that, if you are a problem-solver and resilient, you can tackle almost any problem you come across in life. **Dreamtime story hook:** YouTube clip made by year 9 students about how the echidna got its spikes: youtube.com/watch?v=ZP4ap0VjNfQ	**Lesson summary: Students practise creating equal shares with spikes for echidnas. Students push craft sticks into Play-Doh spheres, ensuring that echidna has the same number to avoid a jealous joust!** **Materials:** • Small craft sticks or toothpicks, which are very cheap (approximately $3 for class sets of 1000 from Officeworks or craft suppliers). • Play-Doh. • *Shared between* recording templates from this unit's folder. • Ten frames from this unit's folder. **Best set-up:** Fishbowl model, then students work with their maths buddy. **Modelling:** Model scooping up some spikes with one hand and putting the starting number in the ten frames. Whole-class chant, "When we share, we start with a lot, we end with a little each (emphasise the alliteration of *lot* and *little*)." Just like subtraction, division makes your number smaller and you start with the big number, because you need lots to be able to share it out. However, unlike subtraction, the share must be fair. Always make and record your **starting number** before sharing it out, for example, 24. Now roll out how many echidnas you are going to use. Take a pinch of Play-Doh and rotate it between the palms of your hands. Record your number of echidnas in the template too: 24 shared between 2 gives _ each, before you start sharing out the spikes. Share the 24 spikes onto 2 echidnas. Record the answer to the shared between sentence, *24 shared between 2 makes 12 spikes each*, and the number sentence under it, as shown below. Next, try sharing 24 spikes equally between 3 echidnas, then 4, then 5.  24 shared between 3 gives 8 to each 24 ÷ 3 = 8

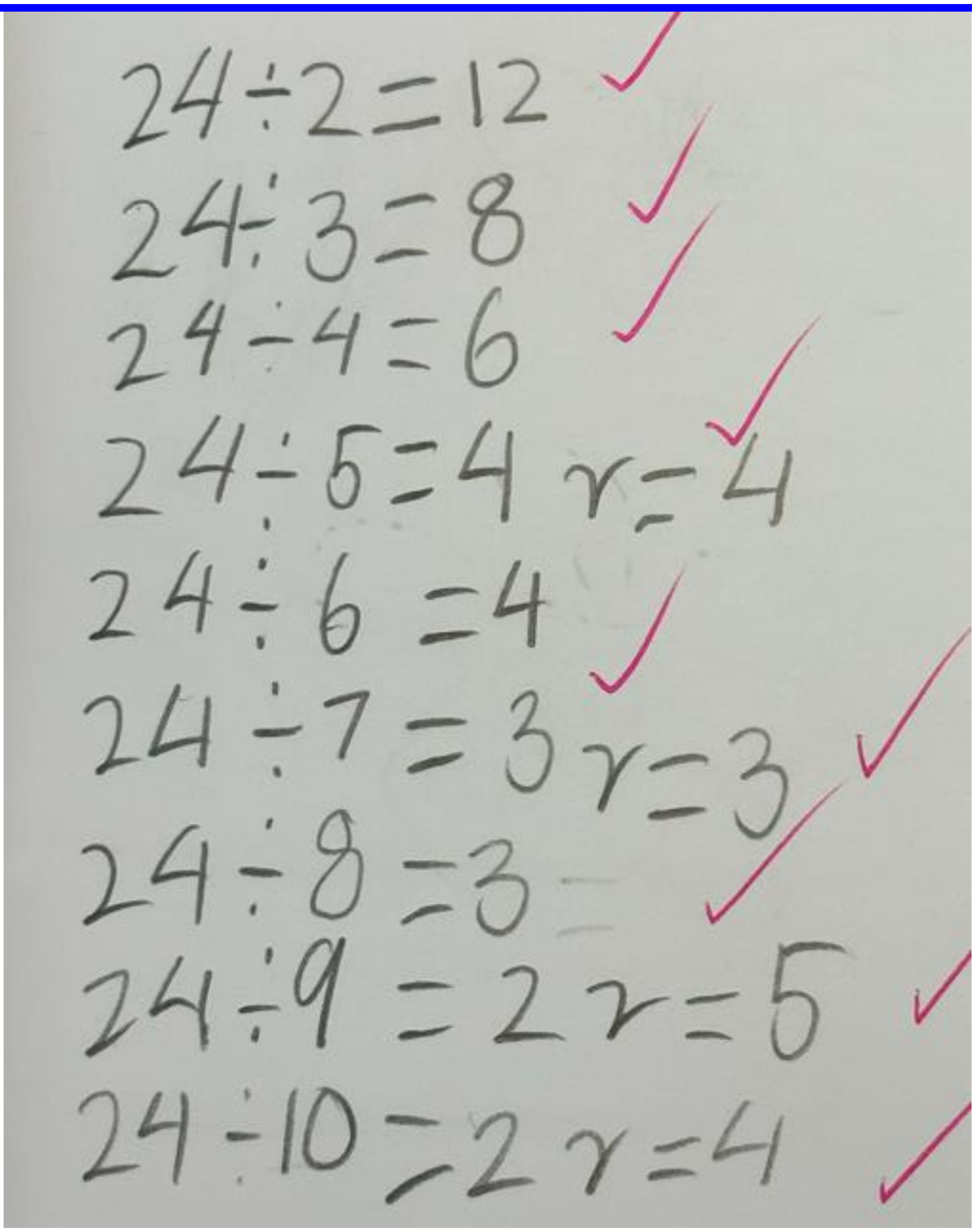
Learn about this amazing native animal: Short (2 minute) documentary on echidnas: youtube.com/watch?v=3Qm6O-HG02E	**Tip:** Encourage students to use the, "One for you, one for you," strategy. For students who are ready, encourage them to use, "Two for you, two for you," or 3, 4 or 5 at a time, particularly for sharing larger starting numbers. This scaffolds the next strategy for division – skip-counting to divide.  When students try to share 24 between 5, they will find they can fairly share 4 spikes onto each echidna, then cannot fairly share the final 4 spikes. They may find most echidnas can receive 5, but the final echidna only has 4, which would be unfair. Instruct students to leave these in their ten frame or on the side as leftovers. Maths calls leftovers **remainders**. **Misconception alert:** Often, students try to add or subtract from their starting number (changing it to make the share fair), rather than leaving remainders to the side. Emphasise that students are to make their starting number, and then cannot add or subtract from it. To assist with this, keep the starting number consistent for the whole session. For example, figure out all the ways to share 24 spikes, just by changing the number of echidnas. Emphasise that the shares must be fair, otherwise the echidnas will joust each other like medieval knights with their spikes, or one echidna might look very sad indeed:  "Unfair! Unequal!" **Questioning:** • Will the number each echidna receives be higher or lower than the starting number? Will it always be lower? How do you know? • Why can't we just give the leftover spikes to one of the echidnas and make it an unfair share? • Can you create a matching 'groups of' sentence about what you can see: I see 3 echidnas with 8 spikes each, that makes 24, 3 x 8 = 24



Year 1 student work samples **[Template available]**



	 **All the ways to share 18 spikes** **Reflection:** Refer to the start of this unit – students create worded division problems about this lesson's materials for the final 10 minutes of the session: "I had 20 spears. I saw four echidnas walking along. Each echidna got 5 spikes!"



Student work sample – Note that the number of spikes remains unchanged (24 spikes, shared between a progressively increasing number of echidnas), which provides deeper questioning and patterning opportunities for students and the teacher focused on how the number of shares impacts upon the quantity that each group receives.

This also ensures students can independently work out what to do next, without needing equations on the board or from a sheet – the lesson and the mathematical pattern evolves naturally by the use of the materials.

Shared between Name:

_________ shared between _________  makes __________ on each

_________ shared between _________  makes __________ on each

_________ shared between _________  makes __________ on each

_________ shared between _________  makes __________ on each

Support 1: Use the visual recording template (shown here), which is similar to the recording templates used throughout the first division unit.

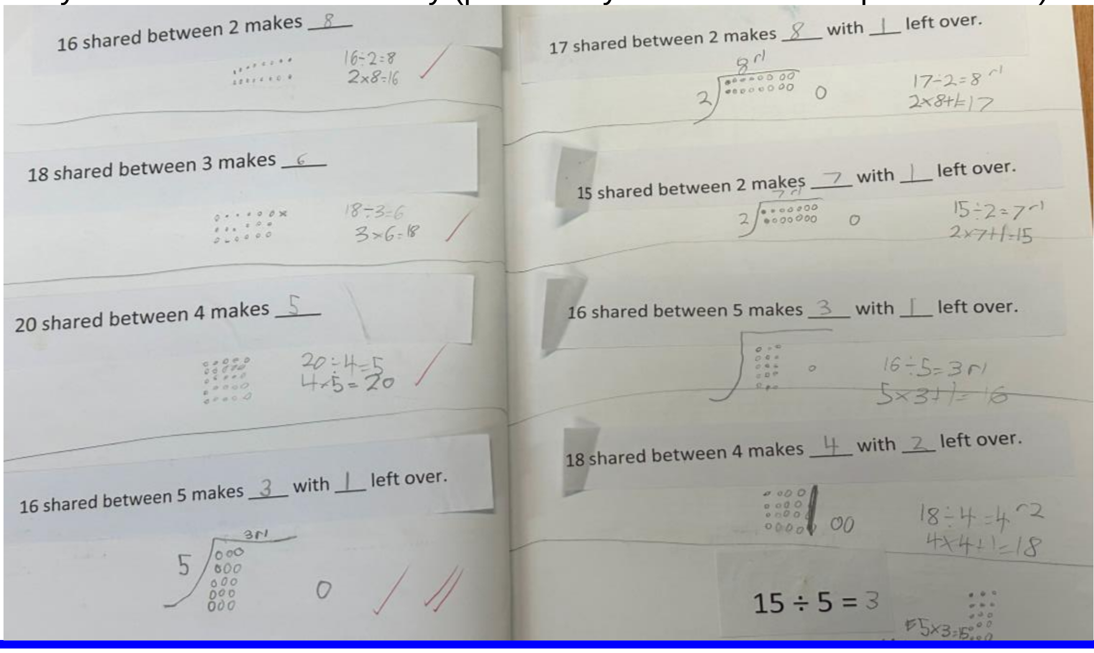
Support 2: Keep the starting number of spikes the same and figure out all the ways to share that same total between varying amounts of echidnas. For example, what are all the ways to share 12? Give these students 12 sticks and remove all other sticks, so they cannot add or subtract any from their set starting number.

Extreme support: Practise making numbers, rather than sharing them. Roll the 6-sided dice and make that number in spikes. For example, if they roll 6, make a 6-spike echidna.
Later, roll 2 dice and put both numbers on the same echidna to practise addition. For example, rolled 3 on the red die and 5 on the green die:
3 red spikes + (and) 5 green spikes = (makes) 8 spikes altogether, 5 + 3 = 8. Record using the _and_is_ template from Addition Unit 1.

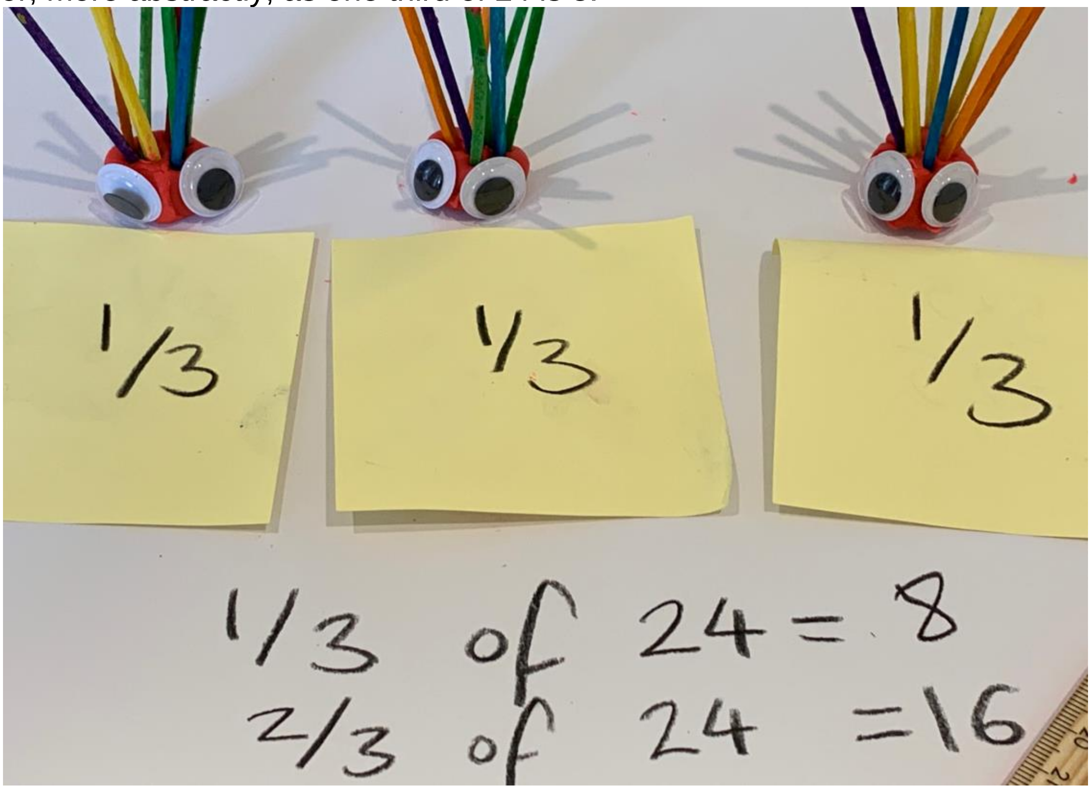
Extension 1: Encourage these students to predict answers using skip-counting or any known multiplication facts, before physically sharing out the spikes. For example, for 24 spikes shared between 3 echidnas, if you know 3 equal groups of 8 is 24 or you know 3 x 8 = 24, you might guess that 24 shared between 3 echidnas will give each echidna 8 spikes.

If you don't know the times table, skip-count by 3 to guess the answer (how many times did you need to skip-count by 3 to reach 24). If you know 5 threes is 15, then start skip-counting from there, 5 threes is 15, 6 threes 18, 7 threes 21, 8 threes is 24.

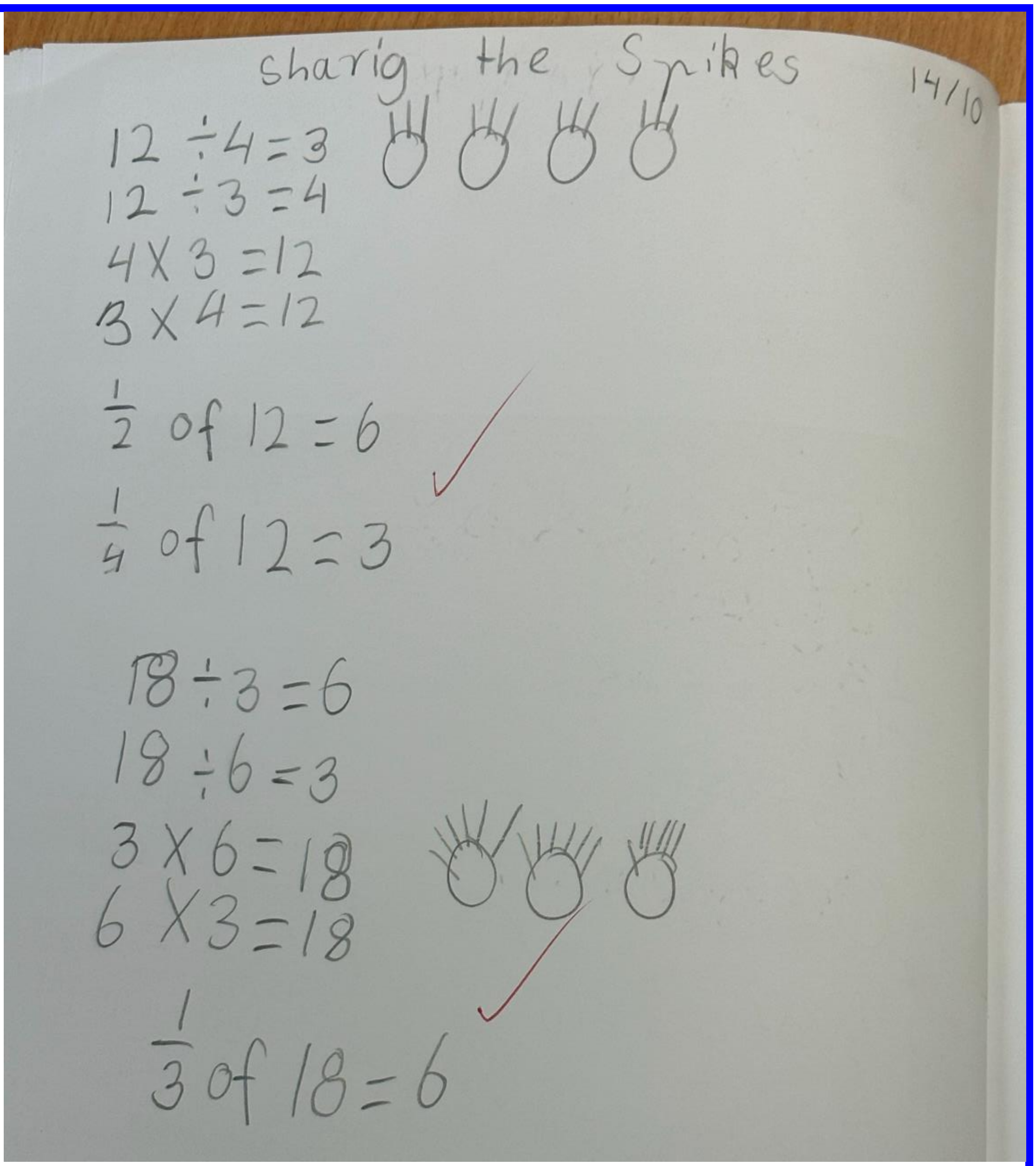
Extension 2: Record the division using multiple representations, such as an array and record the fact family (particularly the inverse multiplication fact):



Extension 3: Write the matching fraction fact. For example, 24 ÷ 3 = 8 is the same as saying, 1 out of 3 equal parts of 24 is 8, because this echidna has 1 of the 3 shares of 24 spikes, and so does this one, and so does this one. So, 1/3 of 24 is 8, or 1/3 x 24, again reading this as 1 out of 3 parts of 24 is 8 or, more abstractly, as one third of 24 is 8.



That means 2 out of 3 parts of 24 is 16 (2 out of the 3 echidnas sharing 24 have 16 spikes) and 3/3 of 24 is 24 (the whole collection/all of them).



Extension student work sample focused on multiple representations and using the materials to uncover connections

Place Value Unit 6: Subitise (conceptual/flexible)

1 of 500 Sequential Lessons for the Early Years

Throughout Foundation and Year 1 as a warm-up to build and consolidate subitising.

Australian Curriculum Version 9 Foundation Number: Recognise and name the number of objects within a collection up to 5 using subitising AC9MFN02

Australian Curriculum Version 9 Year 1 Number: Building knowledge and understanding of the part-part-whole facts to 10, using physical and virtual materials AC9M1N02

Subitise Foundation and Year 1 Lesson 8

Maths Superhero Eyes!

Learning intention: See numbers in different ways (without counting).

Key vocabulary: maths superhero eyes (subitise), "I see…I see…I see…," parts, total (altogether), combinations (ways to make), rotate

Superhero hook: If you were a superhero, what superpower would you want? Invite student suggestions which often include flying, super speed and invisibility. Well, I think x-ray vision is really cool because you can see anything! Do you know that you can have a maths super power? Maths superhero eyes! Everyone can learn this super power through practice, by

Lesson summary: Students show and explain to their partner how they saw each number. Students use their fingers to circle around each part of the plate, then listen to how their partner saw the same collection.

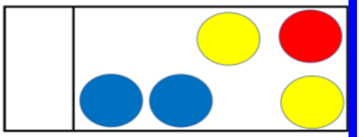
Note the strategic arrangements that make use of colour. Plates can show numbers in their regular formats (like on 6-sided dice), but should also show lots of irregular formats (numbers that are not in their usual dice format):



seeing numbers, not counting 1, 2, 3, but just seeing 3! Let's practise it! Everyone put on your superhero eyes! Students can motion to their eyes and use their fingers to create mini 'goggles.' Consider bringing in your own real goggles as an extra prop for effect; for example, skiing or swimming goggles.

Materials:

- Plates, approximately 10 per pair of students, 100 in total.
- Sticker dots in different colours, ideal for visual learners in particular. **Alternatively, printable versions of dot cards are in the unit folder:**



- *I see, I see, I see* recording template from this unit's folder.
- *Optional extra prop for the hook:* Superhero goggles of some sort – ski mask or swimming goggles to excite students about 'maths superhero eyes.'

Creating the plates tip: When creating the plates, aim to create some that look similar to dice arrangements, but most that do not. For example, show 7 as 4 black dots in the corners and 3 in the middle, or a long line of 5 red dots and two black dots, or 6 in black dots like on dice with 1 extra red on the side. **See the photographs from the first page and following pages for multiple examples.**

Creating the plates tip: In the extension/support sections, it indicates how you may wish to vary the number of dots and type of arrangements for some plates. Make differentiated sets using different coloured plates (for example, mid-level plates are green, support plates are pink and extension are blue).

Creating the plates tip: If possible, create these plates as a team or using education support officers for assistance, so that you can reduce the workload and maximise their use in warm-ups throughout the year, by rotating the materials from class to class. The plates are very durable, lasting for years.

Modelling: Emphasise seeing numbers over counting them. You don't need to count 1, 2, 3, 4 if you can see 3 and see 1, then see 4 altogether. Show students how to do the finger movements, moving their pointer finger around the 3, saying, **"I see 3,"** then moving their finger around the 1, saying, **"I see 1."** Finally, move their finger around the whole plate/total/circumference, saying, **"I see 4!"** Student A does this as student B watches.

Next, student B can do the same plate, showing their partner how they could see the number differently. **"I see 2, I see 2, I see 4!"** always using the **finger movements.** If student B is struggling to see it another way, try turning or **rotating** the plate.

Critical: Do not emphasise speed at first. Emphasise explaining thinking. Otherwise, students simply learn to count very fast, not subitise.

Use the word **combinations** to describe this: 4 can be made using 3 and 1, or 2 and 2. It can be made using different combinations. This part (3) and this part (1) make the **total** 4. This part (2) and this part (2) also make the total 4. There are lots of ways or combinations that make the same number! Students record what they see using the ['I see, I see, I see' template]() in this unit's folder.

Use your super hero maths eyes! Name:

I see…	I see…	I see…

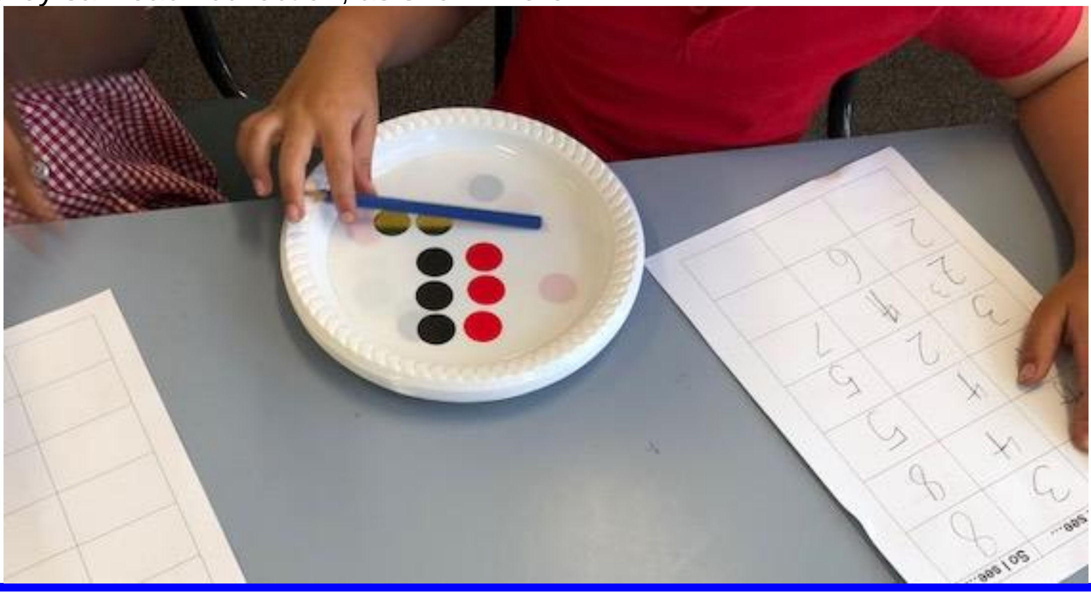
Best set-up: Model with a student partner at a demonstration desk, **particularly emphasising the finger movements.** Students practise with their regular maths buddy. Consider also using a *Subitising PowerPoint* from this unit's folder, as a quick 'superhero eyes' warm-up for the whole-class.

Questioning:

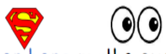
- How did you see that plate? What parts did you see?
- Can you show me your "I see…I see…I see…?"
- Emphasise for partners to try to see the number differently to their friend. Did you see it another way? Can you? What if I **rotate** it like this?

Class management tip: When students finish a set, ask them to return it to a pile in the middle of the room and collect a new pile. If you have colour-coded the plates by difficulty level, you can simply ask students to ensure they collect a pile that is the same colour. As students show they are improving or struggling, you can fluidly change the challenge level for them by altering the colour plates they are working on with their like-ability maths buddy.

Some students prefer using a pencil, rather than their finger, to show how they saw each collection, as shown here:

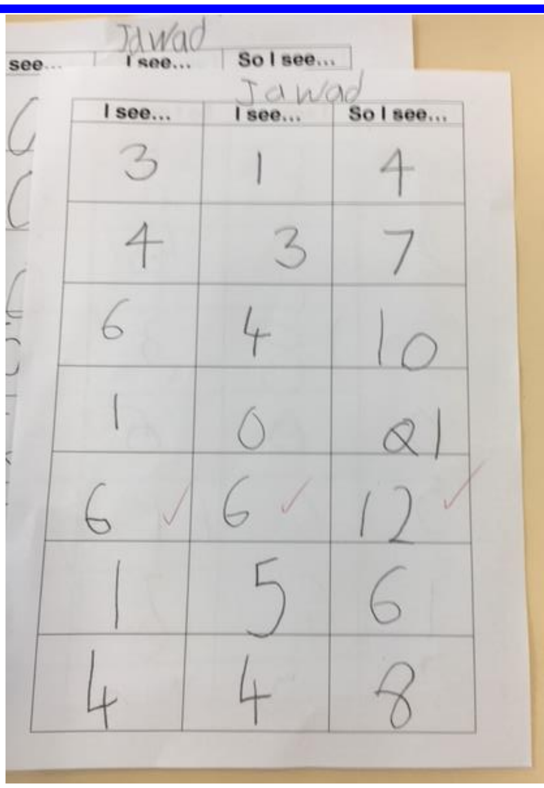


Most students complete 2 or 3 double-sided pages of the [recording template,](recording template) working on this for about 30 minutes of the session.



Use your super hero maths eyes! Name:

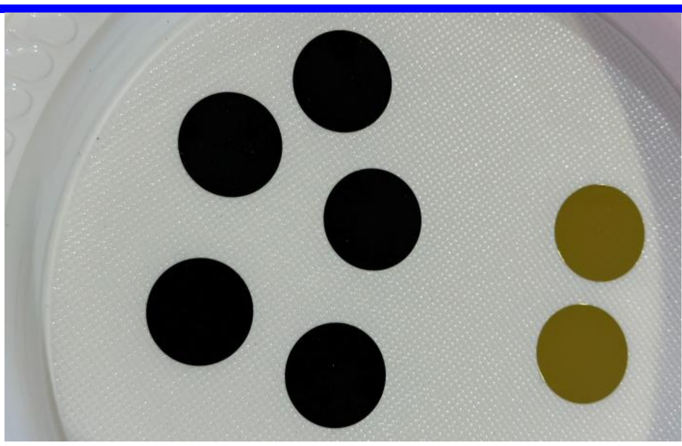
I see…	I see…	I see…



"I see 4,
I see 4,
I see 8!"

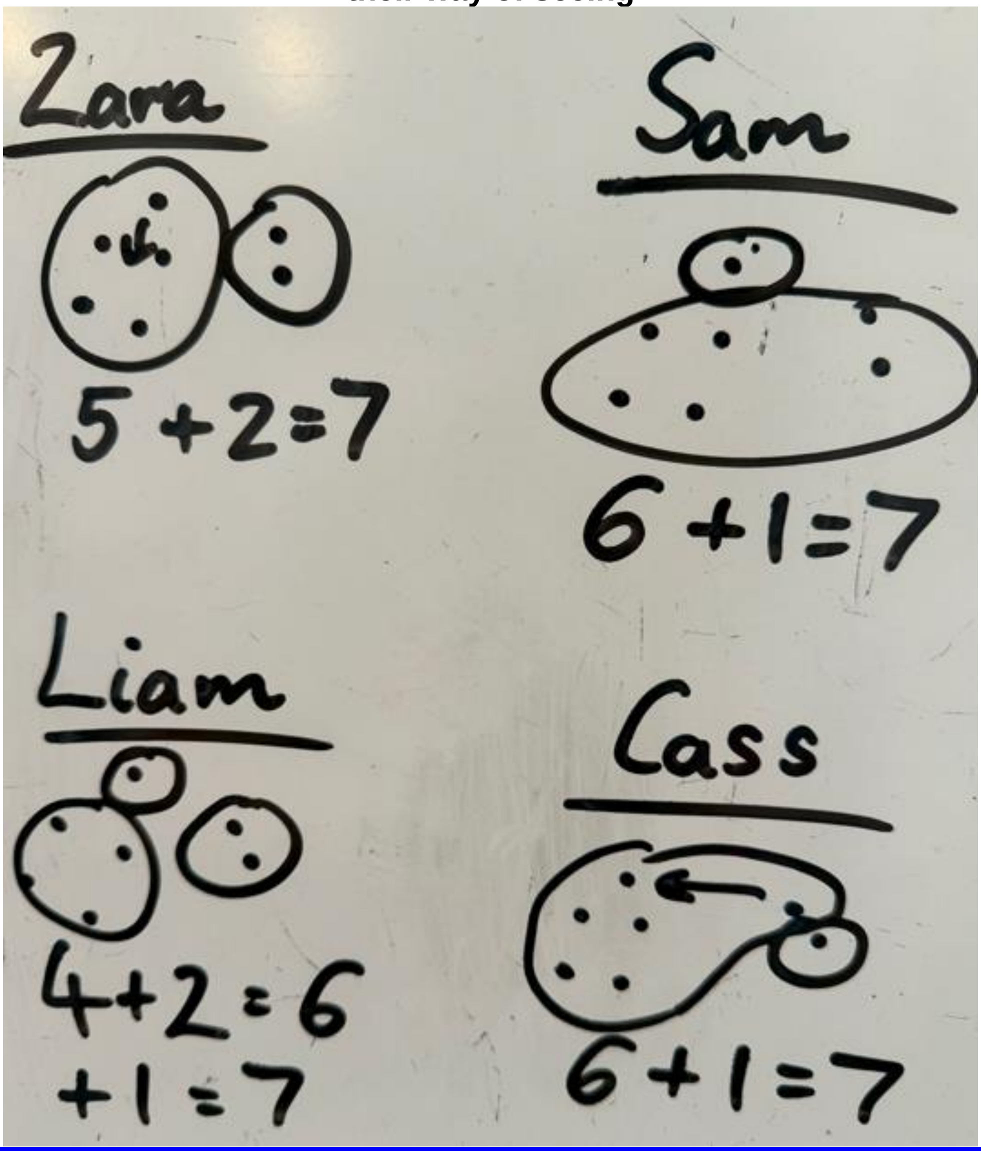
Encourage students to see the collection using large parts. For example, avoid students saying, "I see 2, I see 2, I see 2, I see 2, I see 8," as this is not an efficient way to see 8. Instead, encourage the student to see 4 and 4, or 6 and 2. If this is not possible, the student may need to work on smaller plates, until they become confident at subitising 4 as a set of 2 and 2, before making the leap to subitising 4 twice and seeing this as 8.

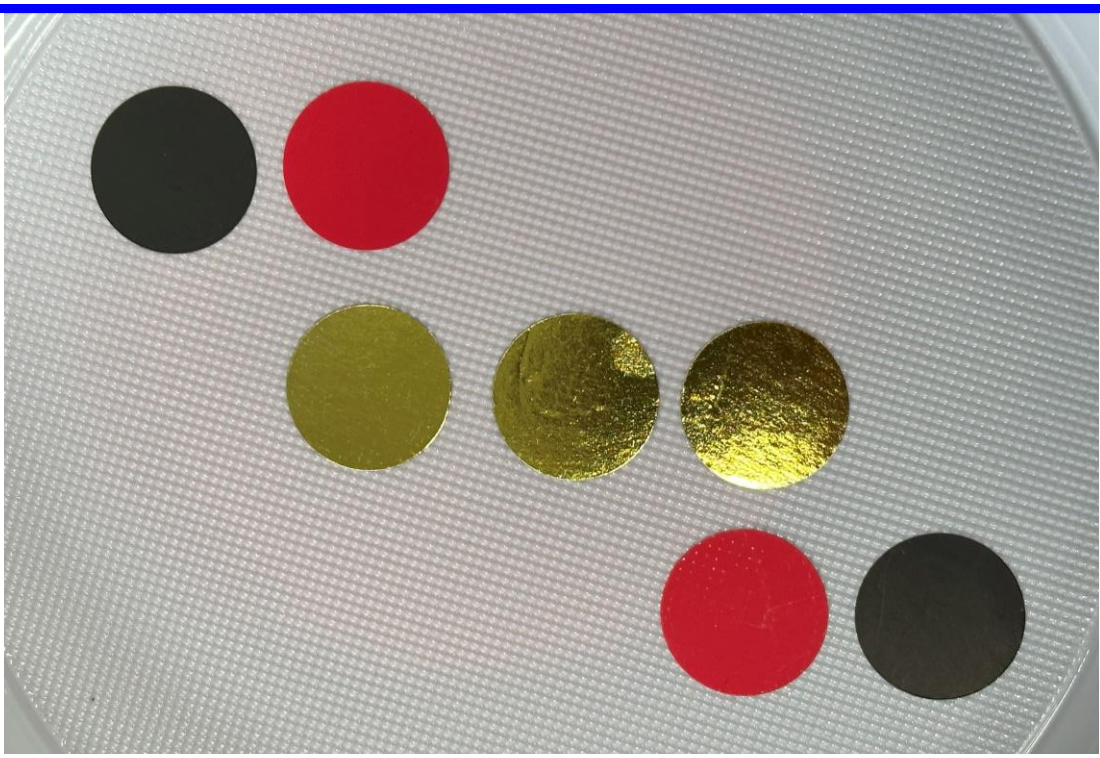
This provides a much deeper, richer understanding of the numbers to 10, far beyond just learning single-digit addition equations by rote. This is because students start to authentically trust and, after consistent warm-up practice at subitising over two terms, instinctively know that 4 and 4 makes 8. It builds the foundations for partitioning the numbers 3 to 9, doubles and the 10 facts. It also greatly assists with subtraction, particularly the later developmental step of fact families. For example, if you trust that 3 and 5 makes 8, then you can more easily form the connection that 8 take away 3 makes 5, and 8 take away 5 makes 3.



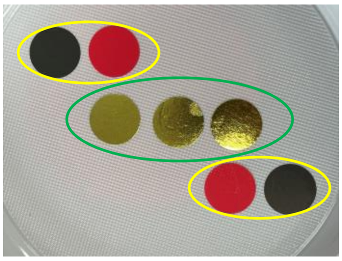
Dot talk recording

Teacher uses a whiteboard to record while each student is explaining their way of seeing

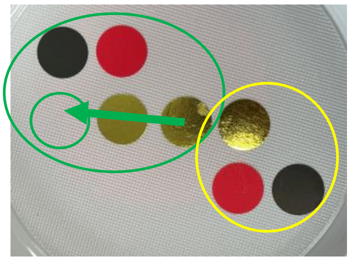




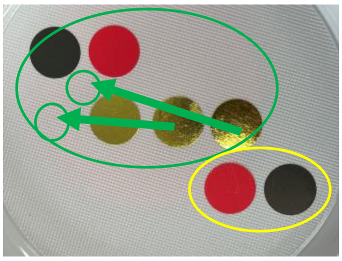
How many different ways could you see this plate?



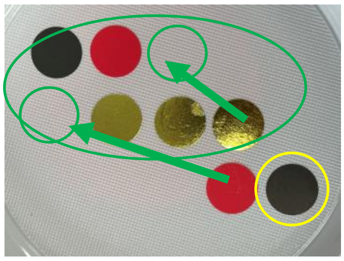
I see 3, I see 4, I see 7!



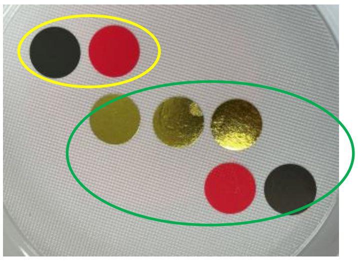
I see 4, I see 3, I see 7!



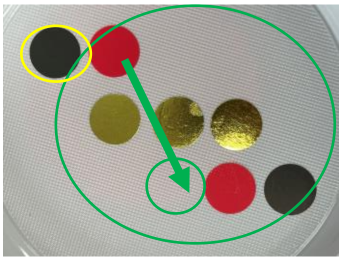
I see 5, I see 2, I see 7!



I see 6. I see 1. I see 7!

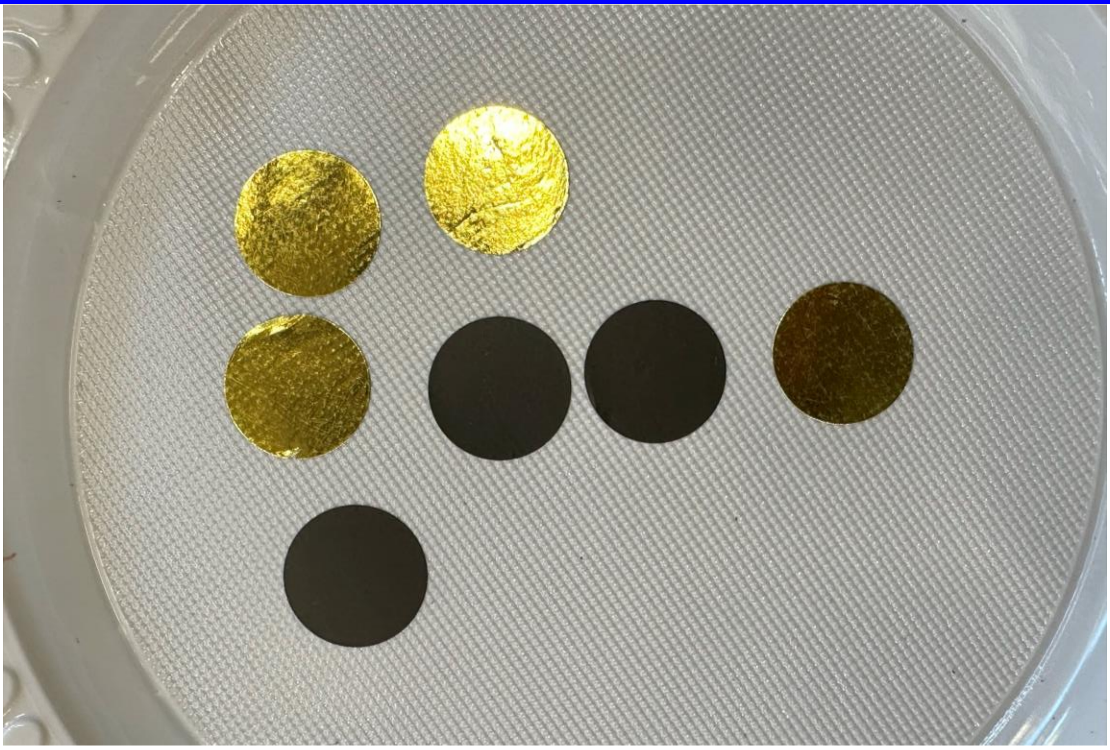


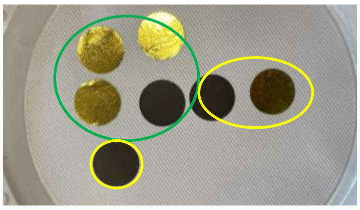
I see 5, I see 2, I see 7!



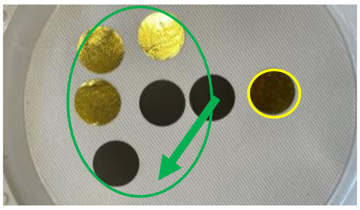
I see 1, I see 6, I see 7!

Move dots with your eyes to create friendlier/easier arrangements to see, particularly to create dice formats (in that way, using skills from Subitising Unit 5). For example, above dots have been moved to visualise 6 as it looks on the dice as two rows of 3, or four like a dice with one dot in each corner.

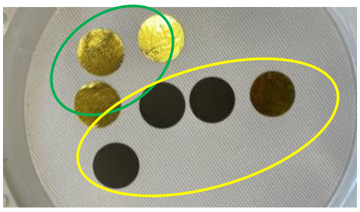




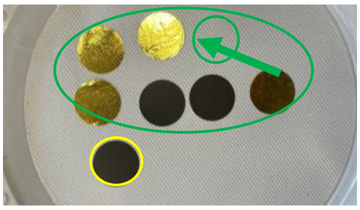
I see 4, I see 3, I see 7!



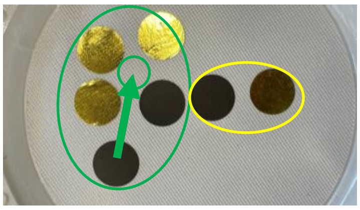
I see 6, I see 1, I see 7!



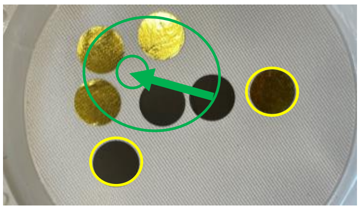
I see 3, I see 4, I see 7!



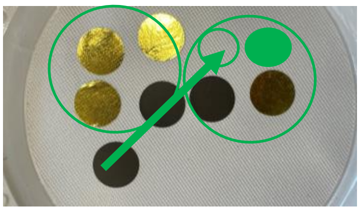
I see 6, I see 1, I see 7!



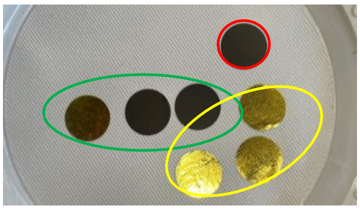
I see 5, I see 2, I see 7!



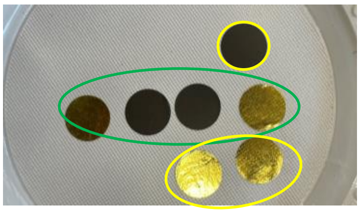
I see 5, I see 2, I see 7!



I see 4, I see 4, take away 1, is 7!

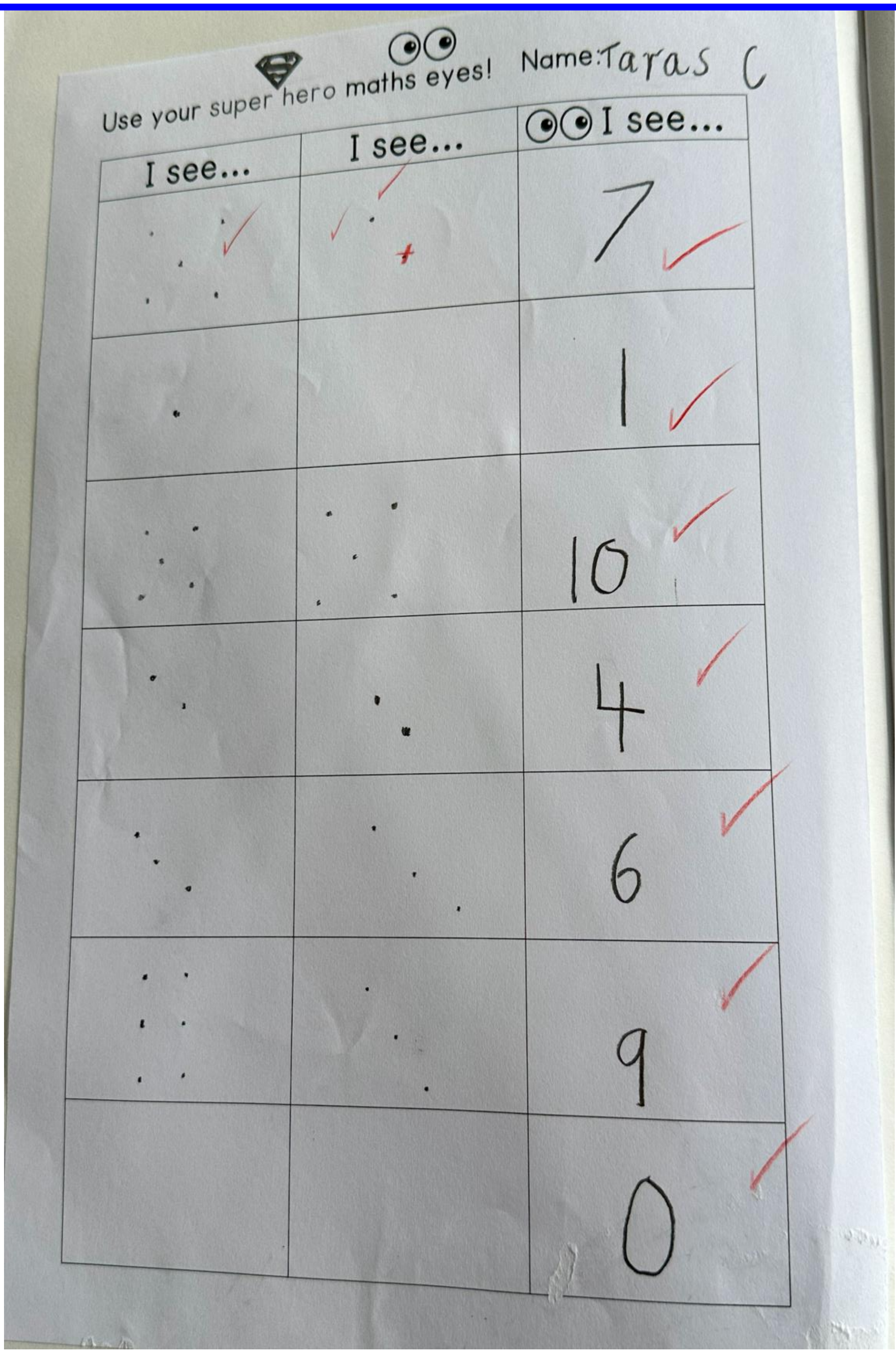


I see 3, I see 3, I see 1, I see 7!



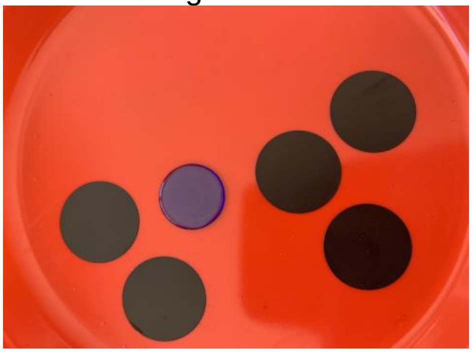
I see 4, I see 3, I see 7.

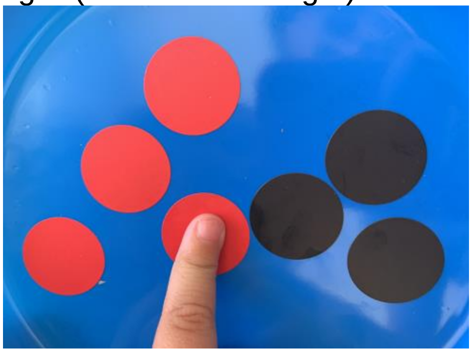
Rotating the plate can help create more ways to see. The best way to see is usually by combining the biggest part possible to make solving easier (for example, 6 and 1, as the total is easiest to solve in that way). Avoid "I see 1, I see 1, I see 1…," or "I see 2, I see 1, I see 1, I see 2," as it becomes too hard to solve the total at the end of all this.



[I see recording template]

Follow on option: The next day, focus on one more, with students identifying the number on the plate, then adding an extra dot as a counter (shown on the left). Later, focus on one less, with students identifying the number on the plate, then covering one dot with their finger (shown on the right).





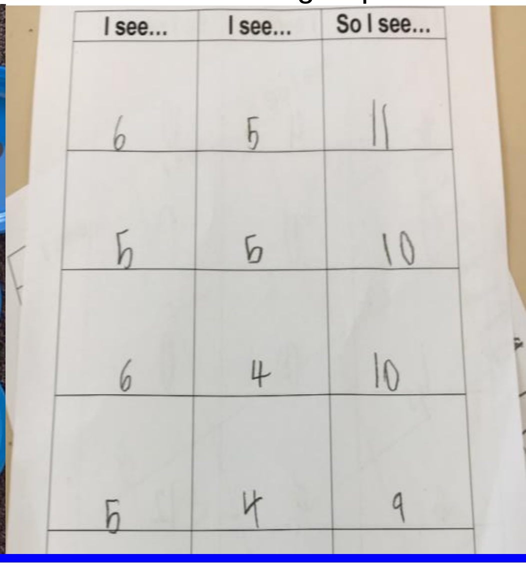
Record using the *one more and one less box recording templates* from the Place Value Unit 8 folder, which are colour-coded for students.

Support 1: Continue to play Bingo using the templates from Subitising Unit 5**.** Roll 3 dot-dice or 6-sided dice (depending on their current progress) to continue to practise subitising with regular dice formats up to 3, or up to 6.

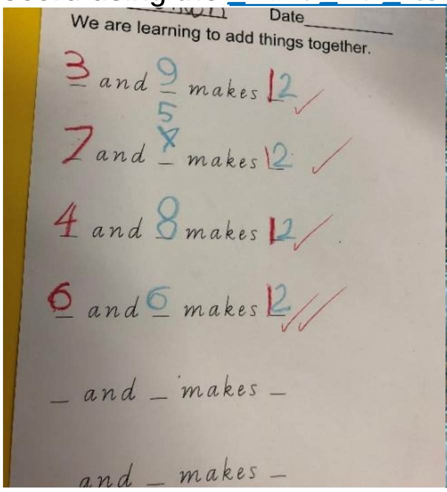
Support 2: When making the plates with your team, create a support set that only goes up to 4 dots per plate. Include plates with just a single dot (in mixed positions, not just the centre), and plates with just two dots (a gold and a black one, or just two gold, or two black).

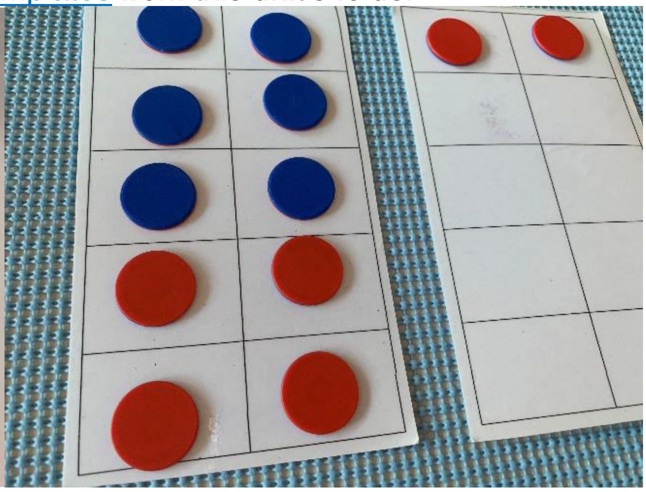
For recording, if these students cannot yet use digits for quantities, draw what they see as coloured dots in the boxes of the *I see* template.

Extension 1: When making the extension plates, create sets with up to 12 dots in mixed arrangements, including combinations with three colours. Also include some multiplicative thinking; for example, 12 as 2 sets of 6 with 1 set in red and 1 set in black, or 12 as 4 sets of 3 dots in coloured groups.



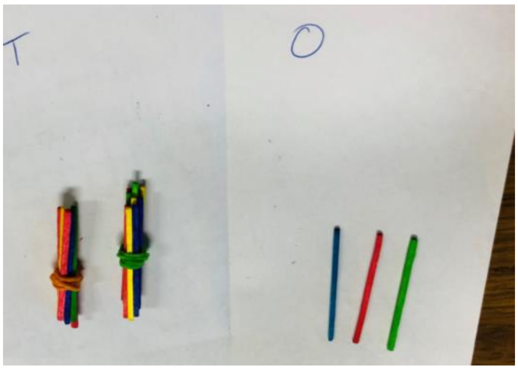
Extension 2: Use two ten frames and two-sided counters to investigate all the ways to make a teen number, such as 12. Change the colours by flipping the counters, creating many different combinations that make 12.
Record using the _ *and* _ *is* _ templates from this unit's folder.





Extension student work sample

Extension 3: Grab a handful of craft sticks and place these on a blank page. Both partners estimate the total, then bundle them into groups of 10 with rubber bands in a T-O chart, to make the total easy to subitise.
Use the finger movements to show how they saw it, "I see 2 tens, I see 3 ones, altogether I see twenty-three."
Use the number spelling assistance chart to record in its worded form too.
Extra challenge: How far off was your estimate from the total?



Subtraction Unit 7: Use Fact Families to Subtract

1 of 500 Sequential Lessons for the Early Years

Australian Curriculum Version 9 Year 1 Number: Add and subtract numbers within 20, **using physical** and virtual materials**, part-part-whole knowledge to 10 and a variety of calculation strategies** AC9M1N04

Fact Families Year 1 Lesson 2

Post-it Note Fact Families

Learning intention: Use addition to help you solve subtractions.

Maths vocabulary: fact family, turnaround fact, addition number sentence, subtraction number sentence, horizontal, halfway mark

History and growth-mindset link: Read the following Wonderopolis article with students wonderopolis.org/wonder/who-invented-sticky-notes. The inventor of post-it notes invented them by mistake! He was trying to invent a super strong glue, but he invented a very weak one by mistake! He essentially failed. That mistake he made was so good that he invented one of the world's most popular products! That shows mistakes are great opportunities!

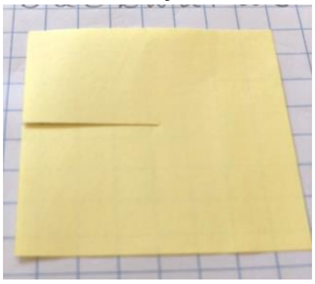
Lesson summary: Students use post-it notes to create fact families.

Materials:

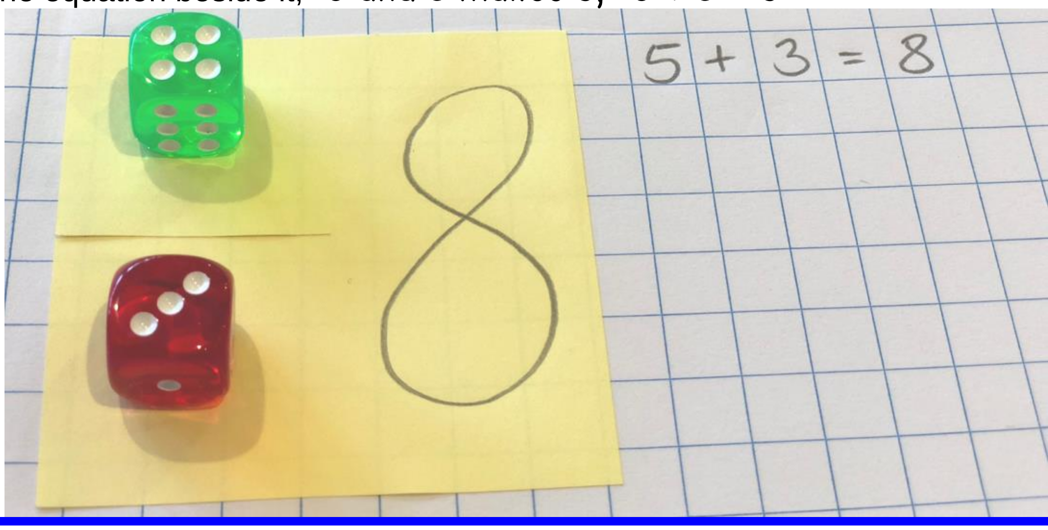
- Post-it notes distributed in small piles to the middle of group desks.
- Two 6-sided dice per student.

Best set-up: Fishbowl model with A3 yellow paper as your giant post-it note examples, followed by a normal-sized example in a support student's maths book. **Tip:** Always use support students' maths books for your modelling. This way, the examples are at the top of their page. Students then work independently.

Modelling: Create a few A3-sized examples together around a modelling desk. First fold the post-it vertically in half. Unfold the post-it and slice horizontally to its halfway mark, so that it can flap like so:



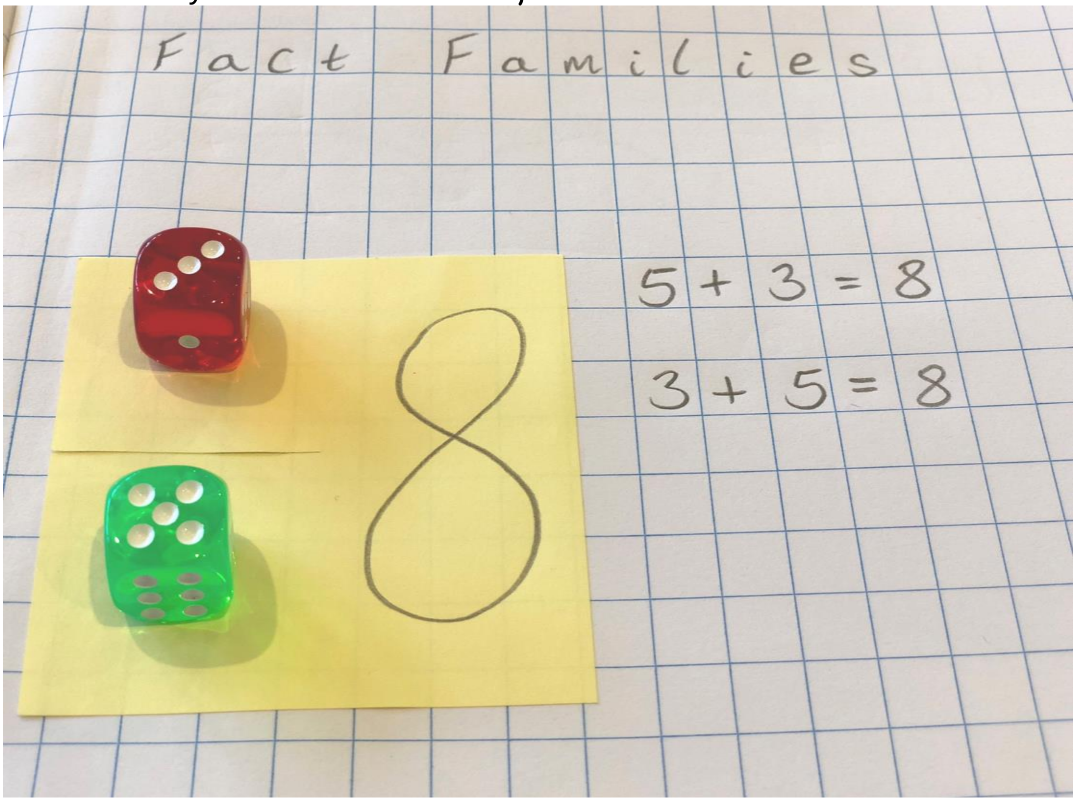
Stick the post-it on the left-hand side of your page. Roll two 6-sided dice. Put the dice on the two flaps and write the total on the other side of the post-it note. These are the 3 numbers that live in your **fact family!** Write the equation beside it, "5 and 3 makes 8," 5 + 3 = 8



To celebrate taking a risk and the great things that can happen when you are brave enough to make mistakes, we are doing post-it note maths today!

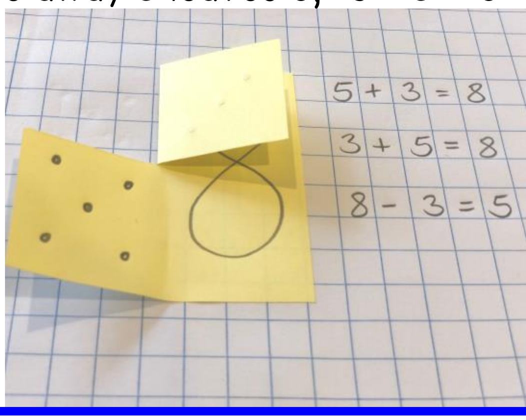
Now switch the position of the dice. Students could use the catchphrase, “Change places!” from a hook experienced in the previous Addition Unit to build their understanding of **turnaround facts / commutativity** (youtube.com/watch?v=8tYXfssLOSM).

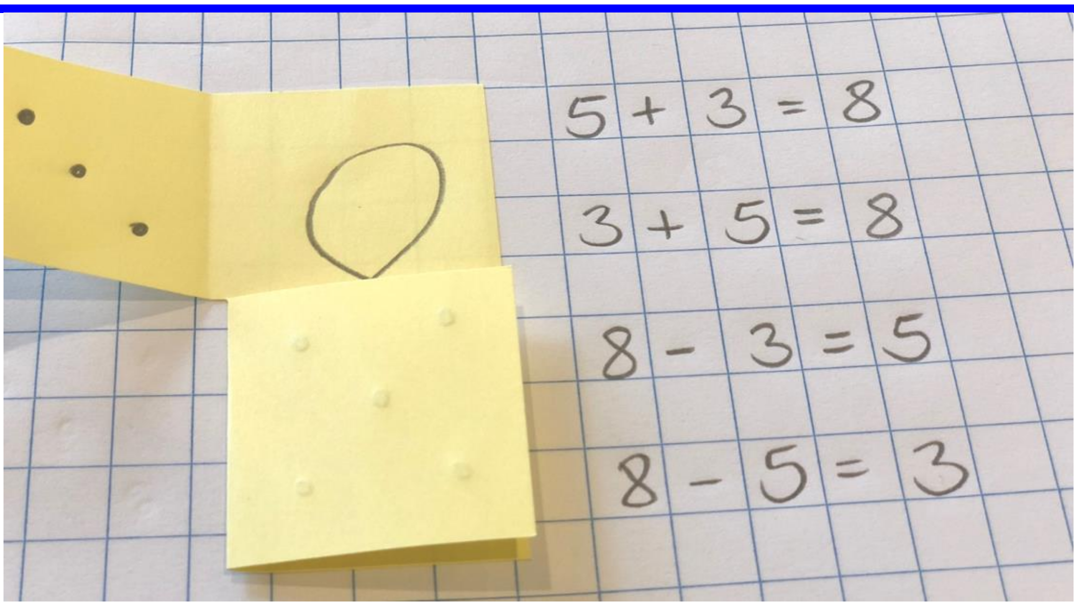
Switch the dice to write the other **addition number sentence** that lives in this fact family: “3 and 5 makes 8,” 3 + 5 = 8



As you remove the dice, draw the dots on the flaps.

For subtraction, **start with the total (8) and fold over one of the flaps.** Say the sentence as you do it, “8 take away 3 leaves 5,” 8 – 3 = 5



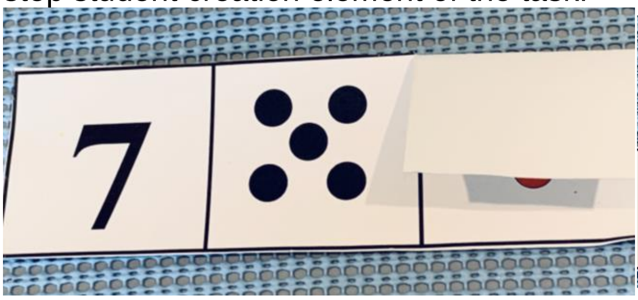


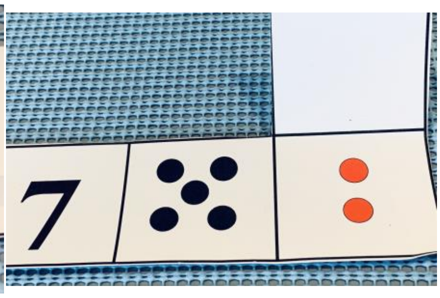
For the final subtraction fact, start with the whole again (8) and cover it with the other part (5).
Say it as you do it, "8 take away 5 leaves 3," 8 – 5 = 3

Questioning:

- What does 2 and 5 make? If you know 2 and 5 makes 7, do you know 7 take away 2? Do you know 7 take away 5?
  Encourage students to use a **fact family/think addition strategy** to solve subtractions, moving on and progressing from a counting back strategy, particularly if they are still reliant on their fingers to subtract (Subtraction Unit 3). Use the wording: For 7 take away 5, think <u>*5 and what*</u> makes 7? If particular students are struggling this with concept, return to tasks from Subtraction Unit 4 (counting on/difference between concept) and Addition Unit 4 (partitioning the numbers 3-9).

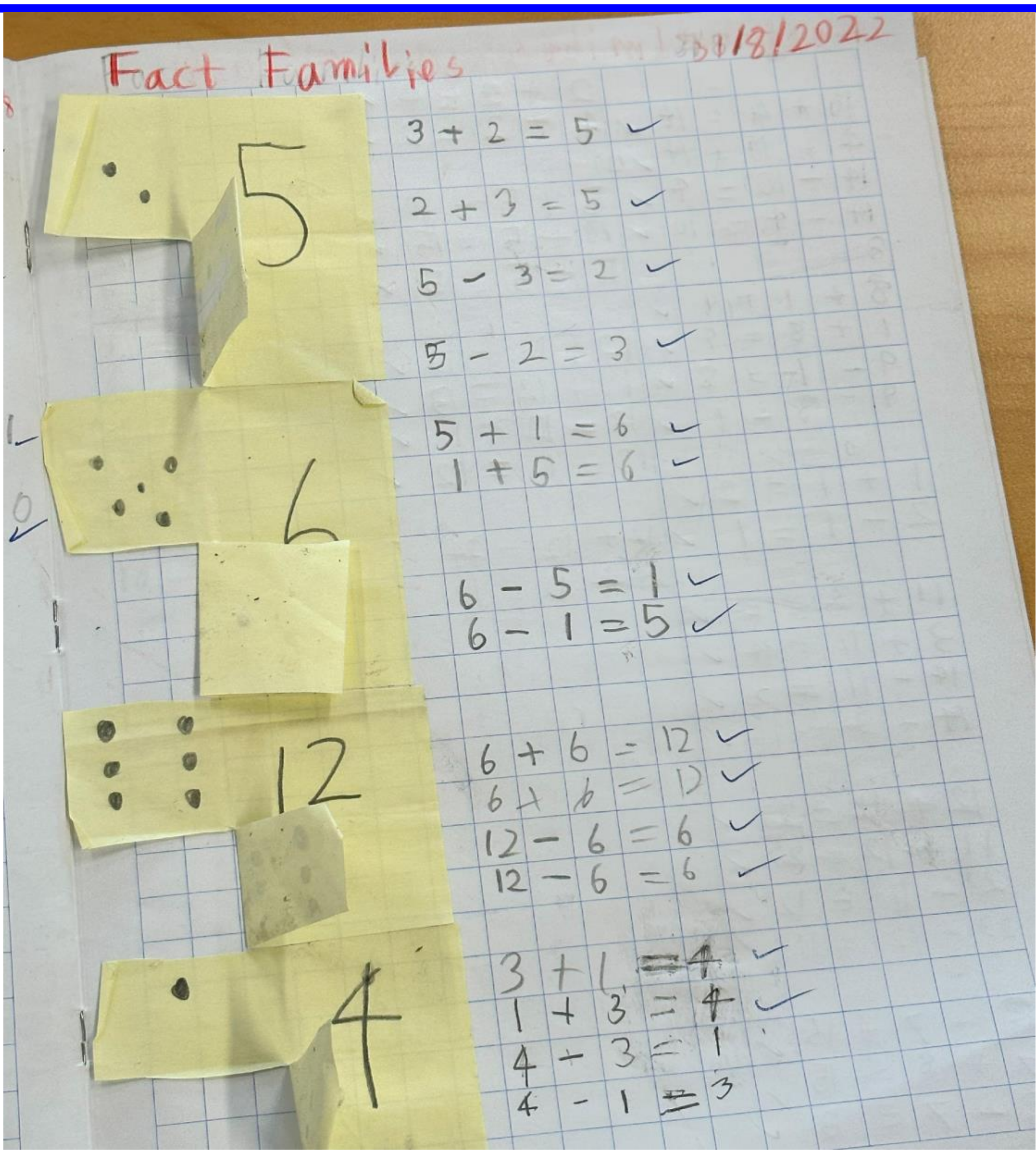
Support 1: ***Play fact family hide-and-seek instead with a like-ability partner:*** If the instructions to create the post-it note flaps are too much for these students, use the *Missing Part Cards* (shown below) from this unit's folder. These are similar to the post-it note flaps, but remove the step-by-step student creation element of the task:



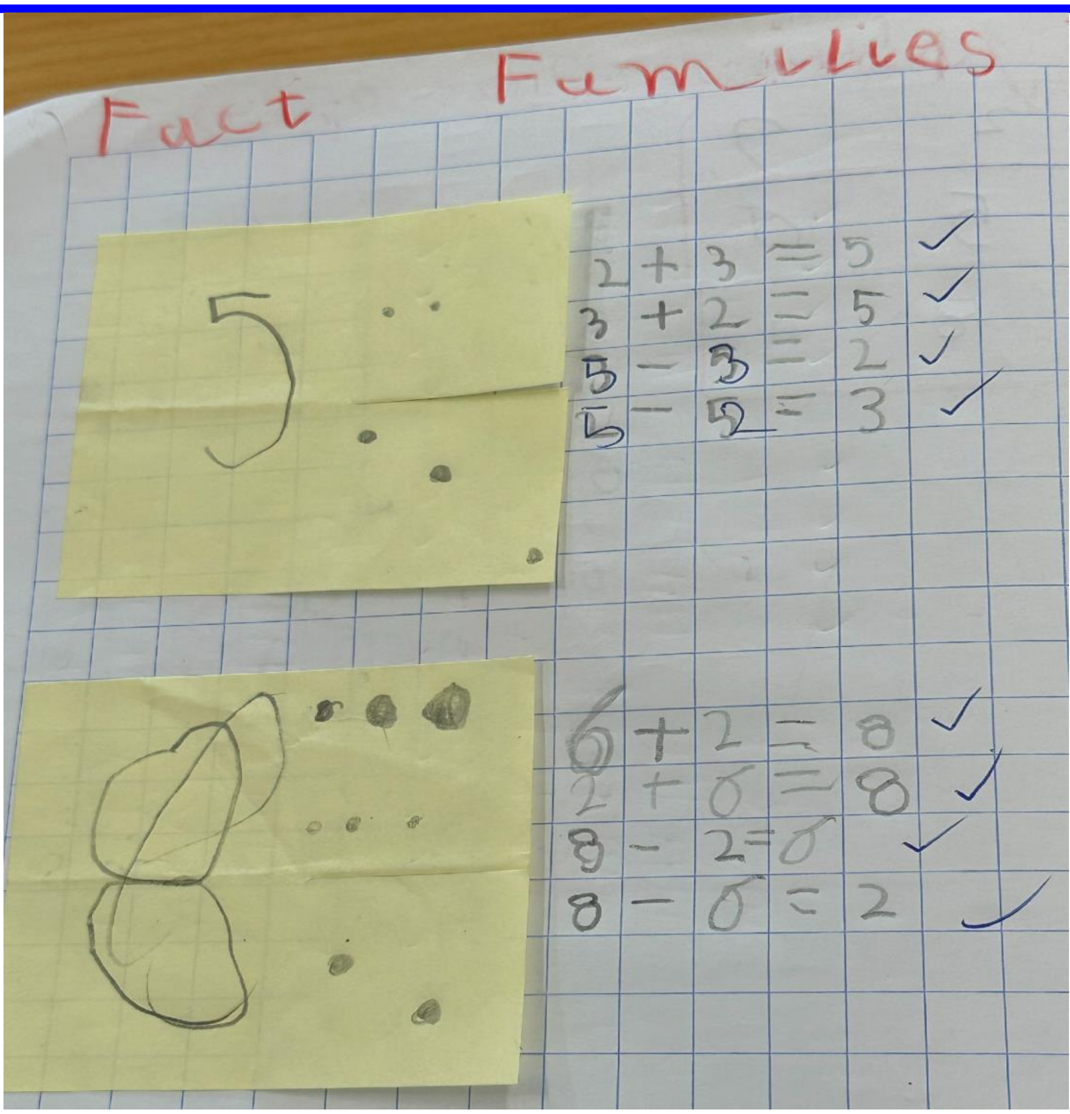


"What's hiding?" Write the matching addition and subtraction sentence for that hide-and-seek card:
5 + 2 = 7 7 – 2 = 5

Support 2: Use 3-dot dice (with 1 on two sides, 2 on two sides and 3 on two sides) to keep their fact families within 6. If unavailable, adapt any dice you can write numbers onto to create 3-dot dice.



Student work sample

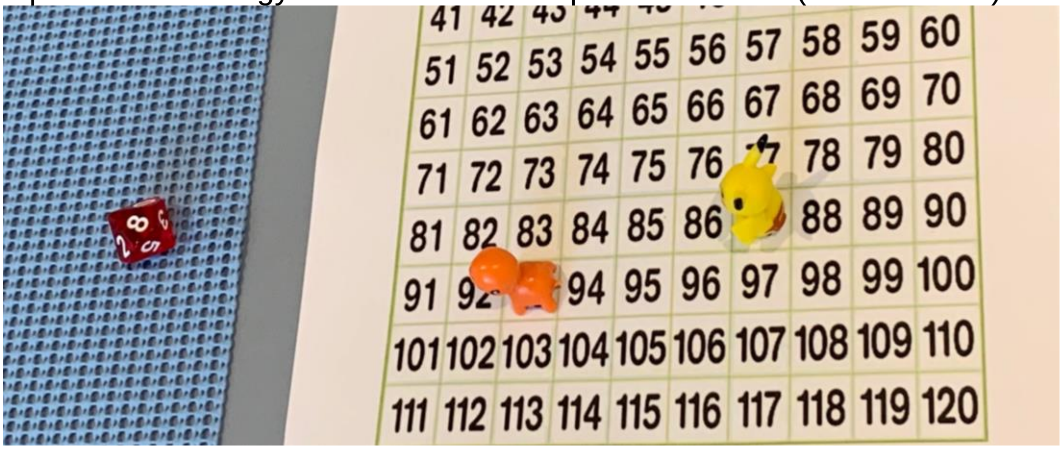


Before further extension: First, orally assess these students to ensure that they are consistently using a fact family strategy to subtract. For example, “What’s 9 take away 6?” Does the student say 3 straight away *and* can they explain how they did it – ‘I know 6 and 3 is 9, so I know 9 take away 6 will be 3’ – or did they just count back very quickly: 8, 7, 6, 5, 4, 3.

Students need to be able to fluently solve subtractions from numbers up to 10, then 20, within 3-5 seconds of thinking time, before moving to extension options. Students also need to know how to explain their strategies, including how they used difference between/count on (Unit 4), backwards 10 facts (Unit 5), backwards doubles (Unit 6) or a fact family/think addition strategy (this unit) to solve a subtraction. This ability to explain is critical, in order for students to apply these strategies to more complex equations later, and still be able to show their working out.

Extension 1: Change the type of dice in use to generate the first two numbers in the fact family. Use two 10-sided dice, then two 20-sided. Use place value tens dice as well (dice that show 10, 20, 30, and so on). For example, if you know 3 + 4 = 7, you also know 30 + 40 = 70, 70 – 30 = 40 and so on.

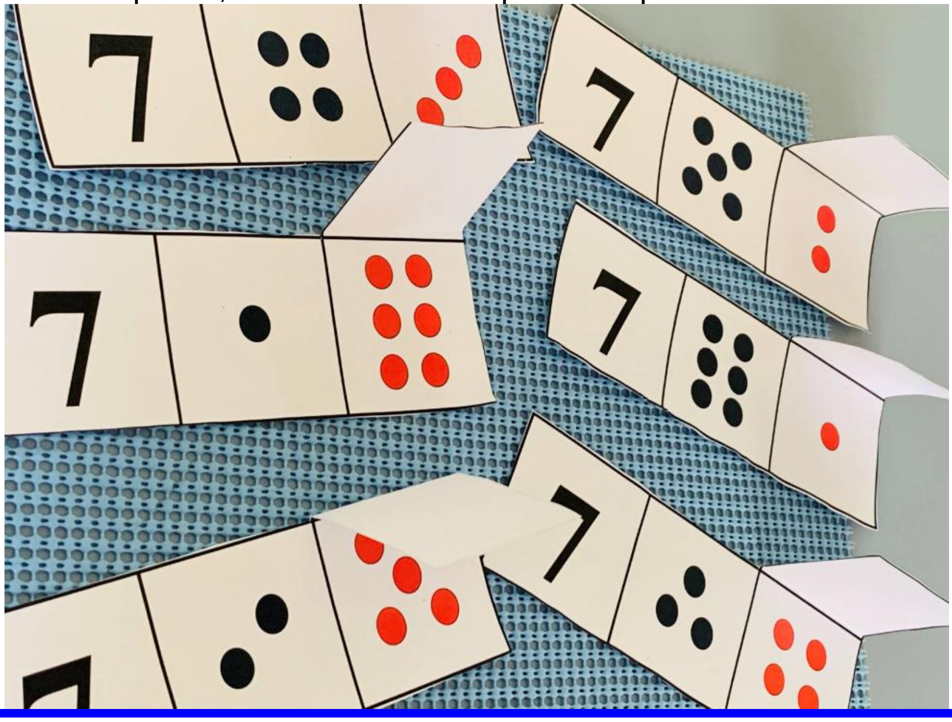
Extension 2: Play a race back to 1 game to apply their knowledge of fact families to subtraction from two-digit numbers and show their strategies. Start their counter at 120. Roll a 10-sided or 20-sided die and race against a like-ability partner to be the first to reach 1. Each time they subtract, explain their strategy in a 2-column set up in their books (shown below).



For example:

Subtraction equation	Strategy
120 − 6 = 114	I used backwards 10 facts 10 − 6 = 4 so 120 − 6 = 114
114 − 7 = 107	backwards doubles 14 − 7 = 7 so 114 − 7 = 107
107 − 3 = 104	fact families 3 + 4 = 7 so 107 − 3 = 104

Ongoing practice: Continue to use the missing part cards as warm-up and warm-down options, as well as a home practice option:



Place Value Unit 14: Rounding and Estimation

1 of 500 Sequential Lessons for the Early Years

Australian Curriculum (curriculum gap): The curriculum does not mention rounding to the nearest ten at any grade level. This is a significant gap in the developmental sequence, which leads to obstacles for estimation in Year 3 **AC9M3N05.** Recommended for Year 2.

Estimate and Round Year 2 Lesson 5

Snakes and Ladders Rounding

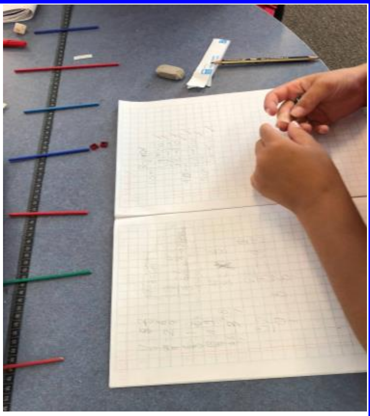
Learning intention: Round to the nearest ten by seeing which ten you are closer to along a number line.

Maths vocabulary: round (which ten are you closer to), nearest ten

Game-based learning: Who has played snakes and ladders before? Today, we are playing the maths version of snakes and ladders! Play an online version with the class during eating time the day prior to this session: https://m.twoplayergames.org/play/snakes-and-ladders.html. Or play on a school gameboard outside during eating time, if one is available:

Lesson summary: Students race to 100 along a measuring tape (using it as a number line), moving to the rolled position and then sliding up to the next ten if they roll 5-9 on the 10-sided die, but going back to the previous ten if they roll 0-4. *Do not tell students this – let them figure it out by literally seeing **which ten they are closer to** as they play the game.*

Materials:

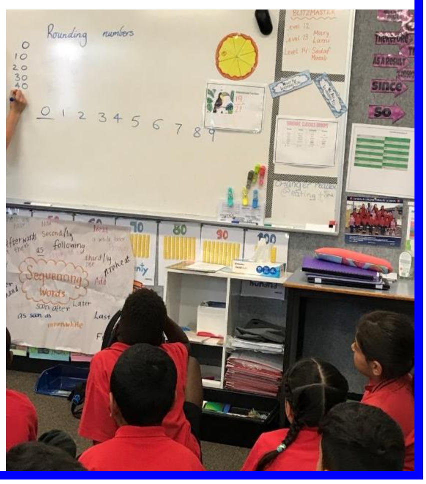


- 100 or 150cm measuring tape stuck to each desk with Blu Tack – one per pair.
- Thin bundling sticks (preferable) or popsicle sticks to mark each ten along the measuring tape – put a stick at 0, 10, 20, 30 up to 150.
- Small counters (one per student) to mark their current position, such as a ones place value (MAB) block or other $1cm^3$ counter (it must be 1cm or less in width).
- 10-sided dice – one per pair.

Best set-up: Start with the 'digits vs. numbers' whole-class discussion below. Set up the materials on desks before the at-desk teacher modelling. Then students work with their like-ability maths buddy.

Modelling: Write all of the digits on the board. Make a distinction between digits and numbers. If maths had an alphabet, digits would be the letters, and numbers would be the words. Letters make words, digits make numbers.

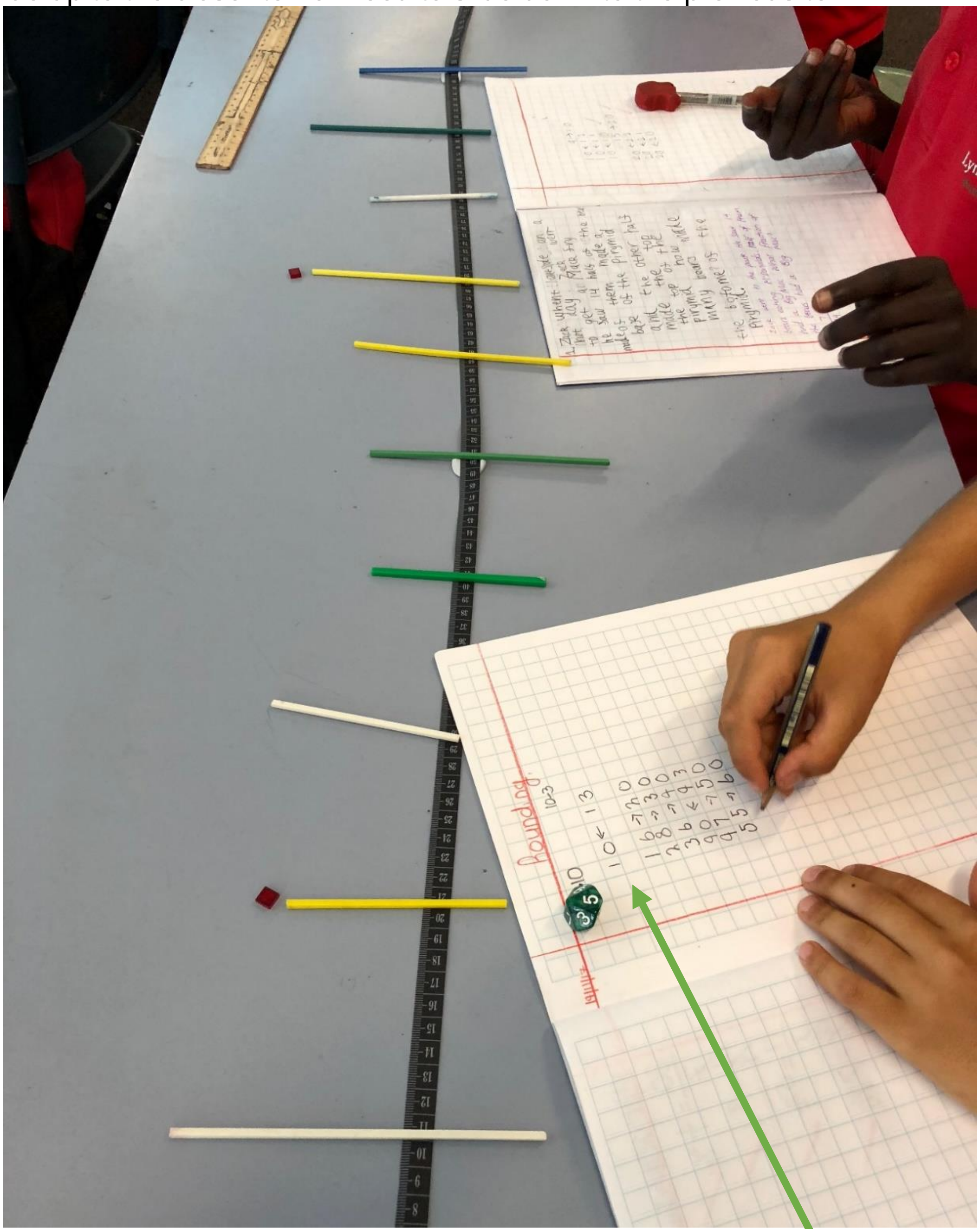
Digits follow certain patterns when we round them to the nearest ten – today your challenge is to figure out the pattern that each digit follows and why. ***Tip:*** Don't 'give away the gold' by telling students straight away that 0-4 stay in the same ten and 5-9 rounds up! Let them work this out.



Pointing to all the digits on the board – "Which digit looks the most round?" Some students will say 8 but most will say it is 0. Therefore, all our rounding numbers will end in zero – they will all be tens numbers. Ten is an important number in our place value system for renaming, but for rounding too!

YouTube hook: You wouldn't want to roll down one of these snakes during a game of snakes and ladders! A countdown of some of the world's longest snakes: youtube.com/watch?v=WViqKHq96mw Play during an eating time before or after the session since the clip is 6 minutes long.

First, set up an example desk (which could be the desk of your support pair). Stick down the measuring tape with 0 on the left. **Count by tens to place the counting sticks along the line. These sticks are effectively the ladders of the game or the snakes,** depending on whether students get to slide up to the closer ten or need to slide down to the previous ten.



Note the recording in this student work sample.

Modelling (after students have set up desks): Start at 0. Roll the 10-sided die. If you roll 3, move your counter up to '3.' Now, which ten/stick am I closer to? 0 or 10? You can visually see that my counter (on 3) is closer to 0, not 10. So that's a snake – oh no!

Next turn, I roll 7. I'm closer to 10, so I can move to 10 – woohoo!

Next turn, I roll 2, so I move up to 12. Am I closer to 10 or 20? I'm closer to 10, so back I go!

To record, students write the number they landed on in the centre of their page, ‘3,’ then use an arrow to show the tens number they rounded to:

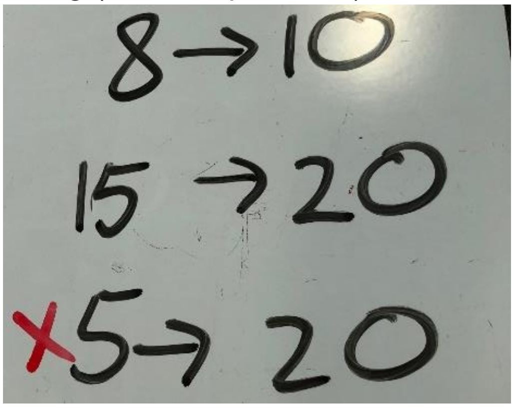
0 ← 3

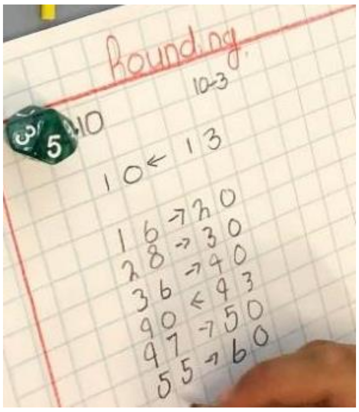
If a student rolled ‘7’ and they were on 30, they would record it like this:

37 → 40

Misconception alert: Emphasise that students should not record this as ‘7 to 40,’ because 7 does not round to 40! 37 rounds to 40, and you were on 37, not 7. If you record ‘7,’ not ‘37,’ I will have to slide you back to ‘7’ when I see this, which will give your partner a *huge* advantage. This is the most common recording mistake, so model for students to avoid this from the start of the session during your whole-class modelling at the desks.

Students must record as they play, but only need to record their own position and rounding (not their partner’s):



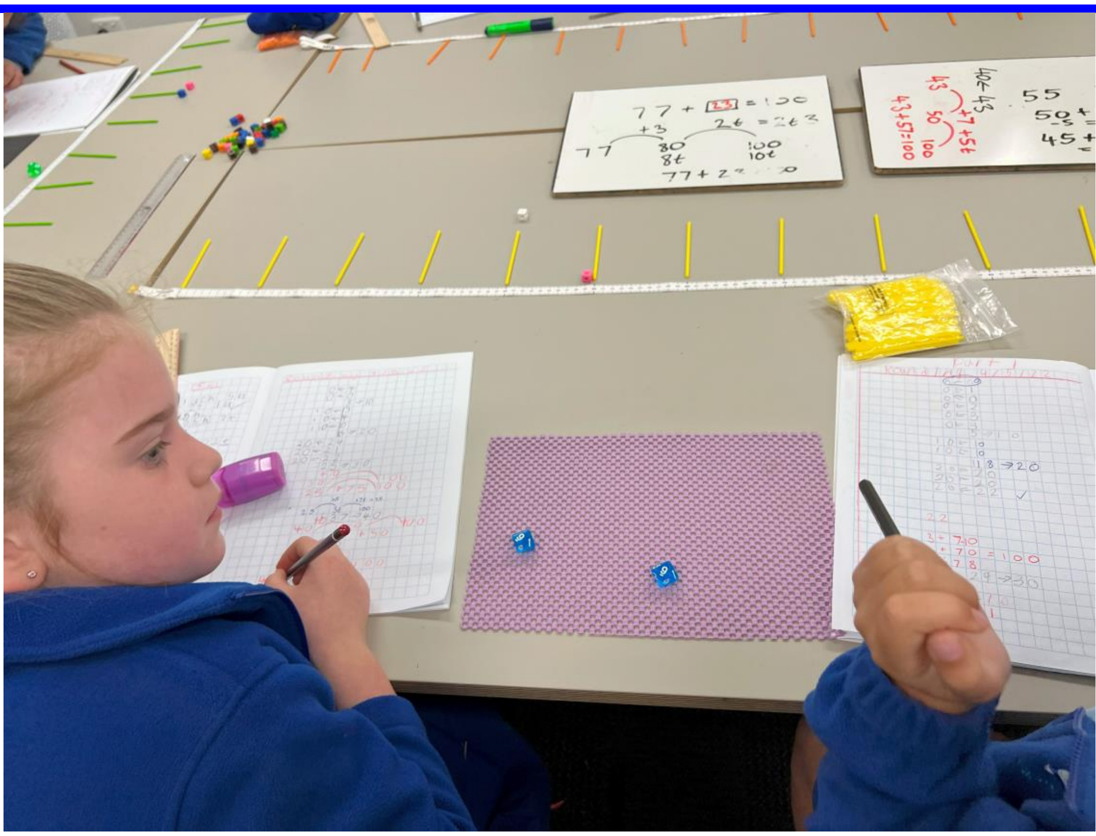


Questioning:

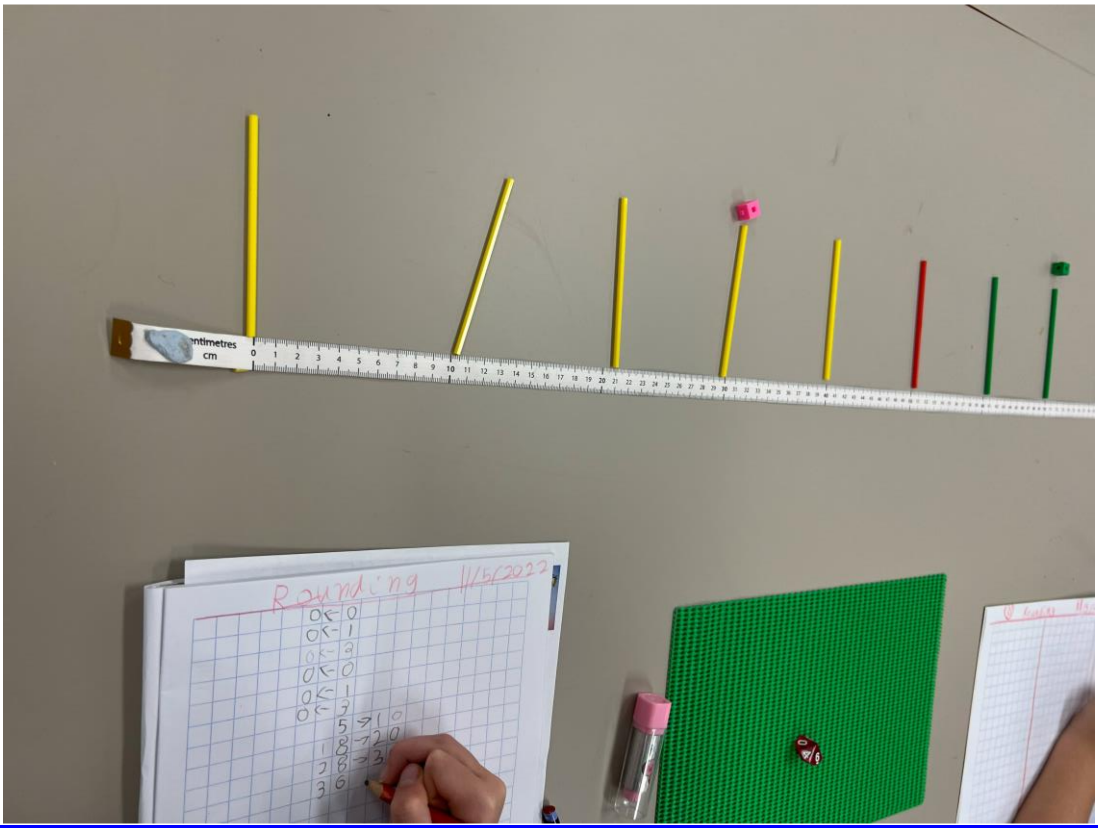
- What if I rolled 5? Well, it’s right in the middle, so of course you are going to choose to use it as a ladder, not a snake.

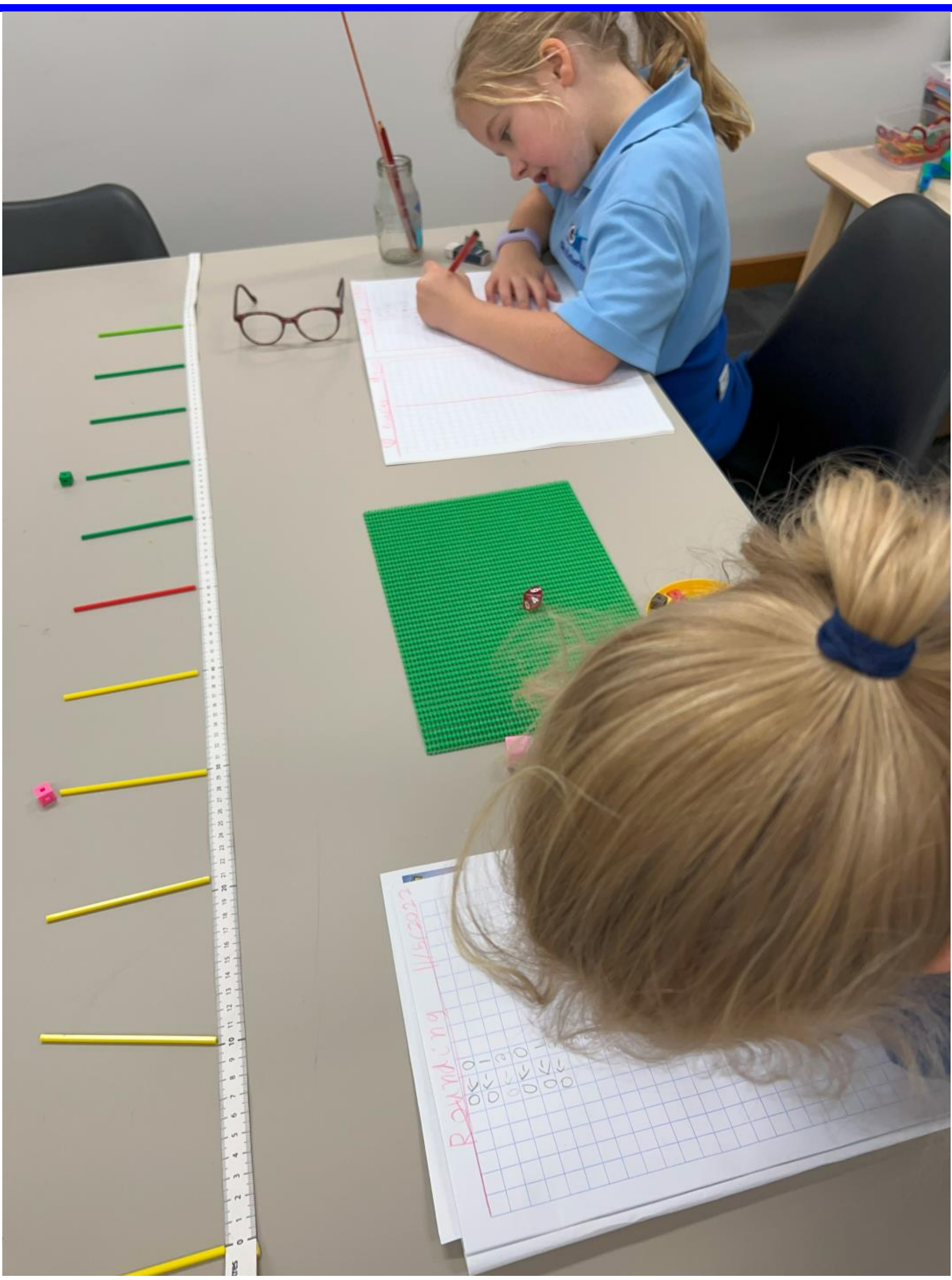
Big challenge: Why does 5 go up? It is in the middle, so why not go down, or stay on 5? There is a mathematical reason to explain why 5 rounds up. Try to work it out and think about this while you play the game. For the purposes of the game, treat ‘5’ as a ladder/go up, but by the end you need to explain why.

Answer to why 5 rounds up: If we count on our hands, there are 10 digits, but 10 is not a digit – it is a two-digit number. The ten digits are: 0 (1 finger up), 1 (2 fingers up), 2, 3, 4 (one full hand); (next hand), 5, 6, 7, 8, 9. So half of the digits round down, the other half round up. If you draw a number line, the number line should be 0 to 9, and the halfway point is 4.5 or 4½, not 5.



Lesson in action in Year 2



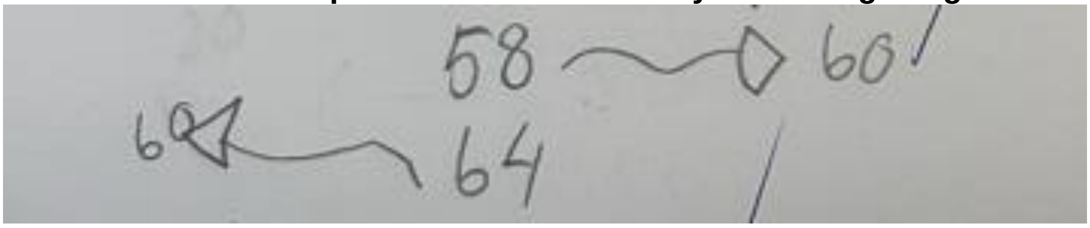


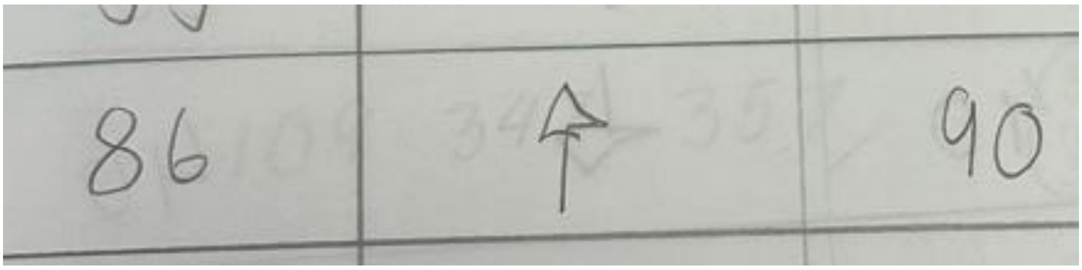
- **Record after each roll, or risk being pushed back to the start of the measuring tape number line!**

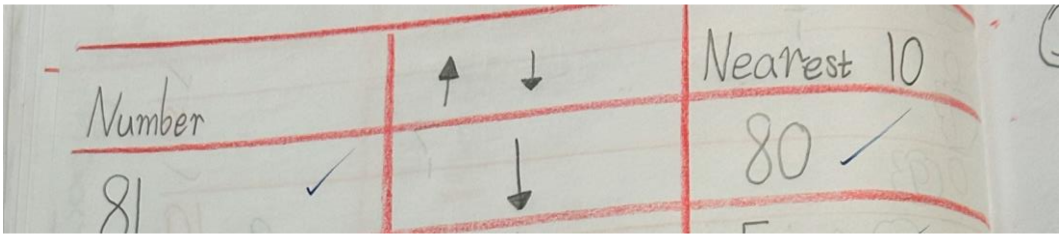
Support: Use a giant number line along the floor to use their own bodies to figure out which ten they are physically closer to, racing to 30 instead of 100, then restarting back at zero once either player reaches 30.

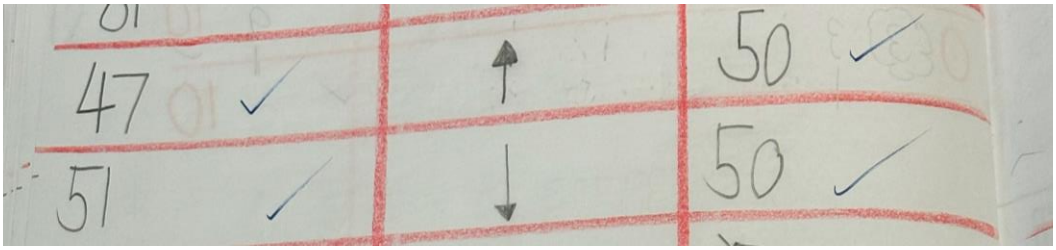
Extreme support: Play an actual game of snakes and ladders to focus on one-to-one correspondence, rather than rounding. Use this context to practise counting to 100 (saying each number they land on) and also subitising (using **maths superhero eyes** to see the number they rolled on the dice, without needing to count the dots one-by-one). If needed, slice off the gameboard so it ends at 20, 30 or 40, close to that pair's upper counting limit. A printable *snakes and ladders gameboard* is in this unit's folder.

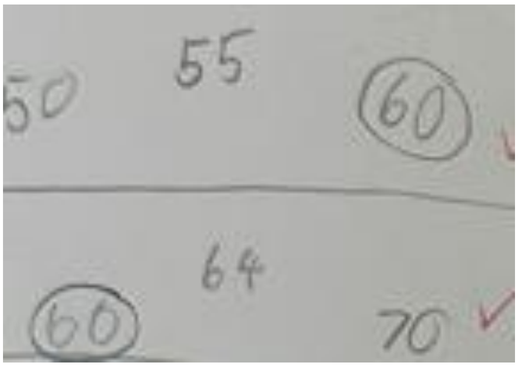
Student work samples – Record after every roll during the game:











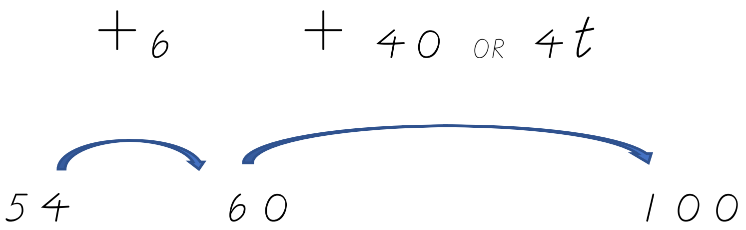
Reflection: Which digits were the snakes (kept you in the same ten)? Which digits were the ladders (always went up to the next ten, rounded up)?

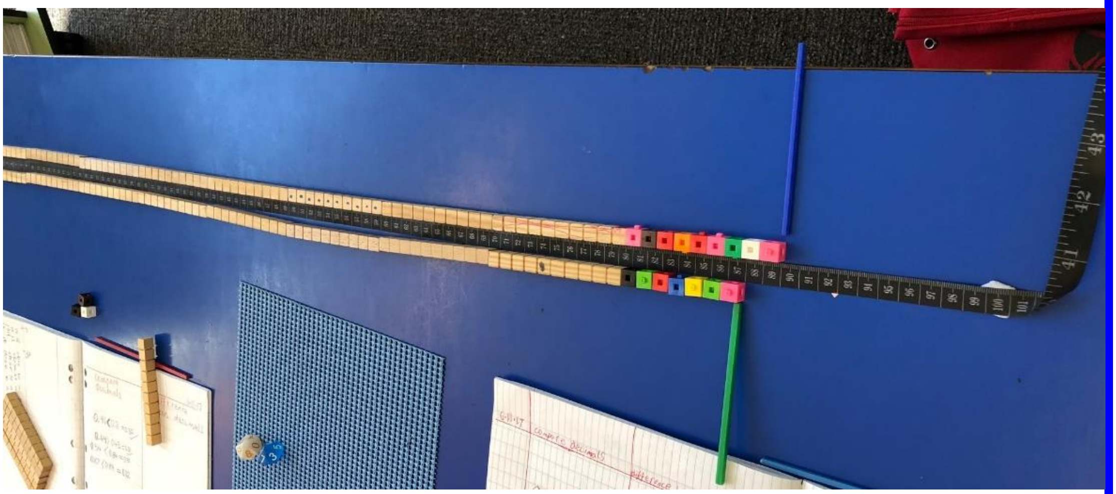
Extension 1 – Partition 100: Figure out how much more you would need to reach 100 from your current position. For example, if you are on 54, how many more spots to go until you reach 100? Well, you could add 6 to get to 60. Then 4 more tens to get to 100. So, it's 46 to go.

Misconception alert: It is not 54 + 56, because that would get you to 110! Many students just use their 10 facts, without accounting for the ones creating an additional ten. For example, many students believe that 73 + 37 makes 100, rather than 73 + 27.

The way to address this misconception is to show students its flaw using the place value blocks (MAB) along the measuring tape. Make 7 tens and 3 ones. Then add another 2 more tens blocks and 7 ones. You are at 100! When you add 3 tens and 7 ones to 73, you cannot actually fit it within the 100, it actually makes 110!

This is essentially a jump strategy and can be recorded like this by extension students, using a second column of their grid book (while playing the regular version of the game and recording that on the other half of their page):





Extension students can use the tens and ones place value blocks (MAB) from their current position, placing these along the measuring tape for assistance to work out 'how many more to make 100?'

Alternatively, try it mentally by getting to the next ten by adding ones (use your 10 facts), then use tens blocks or the 10cm sticks to figure out how many more tens there are to go to reach the full 100.

Extension 2: Use the measuring tape as a decimal number line. 1m is the target or whole. The tens sticks are tenths (one out of ten parts) and students round to the nearest tenth each turn.

Extension modelling – continuation of the fishbowl while other students begin work: How many centimetres are in one metre? So each centimetre is 1 out of 100 parts or one hundred*th*. Each 10cm is 1 out of 10 parts of the whole metre – each 10cm is one ten*th* of the way. This is very clear with the sticks set up at each ten mark (do not place a stick at 0), because students can see that one tenth is 1 out of 10 parts of the way towards 1m, 2 tenths is 2 out of 10 parts or two tenths of the way, and so on.

As you play, record where you land as a decimal – a part of one whole metre. For example, if you landed on 76, it would be 0.76m (0 whole metres and 76 parts of one metre), or 76/100 (76 out of 100 centimetres). You can see from the counting sticks placed at each tenth, 0.76m is closest to 0.80m or 8/10m (8 out of 10 parts of one metre) or 80/100m (80 out of 100 parts of one metre).

Recording would look like this, but can also show the fraction notation:

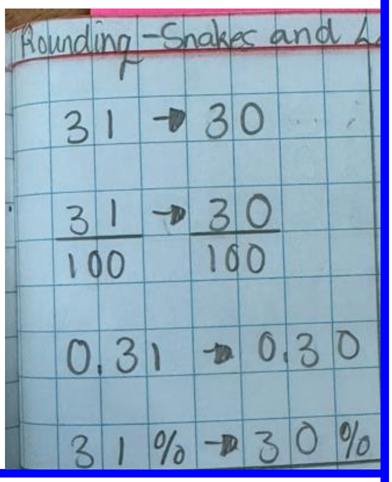
0.30m ⟵ 0.34m

$$\frac{30}{100} \leftarrow \frac{34}{100}$$

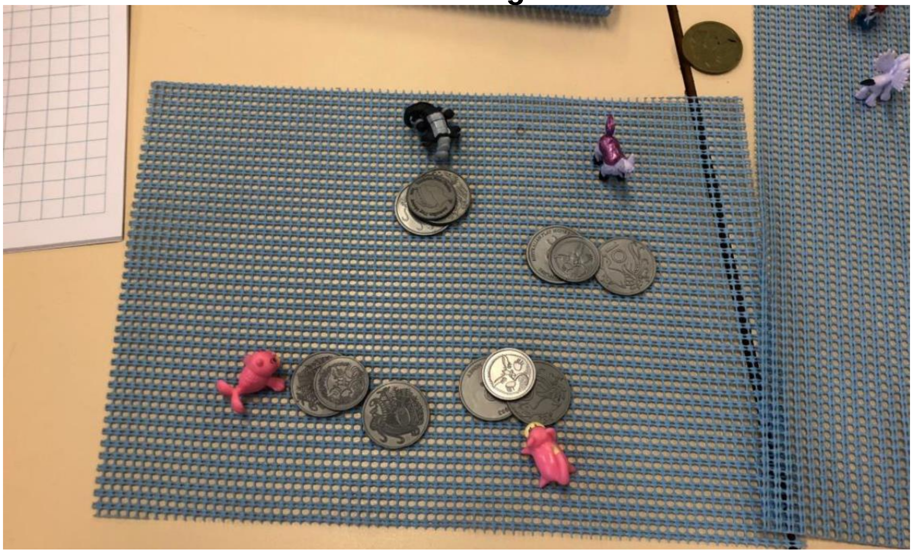
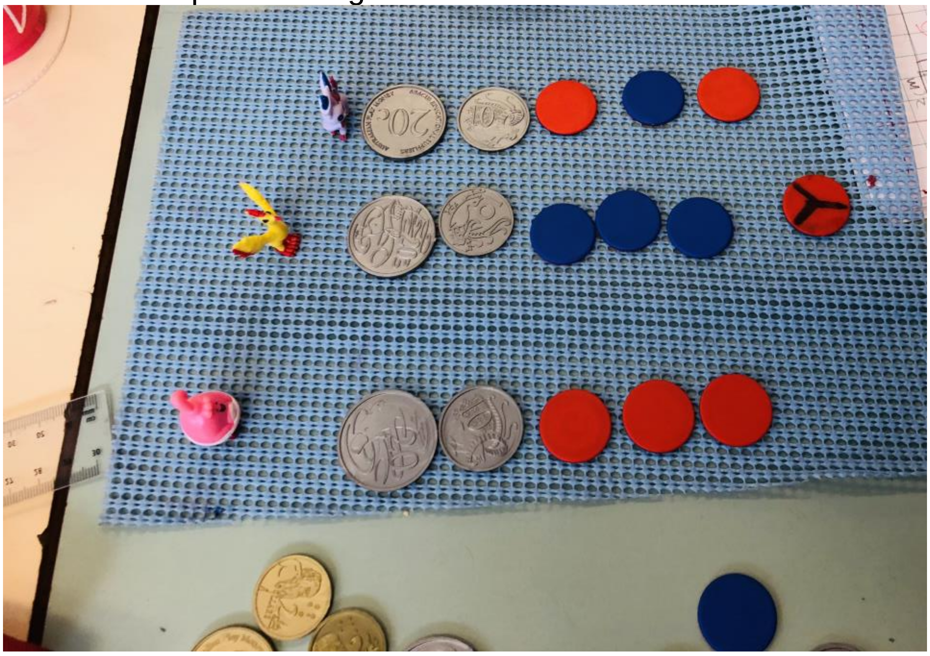
$$\frac{3}{10} \leftarrow \frac{3}{10} + \frac{4}{100}$$

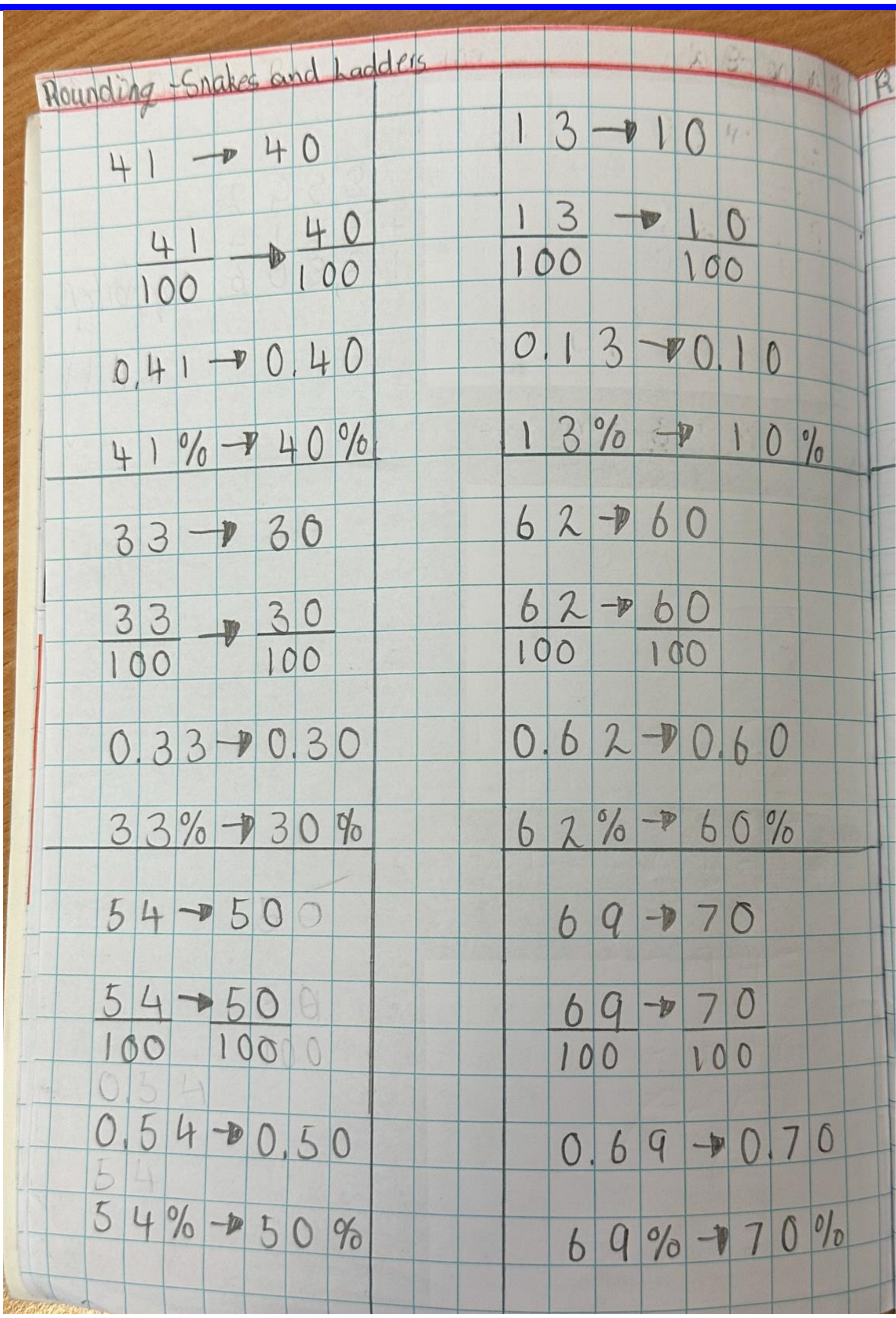
Questioning:

- What's worth more, the tenths or the hundredths? Is this the same as our whole number place value system, or reversed? Why? Because ten*th* means 1 out of 10 parts of the whole, whereas hundred*th* means 1 out of 100 parts of the whole.
- Where do you think 0.50 is on the measuring tape (5 tenths, 0 hundredths)? Is 0.5 (5 tenths, no hundredths) the same or different to 0.50? Where is 0.05 (0 tenths, 5 hundredths)? Which position is better, if you are racing to one whole metre, 0.5m or 0.05m?



Extension 3: Instead of placing the sticks at every tenth, place them at every fifth by splitting the 100cm or one whole metre into five equal parts. Provide students with coins ($1 and other coins) to work this out, sharing $1 between 5 friends (mini Pokémon figurines). Each friend receives 20^{c}, so the sticks go at 20, 40, 60, 80 and 100. Now roll a 20-sided die and round to the nearest fifth. This is also the percentage conversion (splitting 100 into 5 equal parts) = 1/5 of 100 = 20% or 0.20 or 20/100 or 2/10, as percentages are out of 100, so 2/5 is 40% or 40cm or 0.40, 3/5 is 0.60 or 60%, and so on.

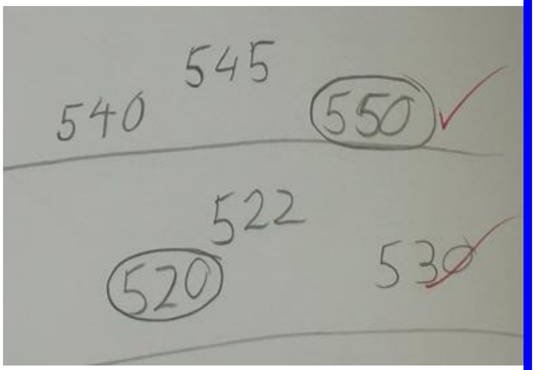
	Students can then invent new versions of the game themselves, changing the fractions they are rounding to each game. Set up the new number line each game, which involves a fraction to decimal and percentage conversion. To work this out, think about an even share of 100 cents or $1. For example, for rounding to the nearest quarter, set up the sticks by thinking about 100 cents or $1 shared between 4 friends (shown below). Each friend receives 25 cents, so one rounding stick is placed at 25, another at 50, another at 75, and the final at 100. **Provide students with coins and mini figurines to work this out:**  If you are rounding to the nearest third, split the $1 between 3 friends. Use plain counters to represent single cent coins.  Before playing their new rounding game, choose dice (or make a post-it note cup with numbers in it to pull out) that make each version progress at a fair pace (not too fast and not too slow). The choice of dice, or which numbers to put in the post-it note cup, will depend on the location of the rounding sticks, which show the fraction to decimal to percentage conversions.

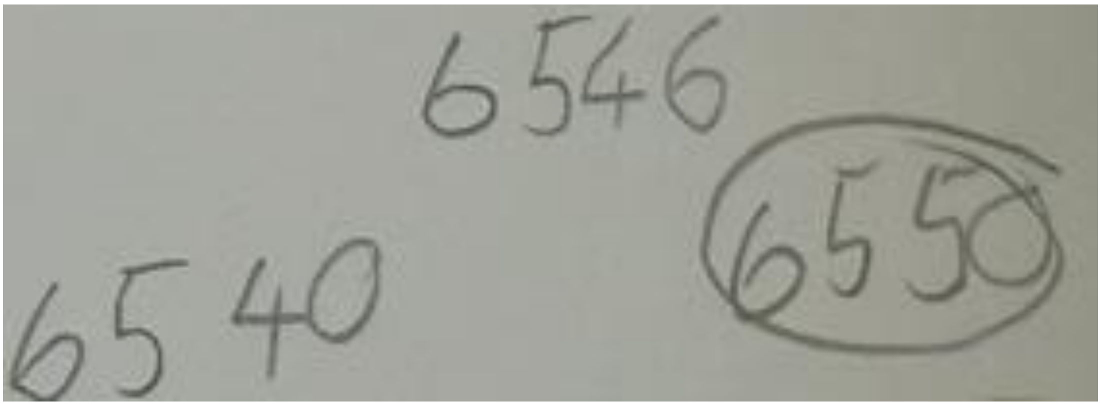


Student work sample for the decimals, percentages, fractions snakes of ladders extension version of the game

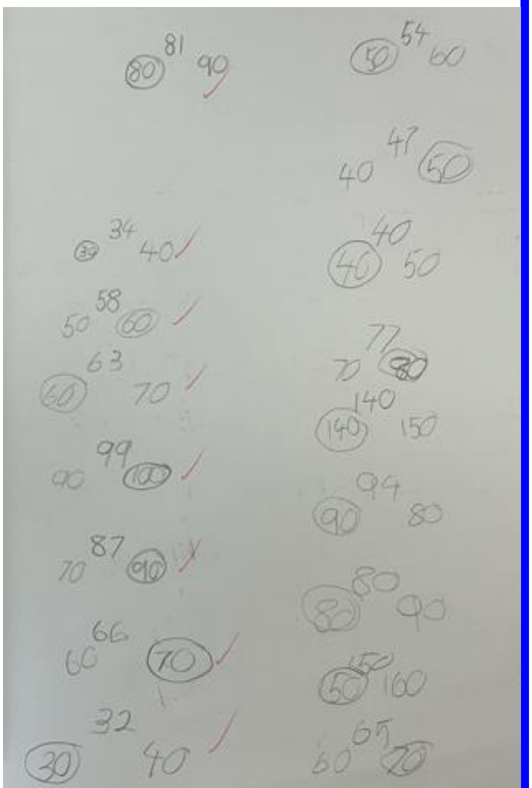
The importance of focusing on 'what is closer,' as opposed to rounding mountain/rollercoaster analogies: As students progress and need to round larger numbers, rounding rollercoasters/mountains or rote-based rules emphasising a focus on a particular place/digit fall apart, particularly when students are challenged to round to a smaller place value within a larger number (for example, round to the nearest hundred within a ten thousands number).

By instead focusing on the language of 'what is closer' and using number lines/measuring tapes as a critical connection, students develop a genuine and deep concept of rounding, as can be seen in related work samples for higher numbers:



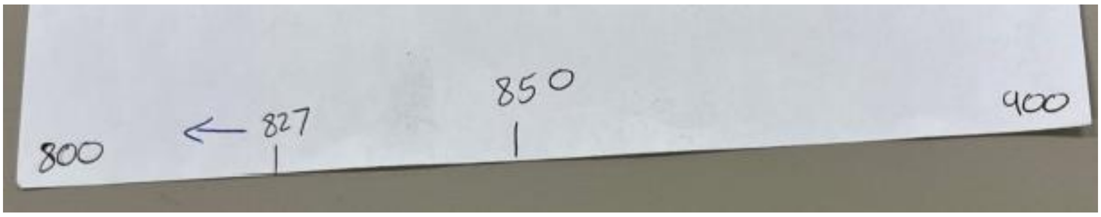


The foundation for rounding larger numbers like the example above begins with rounding two-digit numbers to the nearest ten, like so:

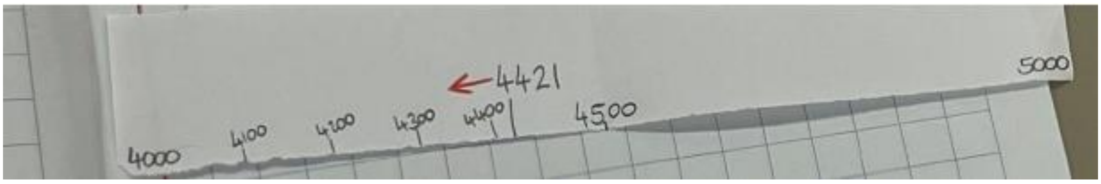


Applying the 'number line/what is it closer to' reasoning in later years

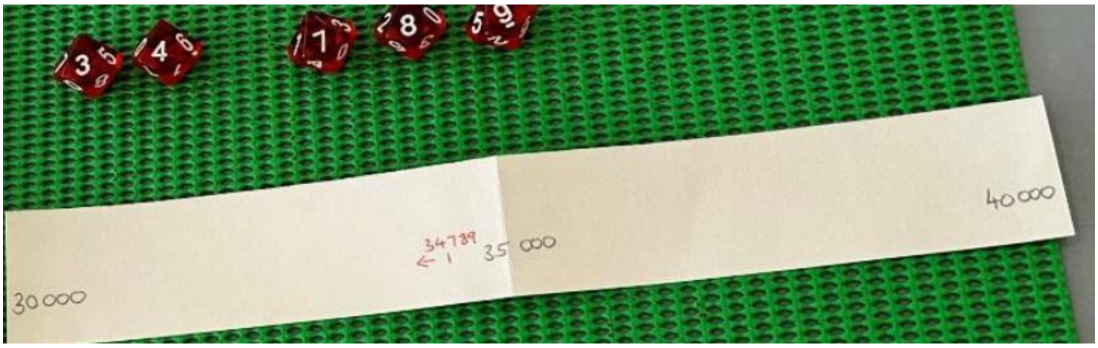
Closest hundred to 827:



Closest thousand to 4421:

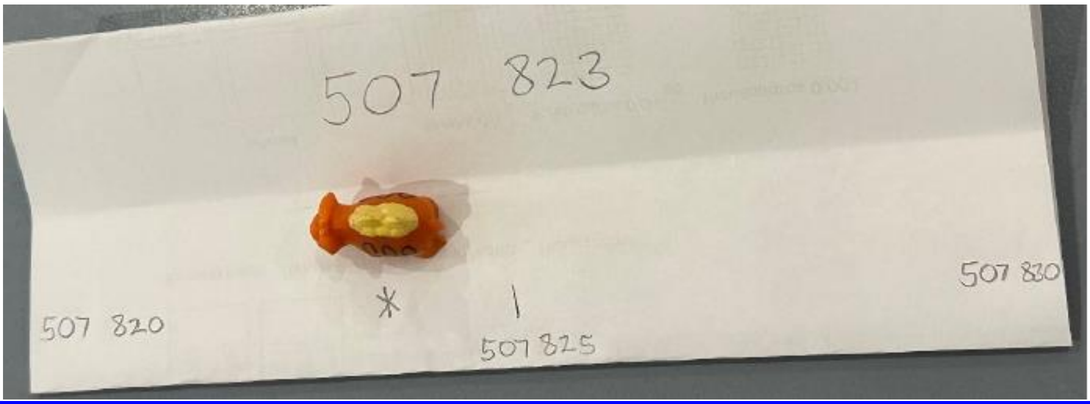


Closest ten thousand to 34 789:



Closest hundred to 598 173:

Closest ten to 507 823:



Subtraction Unit 4: Difference between

1 of 500 Sequential Lessons for the Early Years

Australian Curriculum Version 9 Year 1 Number: Add and subtract numbers within 20, using physical and virtual materials, part-part-whole knowledge to 10 and a variety of calculation strategies AC9M1N04

Difference Between Year 1 Lesson 1

Super Mario – Count on to solve difference between

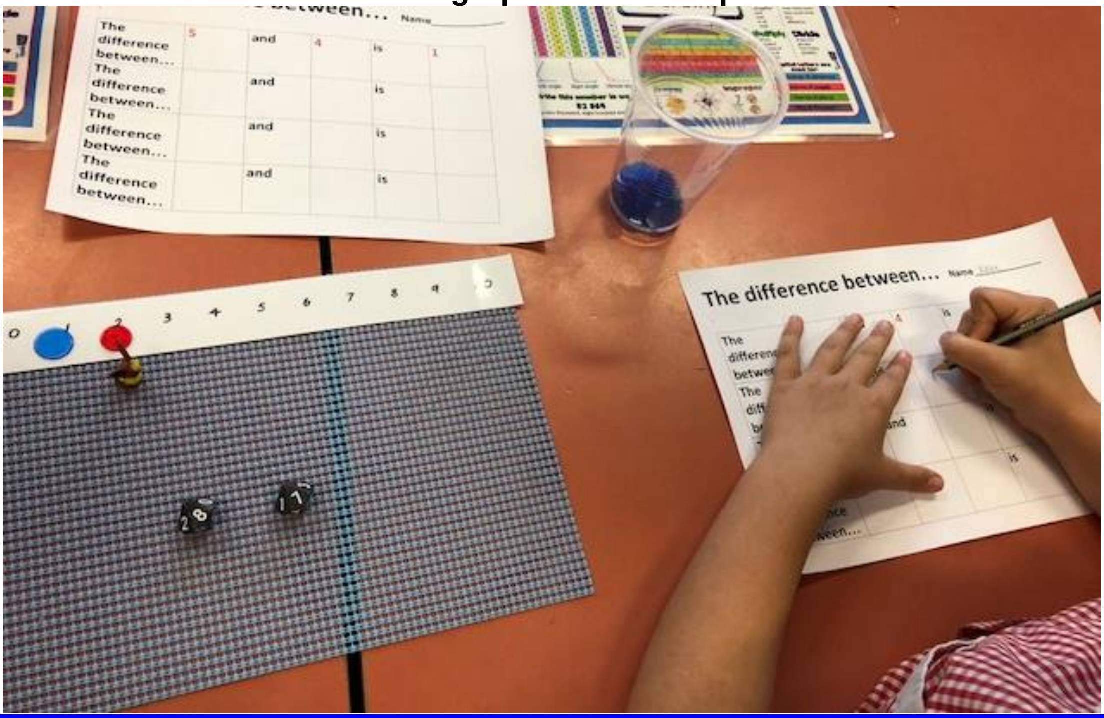
Learning intention: Work out the difference between two numbers (subtraction) by counting on from the smaller number.

Maths vocabulary: difference between, subtraction number sentence

YouTube hook: Relate difference between to video games like Super Mario, where characters need to jump between one platform and another, accurately figuring out how far forward they need to jump or the 'difference between' the platforms to avoid going back to the first level. Use this link youtube.com/watch?v=WMUuEdSmxCE to watch a YouTube of a Super Mario game where he jumps between platforms, then

Lesson summary: Students figure out the difference between single-digit numbers by jumping their figurine from one number/platform to the next. Count the number of jumps they had to make to land safely.

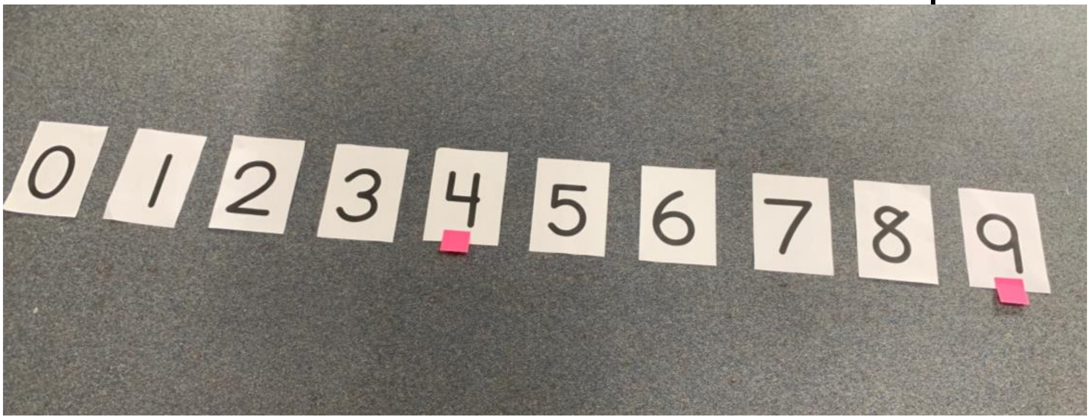
Photograph of the set up

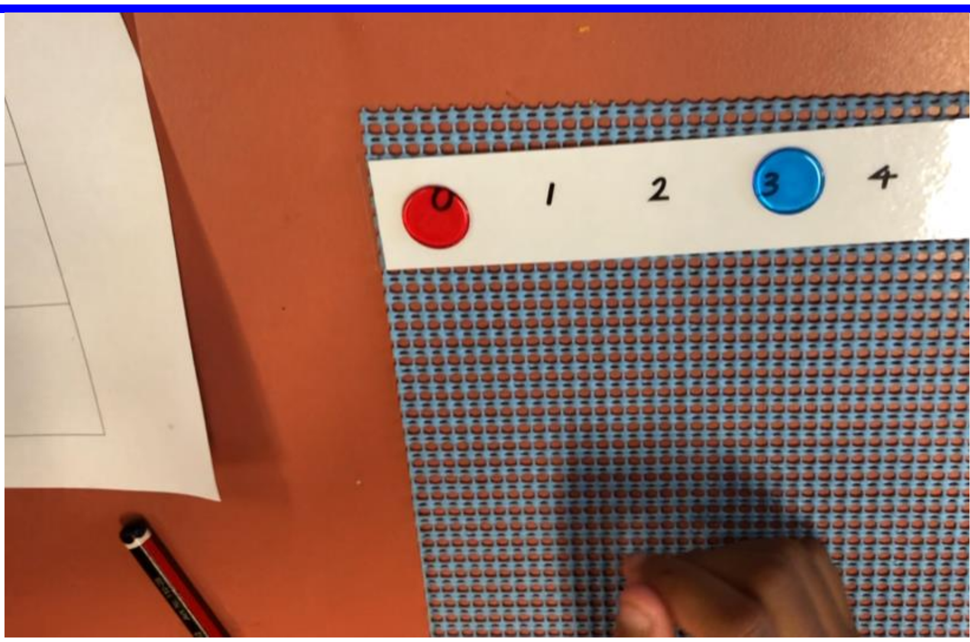
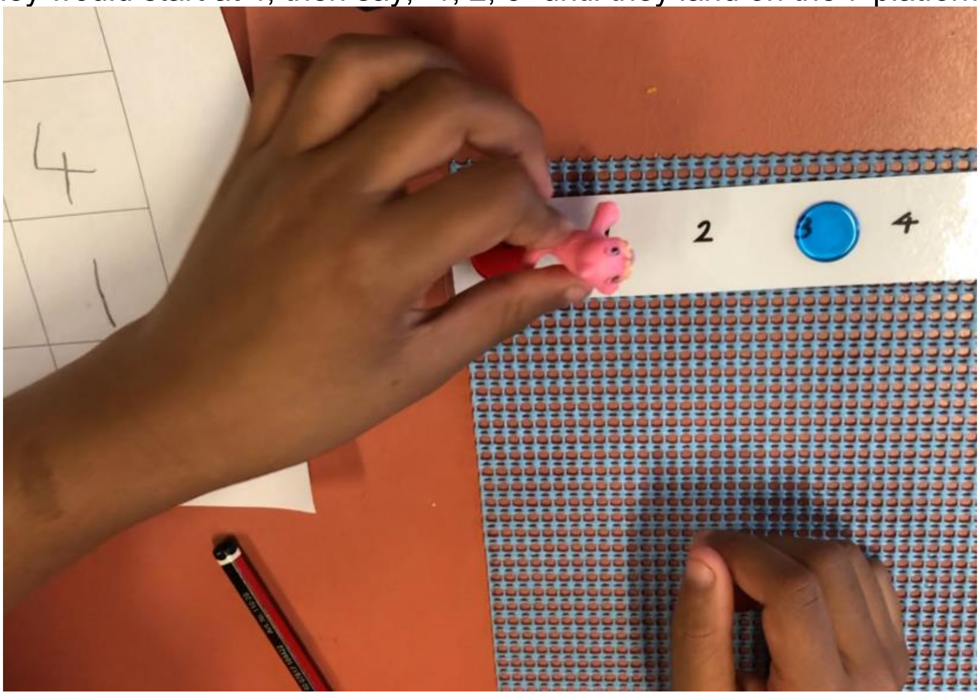


Materials:

- Two 10-sided dice per pair.
- Two transparent counters per pair.
- Two figurines per pair (mini Pokémon to mirror the first YouTube where Mario transformed into a Pokémon) *or* any animal counter.
- 0 to 10 number line from this unit's folder – one per pair, laminated.
- Difference between recording template from this unit's folder.
- *For whole-class modelling*: A4 number line templates are available in this unit's folder, laminate and connect with string to make a large durable number line for all future whole-class number line modelling.

Best set-up: Model using a giant number line with students, then model at a desk. Students work with their regular like-ability maths buddy.

transforms into a Pokémon. This is a very similar, longer clip so you could just choose your favourite few minutes, where Mario needs to be very careful to accurately figure out the distance between each platform, particularly in the fire section: youtube.com/watch?v=o4CfkUZ6N20 In this extra YouTube hook option, a video game designer has created an augmented reality version of Super Mario, bringing it to life in a park:	**Modelling:** Model the concept on a giant number line at the front of the room. Students roll two giant dice. For example, the students roll 4 and 9. Student A puts a kinder circle or post-it note on 4. Student B puts a kinder circle on 9. These are the 'platforms' or numbers in the subtraction number sentence. "What's the difference between 9 and 4?" With a subtraction number sentence, you always record the larger number first, for example, **9** – 4. However, to figure out the answer, you can start your character from the smaller number and just count forwards. Now we want to figure out how far you need to jump to get from one platform to the other, or the difference between the numbers. **Students step as they count on to work out the difference between the two number platforms.**  **Whole-class modelling with enlarged materials**  Following this, model at a desk using student materials.

youtube.com/watch?v=QN95nNDtxjo **Alternative hook:** Street parkour video clip to emphasise the 'jump the difference' strategy: youtube.com/watch?v=2vfoyY9lshI Don't do this at home!	 ***First:*** Both partners put their counters on the number they rolled. ***Second:*** Write the two numbers in the template, recording the bigger number first, since subtraction always starts with a lot and ends with a little. ***Third:*** Jump your character from the smaller number to the bigger number, counting each jump. If the student was solving the difference between 7 and 4, they would start at 4, then say, "1, 2, 3" until they land on the 7 platform.  ***Fourth:*** Read the number sentence back to your partner from your recording sheet, using 'difference between' vocabulary: "The difference between 3 and 0 is 3." **See the video in this unit's folder of the lesson in action.**

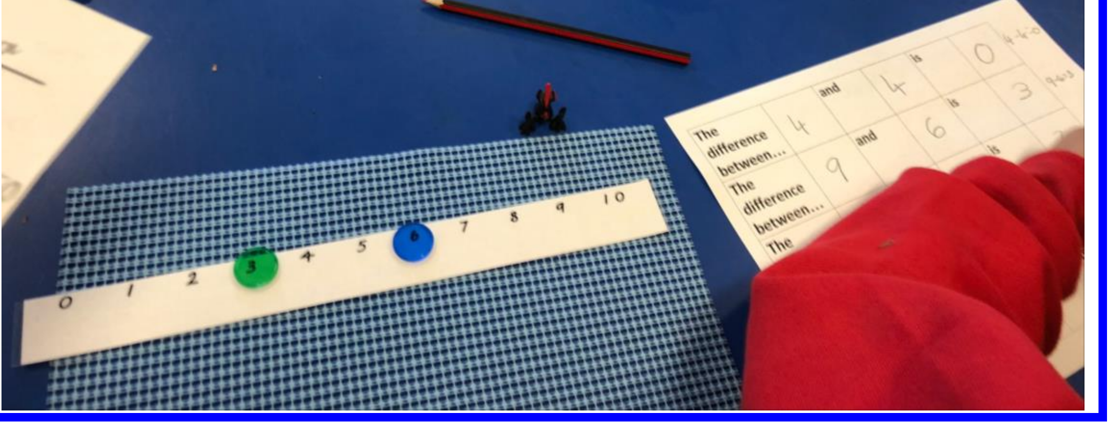
Common misconception 1: Point out that you cannot just look at the number of spaces between the numbers, because that will end up one short, and your player will not make it all the way to the platform. For example, the difference between 6 and 3 is not 2, even though you can see there are 2 numbers (4 and 5) between them. You need to make it all the way to the 6 from the 3, so it's 3 jumps for your character, or 3 counts forward.

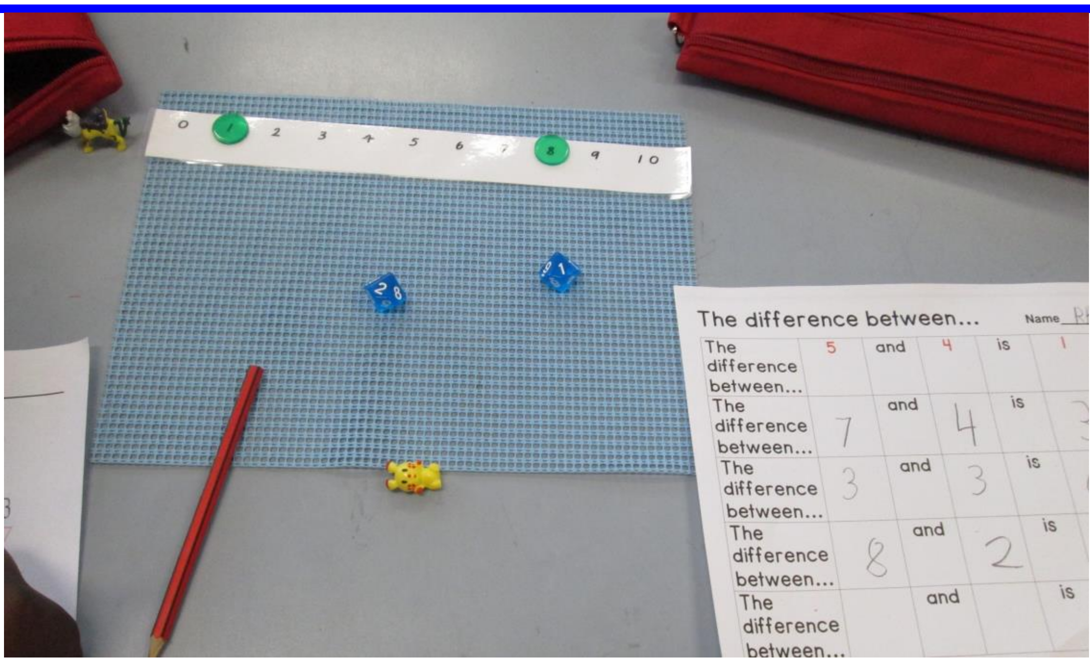
Common misconception 2: Another common misconception is that students tend to start counting from the first number/platform, before they do a jump. Students sometimes even jump their character up in the air and count 1 on the starting number. Does Mario just jump up and stay where he is? Or does he jump forward? You don't need to start counting on your current platform, because that's your starting point. You start counting from the first jump forward that your character does.

Questioning:

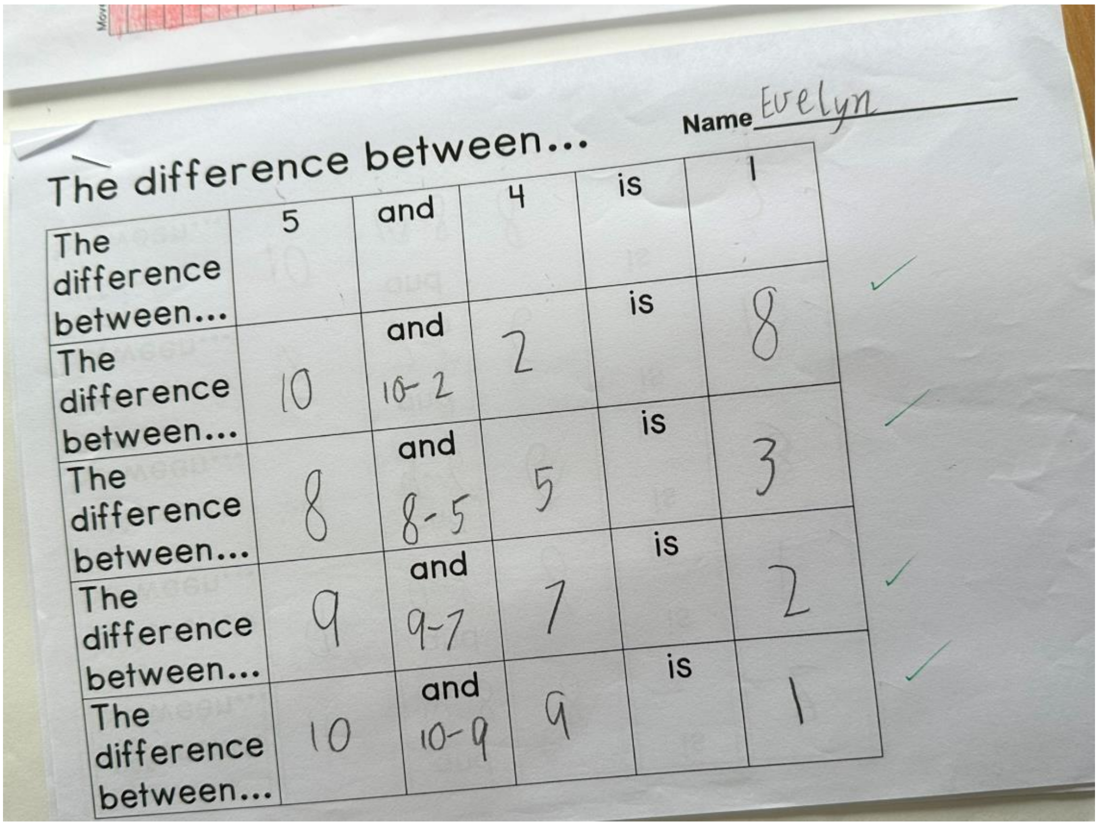
- If you both roll 4, what is the difference between your numbers?
- Does it matter whether you start from the bigger number and count back, or start from the smaller number and count forward?
- Without the number lines, is it easier to count back or count forward? Most students will prefer counting forward, as that is their first learned counting sequence. The aim of this unit is to ensure students can use the strategy of counting forward to solve difference between situations, rather than only seeing subtractions as 'take away' scenarios that can be solved using counting back alone.

Lesson in action in year 2

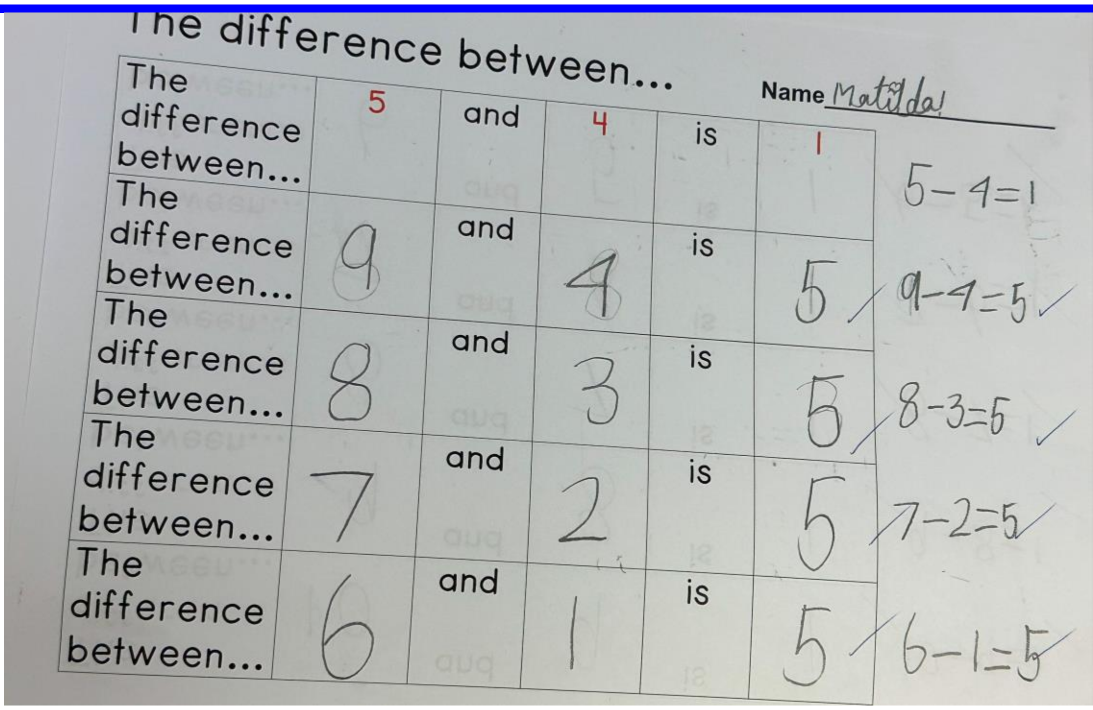




Lesson in action



Student work sample



Student work sample

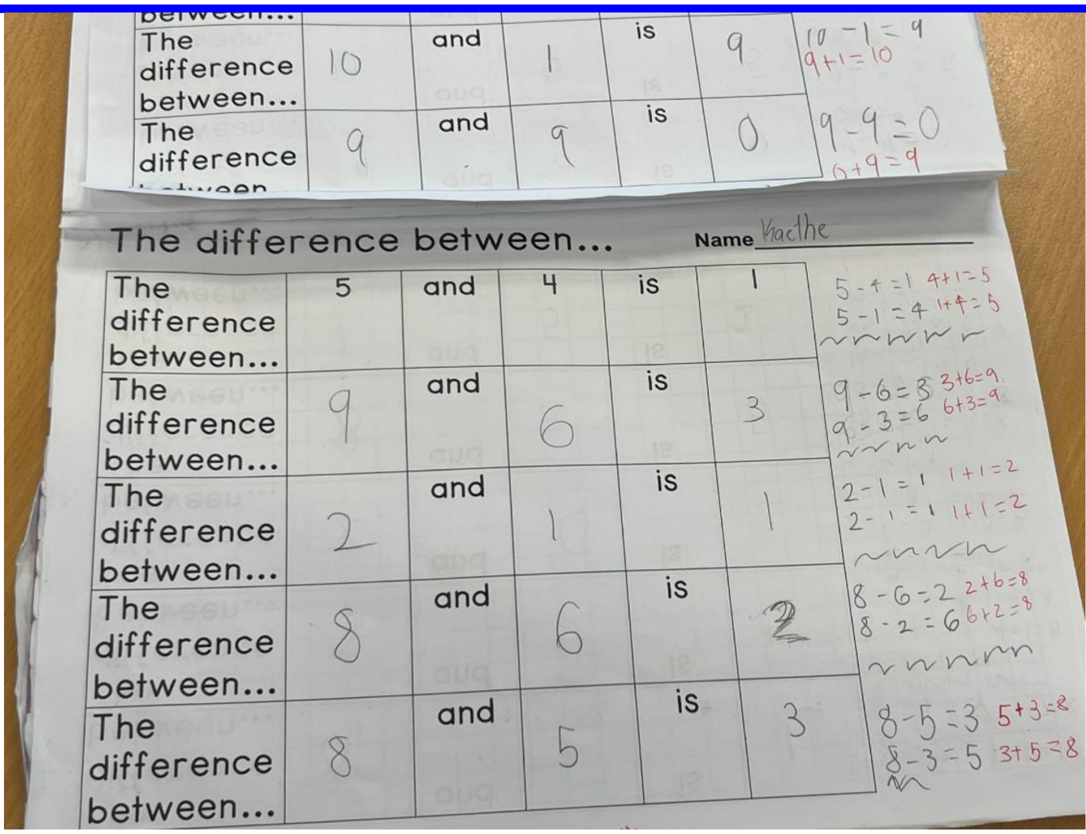
End-of-session oral language: For the final few minutes of the session, ask students to pause their work and read back all their ‘difference between’ sentences to one another, using their completed recording sheet.
Swap partners so that they are reading different equations and take turns reading the sentences they have created. Students could then write the matching number sentences on the side of the template, 6 – 5 = 1, but read it as a ‘difference between’ scenario: “The difference between 6 and 5 is 1.” This reinforces that subtraction can mean take away *or* difference between.

Support 1: Work on the large number line for longer, using their bodies as support. Students will enjoy this added kinesthetic element to the session.

Support 2: Use 6-sided rather than 10-sided dice in like-ability pairs to keep the difference between the numbers smaller, for example, the difference between 6 and 4.

Extension 1 check: Ensure that extension students can read subtraction equations as ‘difference between’ sentences, not just ‘minus’ or ‘take away’ sentences, as otherwise this will limit more advanced strategies for subtraction in their middle years. For example, write down 8 – 6 = 2. Ask your extension students to read this to you. Many may read this as, “8 take away 6 is 2.” This ‘take away’ language is ideal for the first element of subtraction. If an extension student can *only* read this number sentence as, “8 minus 6 equals 2,” or, “8 subtract 6 equals 2,” they only know the abstract language and not the real-life language. Only when an extension student can read 8 – 6 = 2 as, “8 take away 6 leaves 2,” *and* as, “The difference between 8 and 6 is 2,” are they then ready for further extension.

Another quick check is to ask an extension student to solve 80 – 78. Does the student think about the difference between the two numbers (78 + 2 = 80, they are two apart on a number line/chart), or do they start using a vertical algorithm or jump back strategy (taking away the 78 from 80).



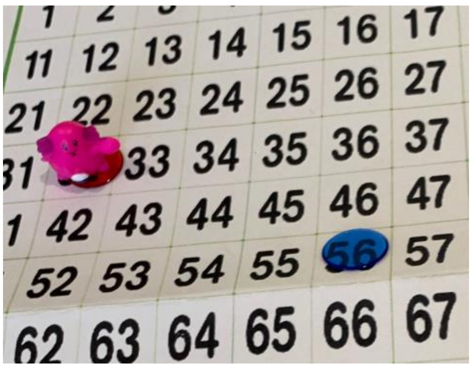
Extension 2: Record the full fact family, as shown in this student work sample.

Extension 3: Roll two 6-sided dice each, in like-ability extension pairs, to make two 2-digit numbers. Students place their counters on a 120 chart. Work out the difference between their two numbers. One strategy is to jump forward by tens first (jumping down the tens rows), then step forward (across) by ones.

For example, for the difference between 56 and 32: Start at 32.

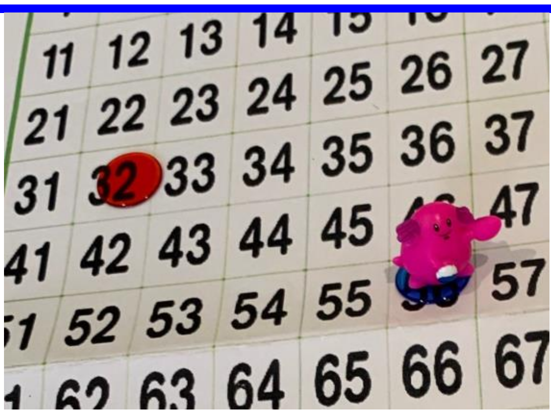
Jump forward 2 tens.

Then step forward by 4 ones. The difference is 2t 4ones, 56 – 32 = 24



The difference between 56 and 32

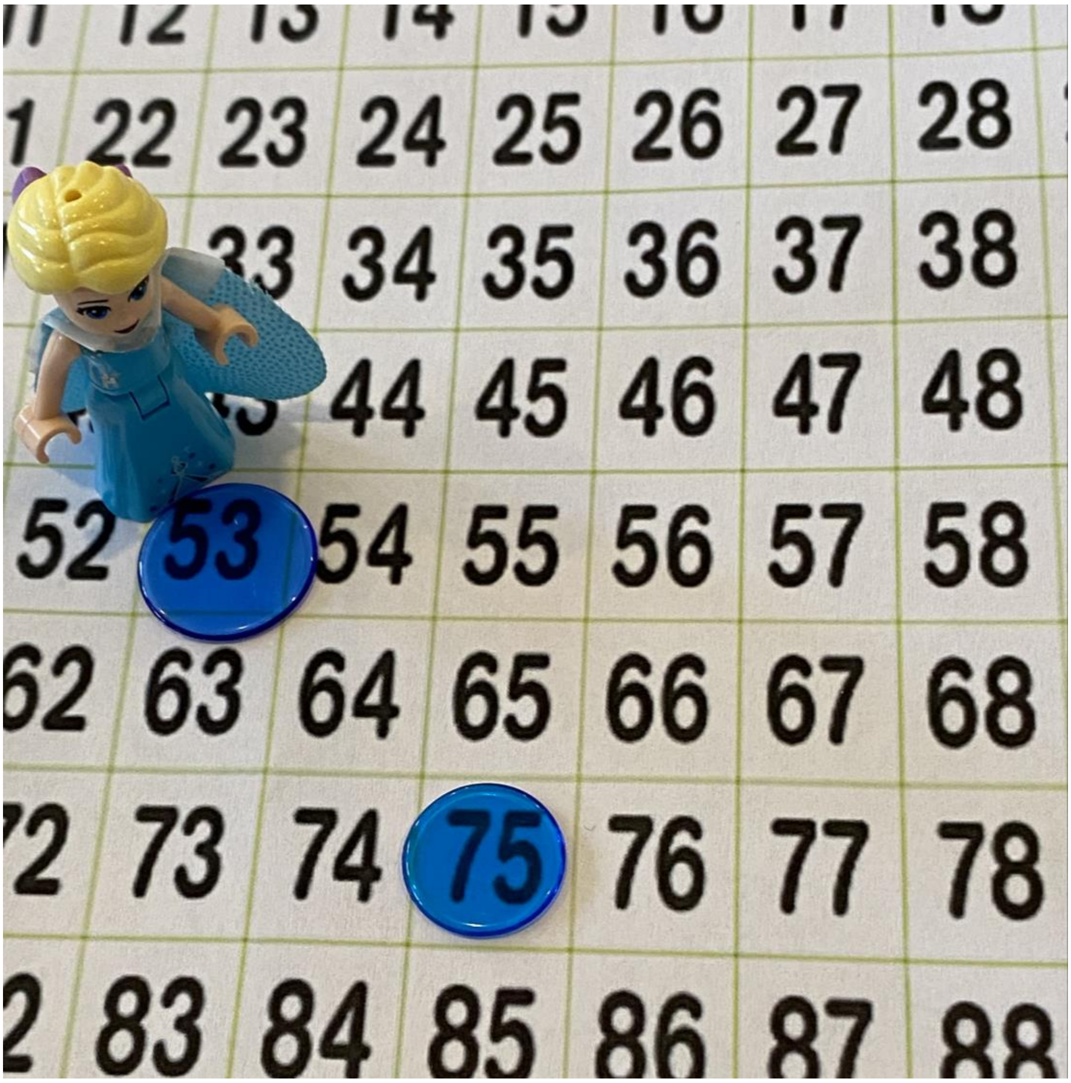
The difference is 2 tens



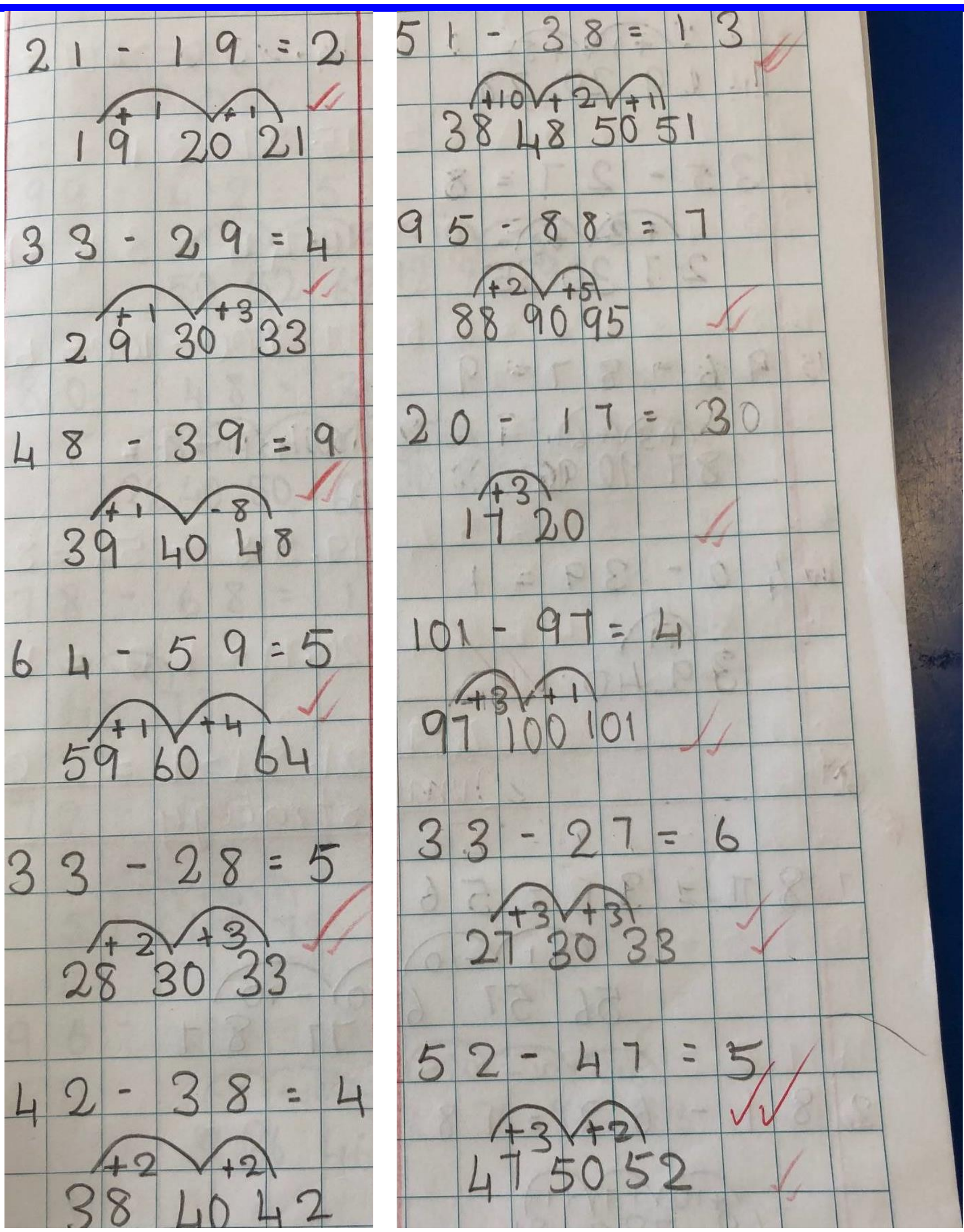
and 4 ones, so 56 – 32 = 24

Try it mentally: Start at 32. Jump forward 2 tens (52), then another 4 ones (56). The difference was 2t 4 ones, or 24.

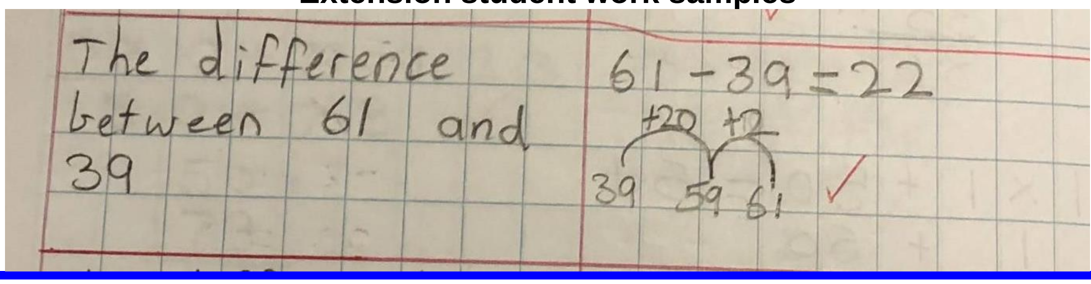
The difference between 53 and 75:



The difference between 75 and 53 is 22 (2 tens and 2 ones).



Extension student work samples



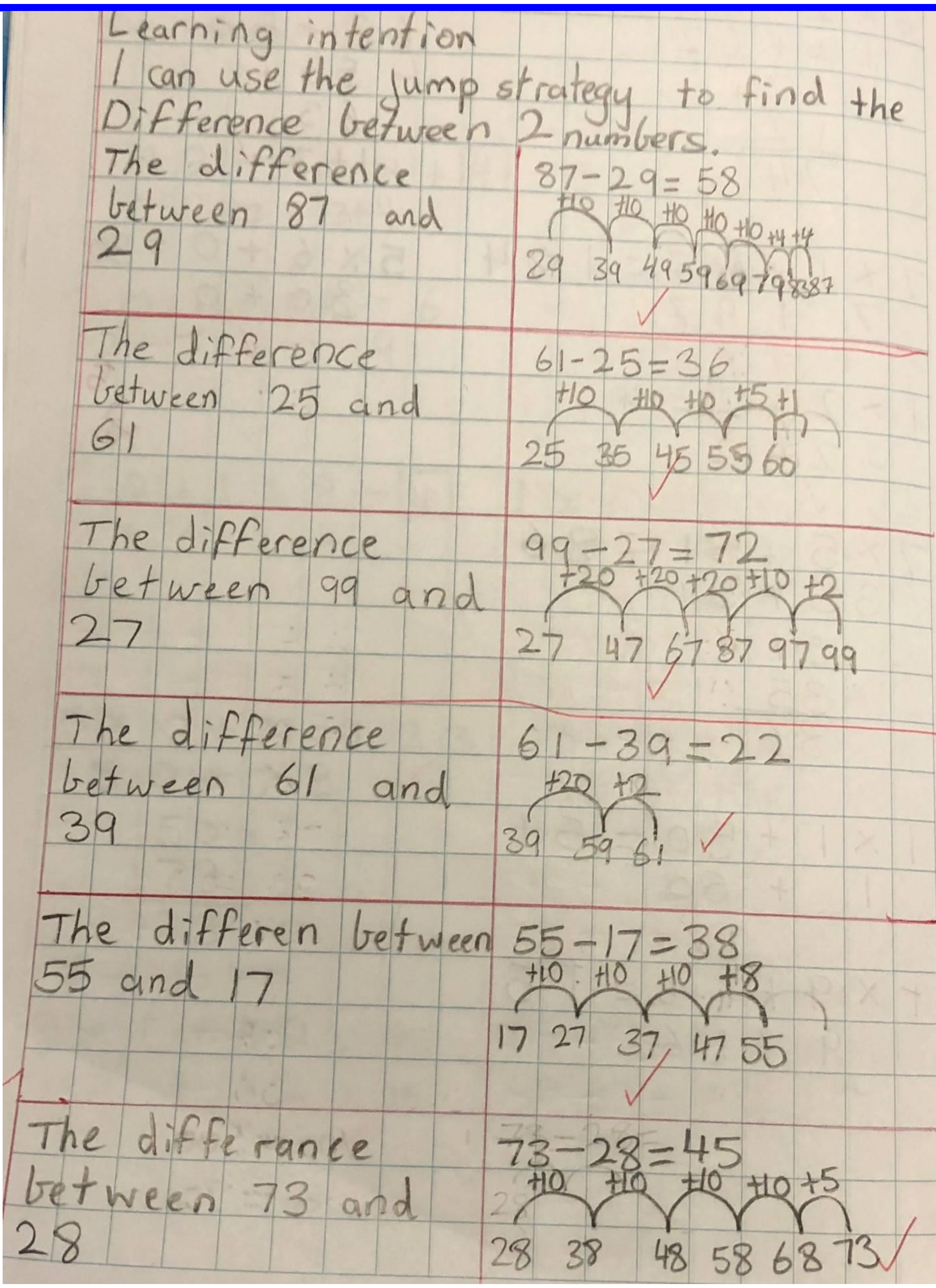
This can become quite challenging for numbers such as 62 and 45. For example, the students may jump their character 2 tens forward (from 45 to 65), but they are now beyond the target number/final platform.

2 tens forward

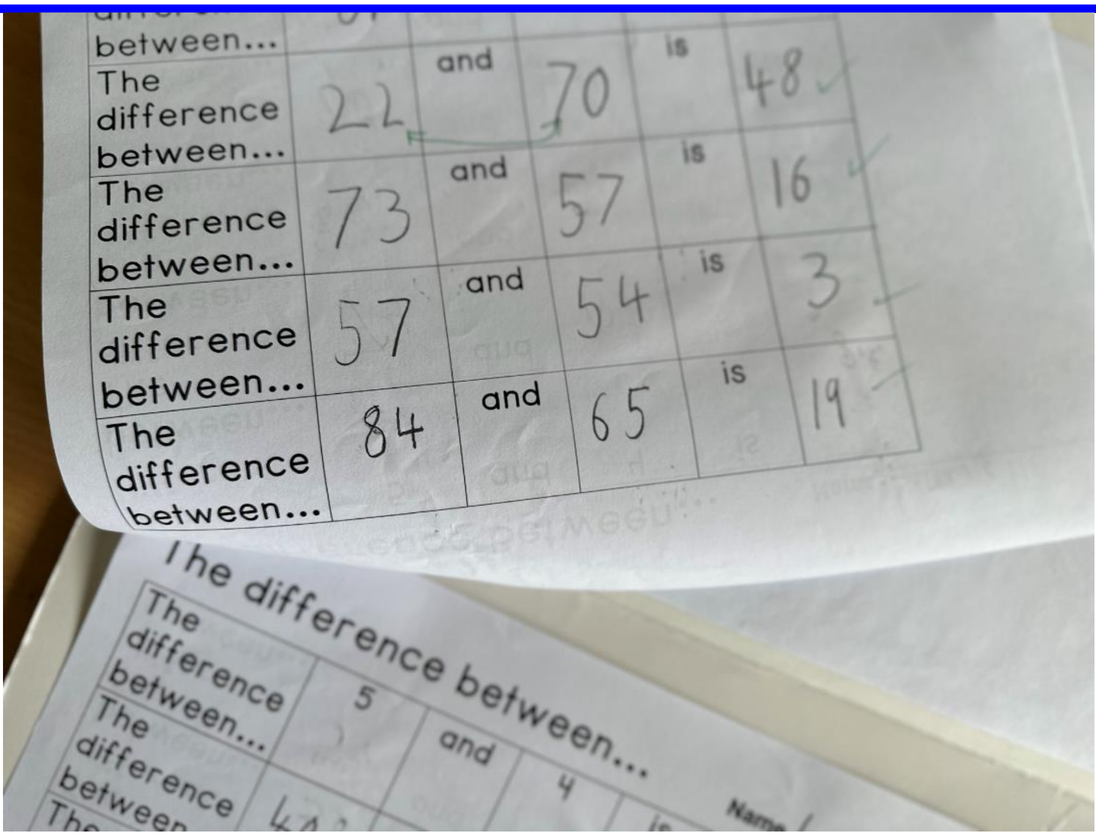
3 back, so the difference is 20 – 3 or 17

Model for extension students to use a ‘jump forward tens, step back ones’ strategy for these type of problems. Ultimately, the goal is for students to do this without the 120 chart. Accordingly, remove the chart when students are ready to attempt this **jump the difference strategy** in their heads. Mentally, the aim would be to think: Start at 45. 2 tens forward, 65, 3 ones back 62! So I did 20 – 3 = 17 was the difference!

This provides students with better strategy options than always thinking of subtraction only as ‘take away.’ For most students, it would be a worse option to solve this particular problem using a **jump back strategy**, by starting at 62, then jumping 4 tens back, then another 5 ones back to take away the entire 45. **Therefore, the ‘difference between strategy’ (or ‘jump the gap strategy’) is ideal when the two numbers in a subtraction are fairly close together.**



Credit to Kath, expert teacher from Lyndale Greens Primary School



Extension student work sample

Note: The student's first example placed the numbers in the wrong position. The teacher provided immediate feedback in green pen, then the rest of the examples were correct. The power of teacher roaming during the lesson and immediate feedback!

Subtraction Unit 1: Physical take away actions

1 of 500 Sequential Lessons for the Early Years

Recommended as the very first introduction to subtraction during Foundation.
Australian Curriculum Version 9 Foundation Number: Represent practical situations, including simple financial situations, involving addition, **subtraction** and quantification with **physical** and virtual **materials** and **use counting or subitising strategies** AC9MFN05

Take Away Foundation Lesson 1

Subtraction Squish

Learning intention: Make a starting number, take away/squish part of it and work out what is left.

Maths vocabulary: starting number, squish, take away, how many are left, sphere

Link to the arts: Today, we are using Play-Doh for maths! Show students this gallery playdough-activities.com/articles/simple-playdough-creations.html of wonderful yet reasonably simple creations.

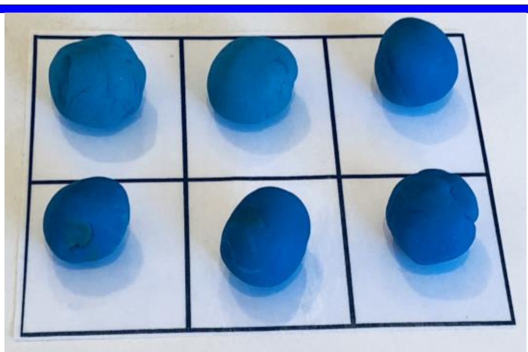
Link to technology: A short stop motion clip that students could try to create their own version of during ICT time: youtube.com/watch?v=yi1Kt8REHE4

Lesson summary: Students make balls/spheres using Play-Doh. Students place these in a frame, starting with a 4-frame, later working up to 6, 8 and 10 frames. Students then squish some of their Play-Doh balls and figure out how many are left, recording this on the template.

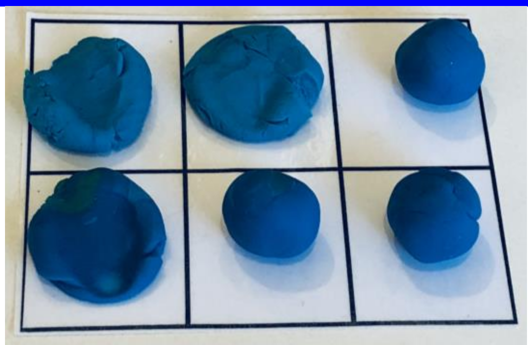
Materials:

- Play-Doh.
- 4, 6, 8 and 10 frames. Print off the ten frame templates from this unit's folder, then slice them into 4, 6 and 8 frames as needed. If possible, laminate each type of frame for durability, as these are often used throughout the number units for the early years.
- _take away_ leaves_ recording templates.

Best set-up: Whole-class model balloon pop (*shown above*) from the warm-up section, with students recording using the _ take away _ leaves _ templates. For balloon pop, start with 4 balloons, pop some, all record together on the *take away* recording templates (students sit around the whole-class circle with pencils). Then restart with another set of 4 balloons. Following balloon pop, model the below lesson with Play-Doh balls around a demonstration desk. Students work independently, or in pairs, after that.



Make 6



6 squish 3 leaves 3

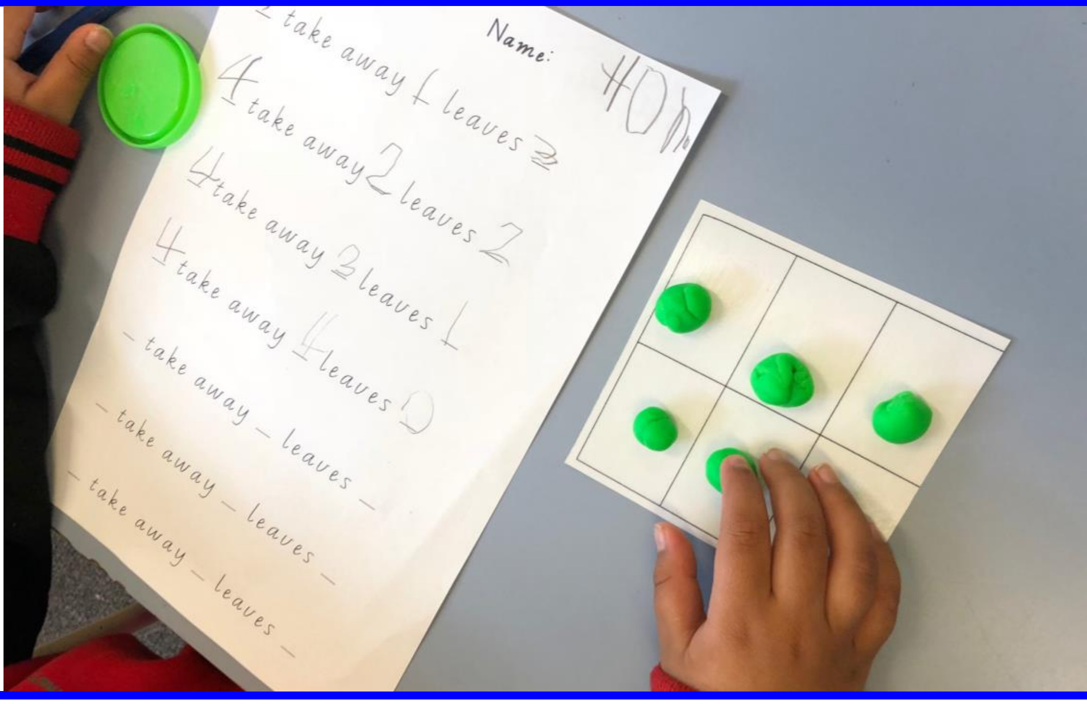
Modelling: Model the actual making of the Play-Doh balls by holding your hand flat (ask the class to chorus the word 'horizontal' three times as they hold their hands flat) and roll the ball under your flat hand against the table. Model recording each step, one at a time, on the _ take away _ leaves_ templates, as you act out each part.

Setting up the session for success and '5 minutes of free create time' at the end: Today is about using the Play-Doh to learn about take away. When we use fun materials for maths, you need to use them sensibly and in the right way. That way, we can keep having fun and doing exciting activities as part of our maths learning! We will have 5 minutes of playtime at the end, BUT if you start using the Play-Doh for something other than maths in the lesson time, I will need to take away the awesome 'free create time.'

For example, after students make the 4 balls in their 4-frame, instruct them to write '4' in the first spot on the recording template. This is your **starting number.** Chorus the subtraction whole-class chant: "We start with a lot, we end with a little."

When the student **squishes/takes away** balls, model writing down how many they squished in the middle spot of recording template. Ensure that students squish the balls till they are flat, so they can look back and it will be obvious. Mention that, sometimes, they can choose to squish zero.

"How many balls are left?" Encourage students to see how many are left using their maths superhero eyes (subitising), rather than counting them, if possible. Practise using the recording template together as a class, particularly as part of the balloon pop warm-up game (*warm up section*), which can flow straight into this session using the same recording template.



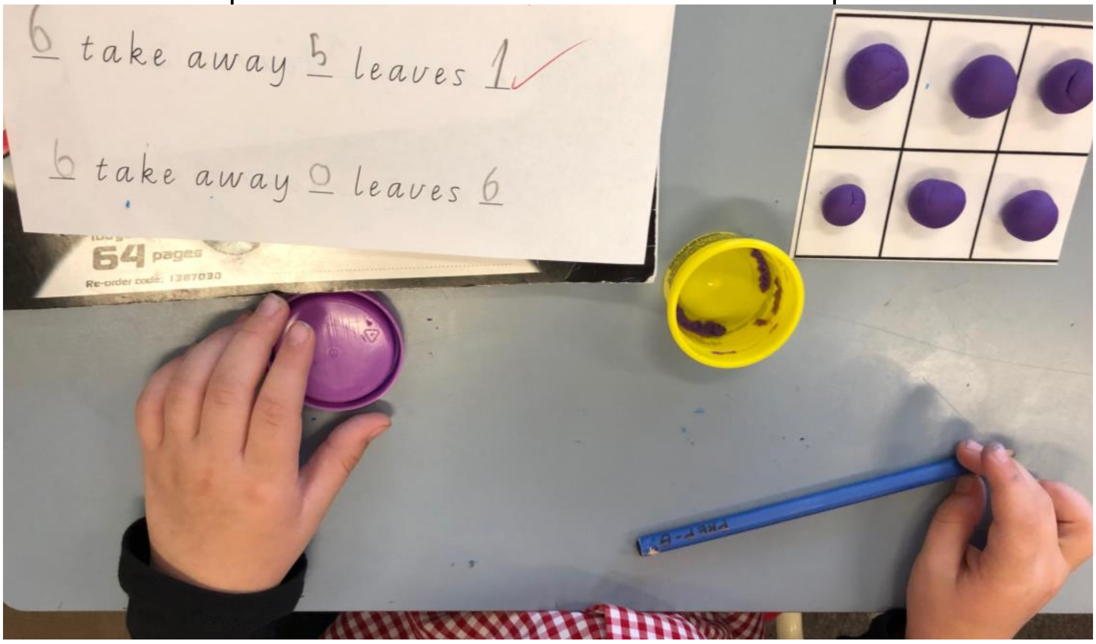
Oral language: Emphasise for students to whisper as they work:

"I have 4."
"I squished 3."
"I have 1 left."

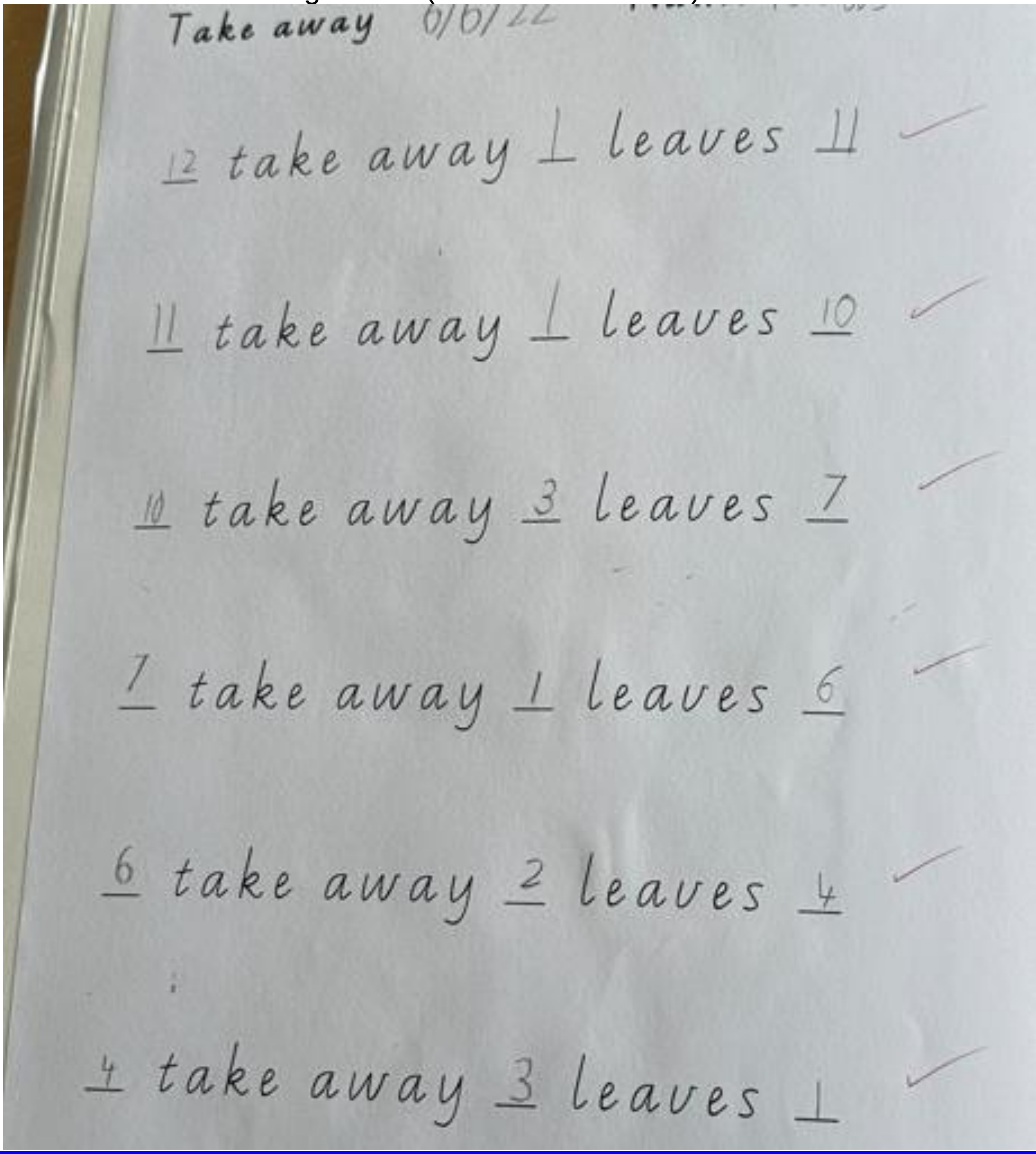
Practise this language together, while acting out a few examples at a desk.

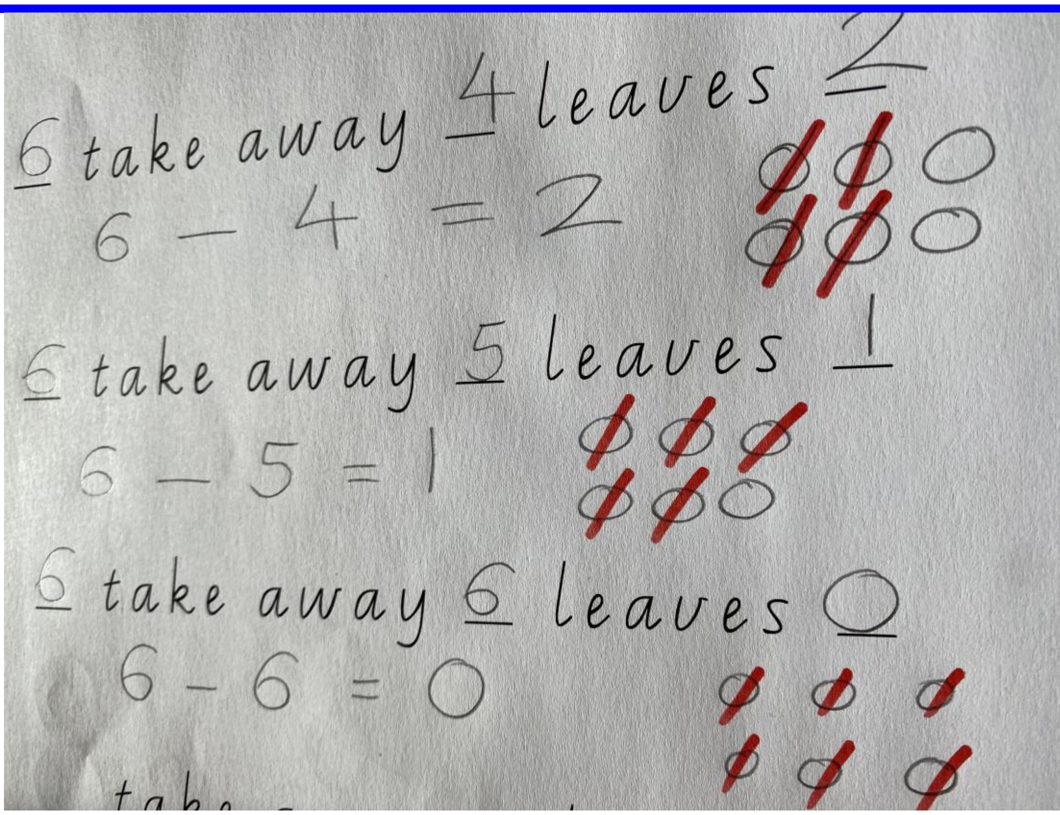
Questioning:

- How many balls/spheres did you start with?
- How many did you squish?
- How many balls/spheres do you have left?
- If you start with 4, could you squish 5?
- What happens if you squish zero?
- What happens if you squish all the balls?
- Do you have more or less than what you started with? Is it always less?

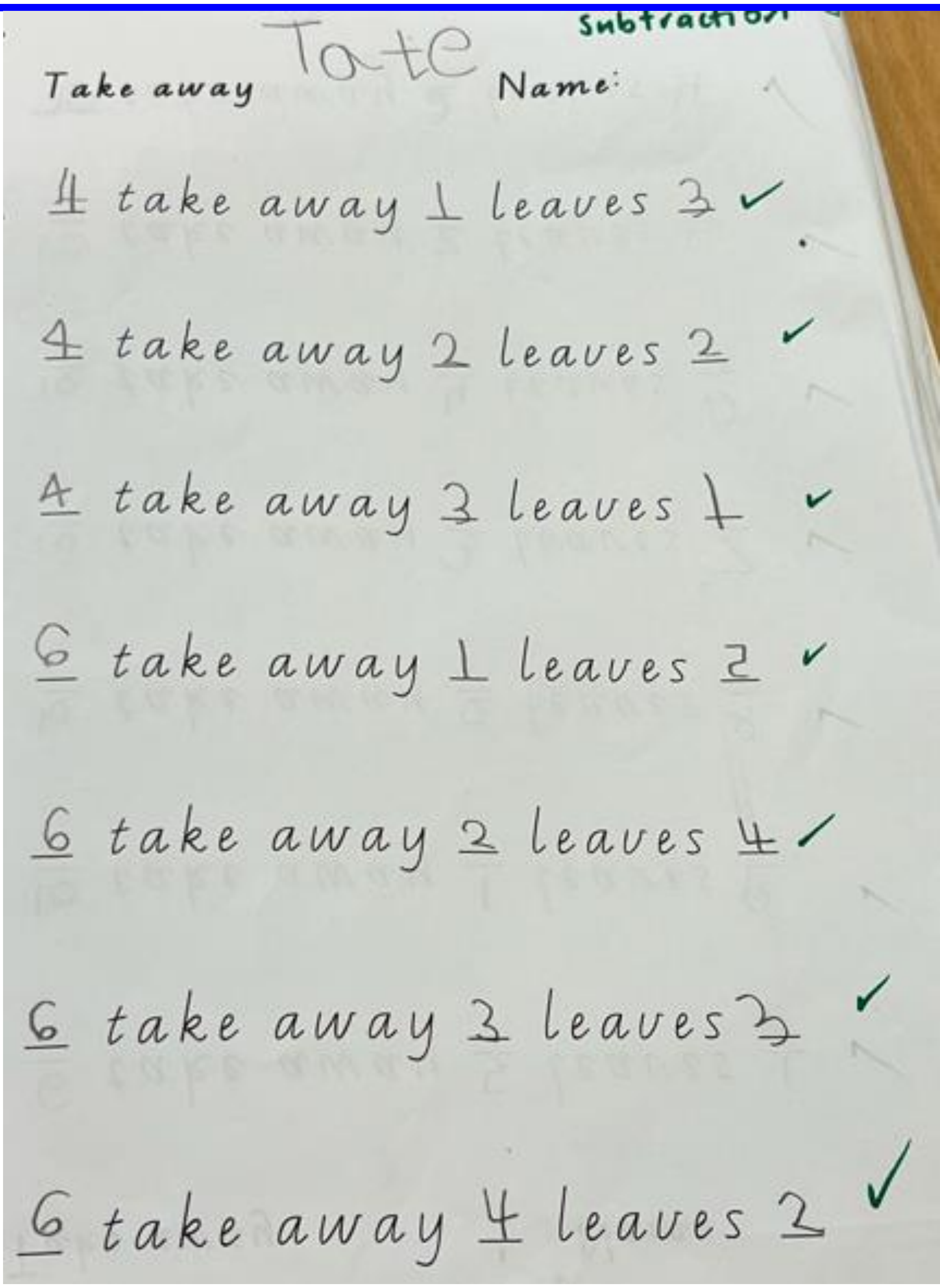
	Cross-content vocabulary link: Emphasise that the maths word for balls is **spheres**. Ask the class to chorus the word after you three times. What's a soccer ball? A sphere! What's a basketball/tennis ball? A sphere!  Once a student figures out all the ways to take away from 4, progress them to a 6-frame, then the 8-frame and finally the 10-frame.
	Support 1: Start with a 2-frame. Model from the start, for these students, what is and what is not a ball, for example, the flat Play-Doh is not a ball, this round Play-Doh is a ball. This will help when you ask support students, "How many balls are left?" or, "How many balls do we have now?" as otherwise they tend to just say the whole starting number again, without distinguishing between flat and round Play-Doh. Progress to a 3-frame, then a 4-frame, then a 5-frame, and so on as their confidence builds.
	Support 2: Fill in the first spot in the template for these students, so that the starting number remains the same for the whole page. This ensures they only need to write what they squished and how many are left (rather than needing to remember their starting number as well).
	Extension 1: Quickly orally assess these students (without the materials) as soon as your class starts work. For example, ask your highest extension student (without the Play-Doh made): "4 take away 2, 4 take away 3, 4 take away 4." If the student can answer accurately and fluently (under 5 seconds thinking time, counting back mentally without materials), give them a frame that represents whichever number started to challenge them. Very advanced students could start with 2 ten frames, taking away from 20 or teen numbers by rolling a 10 or 20-sided die to determine how many balls to squish. This is so long as that student can fluently take away from all preceding numbers as a known fact, or using the addition fact family, or using another efficient explained strategy.
	Extension 2: Record the matching addition fact. For example, for "6 take away 5 is 1" (6 – 5 = 1), the matching addition language is, "5 is 1 makes 6" (5 + 1 = 6).

Extension 3: Roll a 20-sided dice and 6-sided dot dice to generate the take away problem to solve using the materials, or mentally first, then using the materials as a checking device (concrete calculator):





Drawing strategy: During a second repeat session, students could also draw the materials under their starting number on the recording template. For example, draw 6 circles and cross out the taken away or squished balls, to introduce the drawing strategy as a way to solve subtraction problems.



Student work sample

Teaching Tips at the Start of Every Unit

Place Value Unit 15 – Three-Digit Numbers

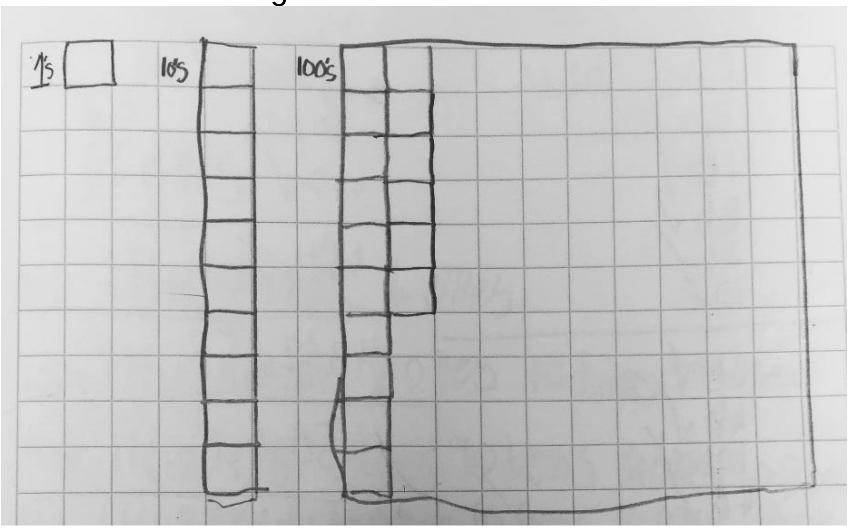
Teaching Tips and Unit Launch

Place Value Unit 15: **Australian Curriculum Version 9 Year 2 Number:** Partition, rearrange, regroup and rename two- and three-digit numbers using standard and non-standard groupings; recognise the role of a zero digit in place value notation AC9M2N02

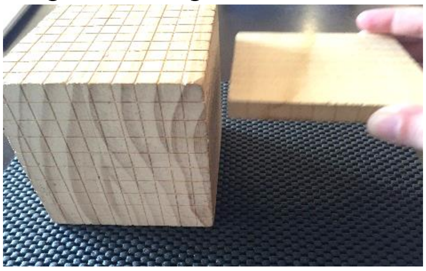
Whole-school language tip: For students, call the MAB/base-ten resources **'place value blocks.'** This language provides a direct link to the content (each block represents a place value) and avoids using the far more abstract commercial name (MAB – multi-attribute blocks).

Begin by introducing each block, particularly the hundred block, as this may be the first time many students have seen these.

- What would you name each of these blocks? Do not tell students the names of each block. Simply give them one of each and ask them to come up with a 'maths nickname' for each block in 5 minutes. *Extra prompt:* Trace around the block using your grid page, or try to count what is in it to figure out what would be a sensible name for each block:



This student was starting to count the hundred block by ones, then changed strategies and started counting how many tens it had.



Questioning:

- How many ones are in a ten?
- How many tens are in one hundred? How many ones are in one hundred? (It may surprise you how many students need thinking time for this question).
- How many hundreds do you think are in one thousand? Collect a thousand block and check. **Misconception alert:** Students sometimes think there are 6 hundreds in one thousand, because there are 6 faces in the cube. Avoid this by counting with a hundreds block horizontally up its layers (shown to the right above). Also place a thousand block on one side of a balance scale, and 6 hundreds on the other side – it does not balance! Then make it 10 hundreds on the other side – it balances! 10 hundreds = 1 thousand.

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

Standard form: The number is written in digits, for example, 45. For numbers in the ten thousands or above, it is the Australian convention to use a space: 10 005 (not a comma).

Worded form: The number is written in words, for example, forty-five. The grammatical convention is to use a hyphen between tens and ones for two-digit numbers: 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 to receive immediate feedback.
- **Top Ten spelling assistance charts** available in cursive and stick and ball font.

Often, some of the most challenging difficulties occur with recording and reading two-digit numbers in words. These are more challenging than learning the three-digit counterparts, in that some of the tens numbers do not follow a logical pattern:

- 40, 60, 70, 80 and 90 follow the 'ty' pattern where seven*ty* is simply seven and 'ty' for tens at the end
- 30 and 50, thir*ty* fif*ty* follow the ordinal form
- twenty and the teens follow neither, although twenty stands for (*tw*o *ten*s).

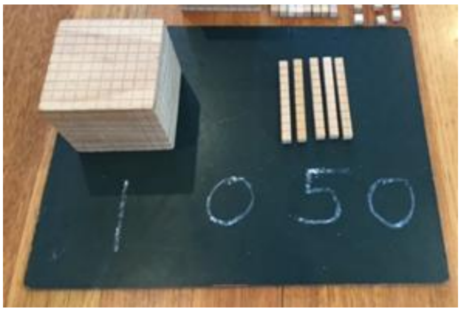
In this sense, the hundreds is more straightforward, because three hundred is literally said as 'three hundred' in English, not 'threedy' or the like. However, the hundreds has 'and' said after it, which is why we highly recommend using 'hundreds **and**-tens (ty) – ones charts' (as shown here), rather than just h-t-o charts. Writing 'and' after the hundreds in the chart helps students remember to say it while reading back numbers to their partner, particularly for ESL students. Also check that students have maintained their understanding of the teens numbers, for example, by asking a student to make 417, then 471, using the place value blocks, to show the difference between these two numbers.

hundred and	tens (ty)	ones

CRITICAL TIP! **Place value form:** The number is written in a way that highlights its place value composition, for example, '456' would be said out loud as, "4 of the hundreds, 5 of the tens, 6 of the ones," or "4 hundreds, 5 tens, 6 ones." Students record using mathematical shorthand, such as '4h + 5t + 6 ones' or '4h + 5t + 6u.' Avoid writing 'o' for 'ones,' as this could be confused with 0 – instead write 'ones' as the full word, or 'u' for units, which is also the language that appears in the Australian Curriculum (ones/units are used interchangeably).

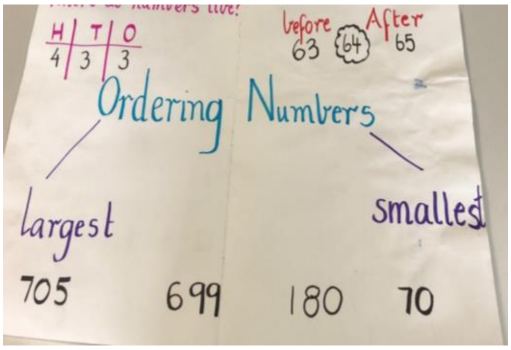
Expanded form/notation: 526 as 500 + 20 + 6. Avoid over-emphasising this notation.
CRITICAL TIP! Australian numeracy coaches advise to emphasise what we call 'place value form,' and avoid over-emphasising expanded form. Expanded form encourages students to see numbers as large sets of ones, rather than 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 they 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.

Internal zeroes: Three and four-digit numbers give rise to internal zeroes. For many students, this is their first encounter with this concept. Ensure that students understand the meaning of an internal zero – that there is zero of that place value (in the photo, zero hundreds and zero ones). Zero is the way we show that there are none of that place value. A few authors, such as Dianne Siemon, also describe zero as a 'place value holder.' However, showing students that there are zero of that place with materials is an even stronger and more visual explanation.

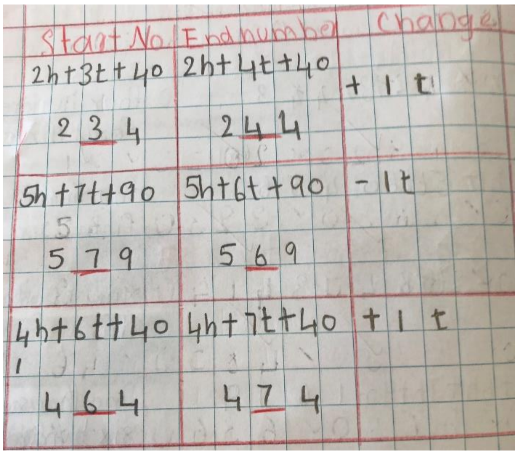


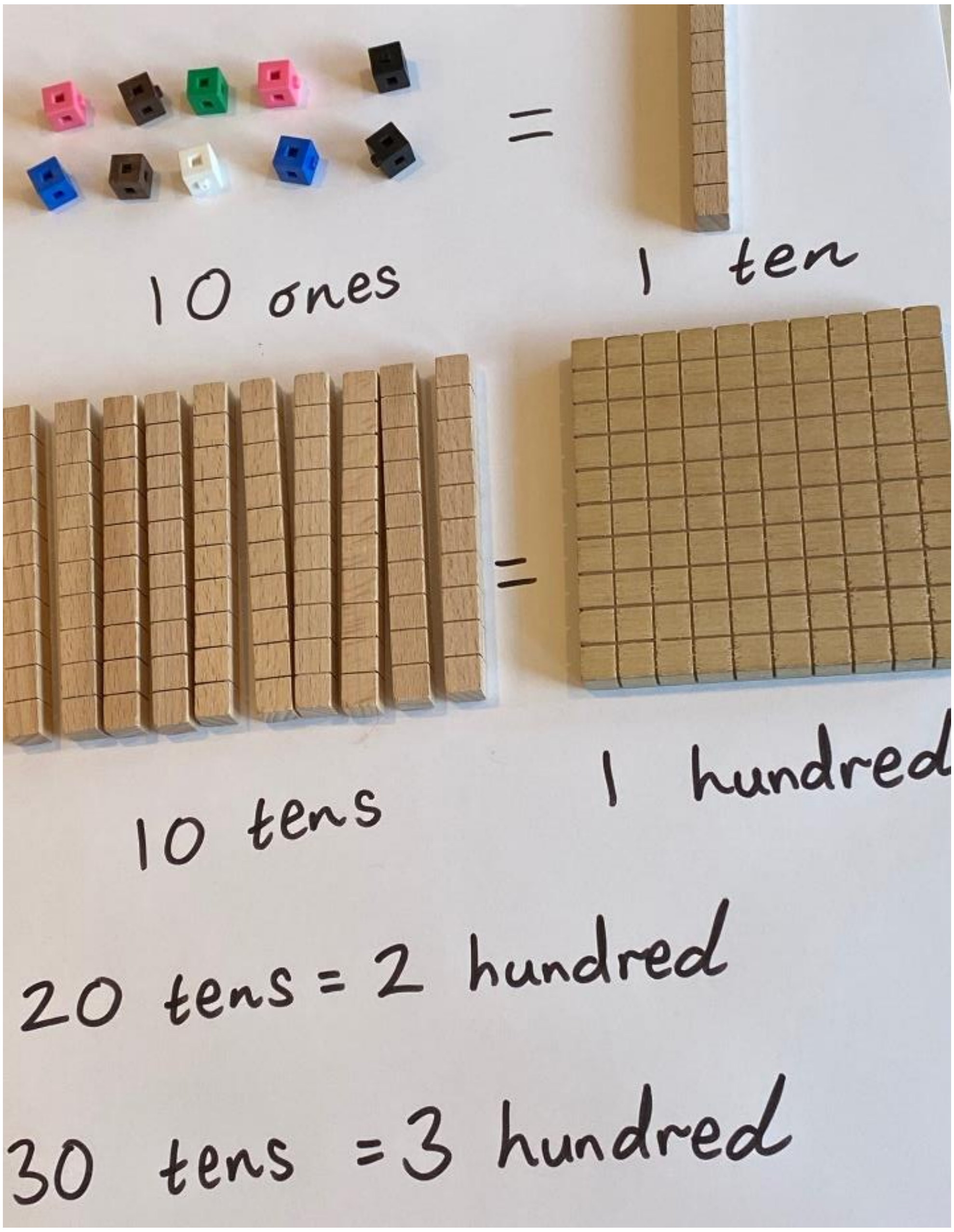
A renaming focus follows this unit (*Place Value Unit 16*), which encourages students to develop more flexibility in the sense that 1050 can be made using 10 hundreds and 50 ones (not zero).

Example Anchor Charts and Numeracy Walls

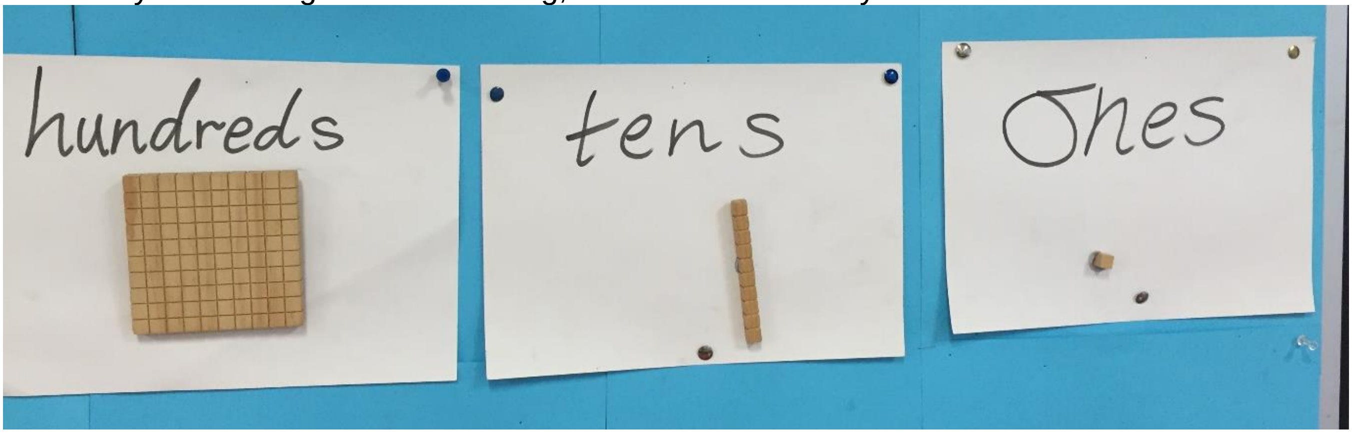


Photocopy a few pieces of students' personal best work each week and place them on a set spot on your classroom numeracy wall:

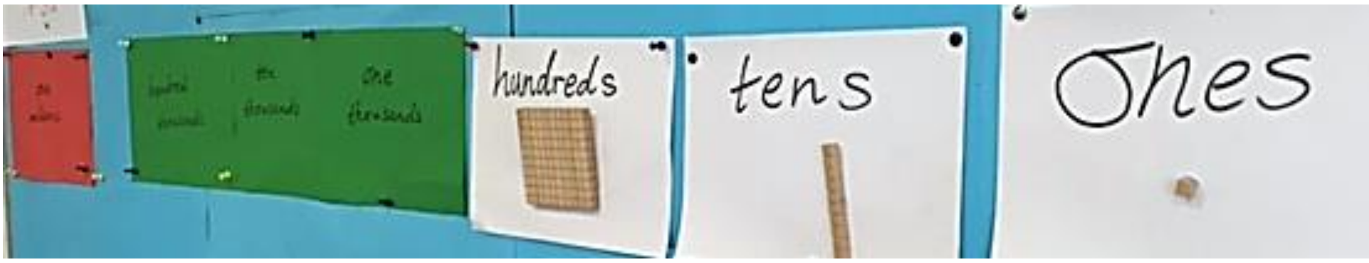




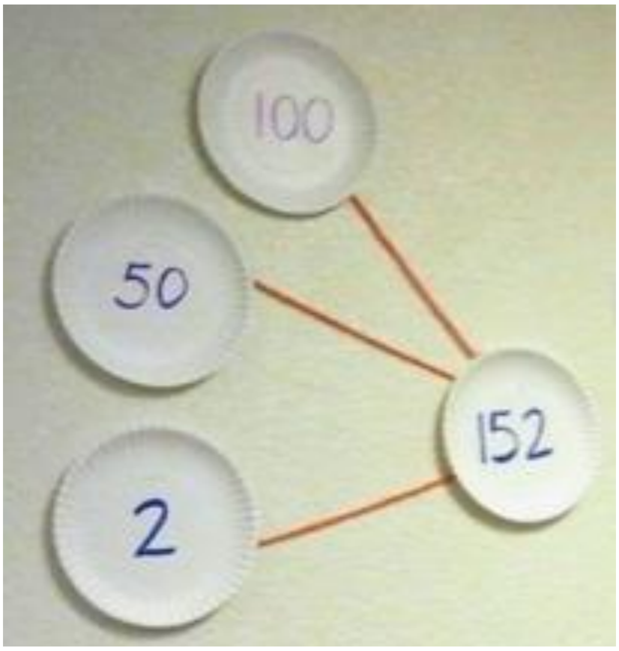
If your drawing skills are lacking, stick materials onto your anchor charts instead!



Show students how the hundreds, tens and ones pattern continues in the thousands and millions family. Otherwise, many students form the misconception that the place value system is ‘ones, tens, hundreds, thousands, millions,’ instead of ‘ones, tens, hundreds; one thousands, ten thousands, hundred thousands; one millions, tens millions,’ and so on:



Choose a colour for each place value that is consistent across the school, which students can mirror in their recording. This is particularly helpful for visual learners.



Warm-Up Games – 1 of 100^{+} warm-ups

Specifically linked to each skill and year level within the sequential units

Partitioning	One of the Warm-Up Games in Addition Unit 4

Last Hands Standing!

Students verse each other at proposing different ways to make the number of the day using their fingers.

For example, the teacher says the number of the day is 6.

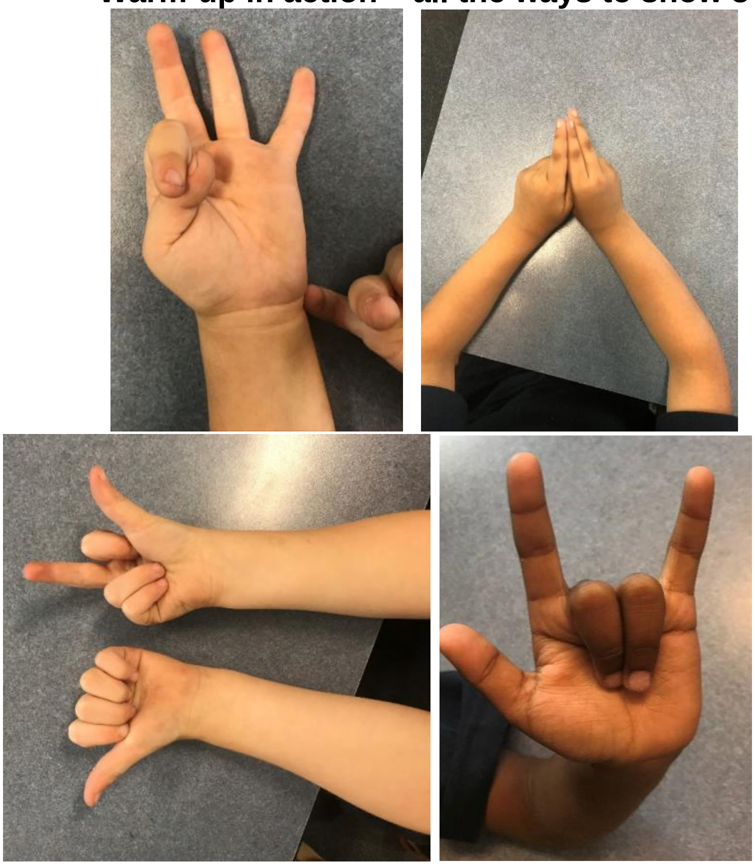
Student A: Pulls out 3 fingers on their right hand and 3 on their left hand, making 6 fingers altogether. Both students record this using the _ and _ is _ template from this unit's folder: 3 and 3 makes 6, 3 + 3 = 6

Student B: Pulls out 2 fingers on their right hand and 4 on their left hand. Both students record in the template. The game continues until both players run out of ideas.

Rule 1: Students cannot repeat a combination that has already been recorded.

Rule 2: Commutative (turnaround) rules are accepted. Student B proposed 2 fingers on the right hand and 4 on the left, student A can then propose 4 on the right and 2 on the left to make 6. This will encourage students to take advantage of these 'freebie' maths facts. The last player to propose an accurate combination wins – the last hands standing!

Warm-up in action – all the ways to show 3

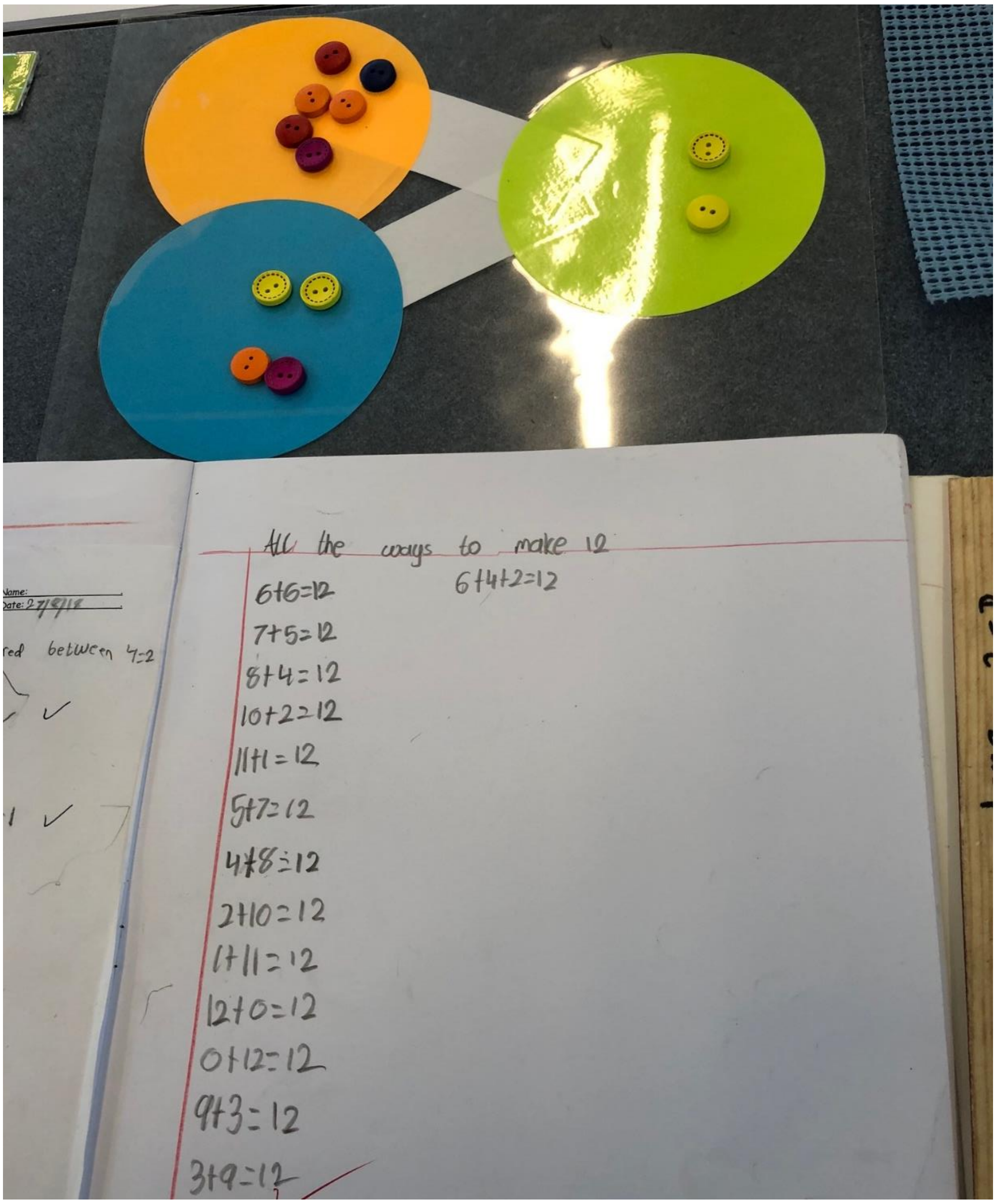


This is excellent subitising practice with other objects (fingers), to avoid students only becoming accustomed to practising subitising using dot dice or the like.

Warm-up Games – 1 of 100⁺ warm-ups

Specifically linked to each skill and year level within sequential units, front-loading new content and building mental fluency in preceding developmental steps.

Warm-Up	One of the Warm-up Games to revise skills needed for Addition Unit 8 – Building to 10
All the ways to make the numbers 3 to 9	Use number bond templates (3 laminated kinder circles as shown in the photo) to revise all the ways to make the numbers 3 to 9. Start with the total in the single circle, then push a few counters to the top circle and the rest to the bottom. 8 is made of 2 and 6. Restart the 8 in the centre circle and repeat, but with a different combination that makes 8. Later, use the three circles to break the number into three parts, as shown here with 12 as 6 + 4 + 2:



Year 1 student work sample for a 10-minute warm-up