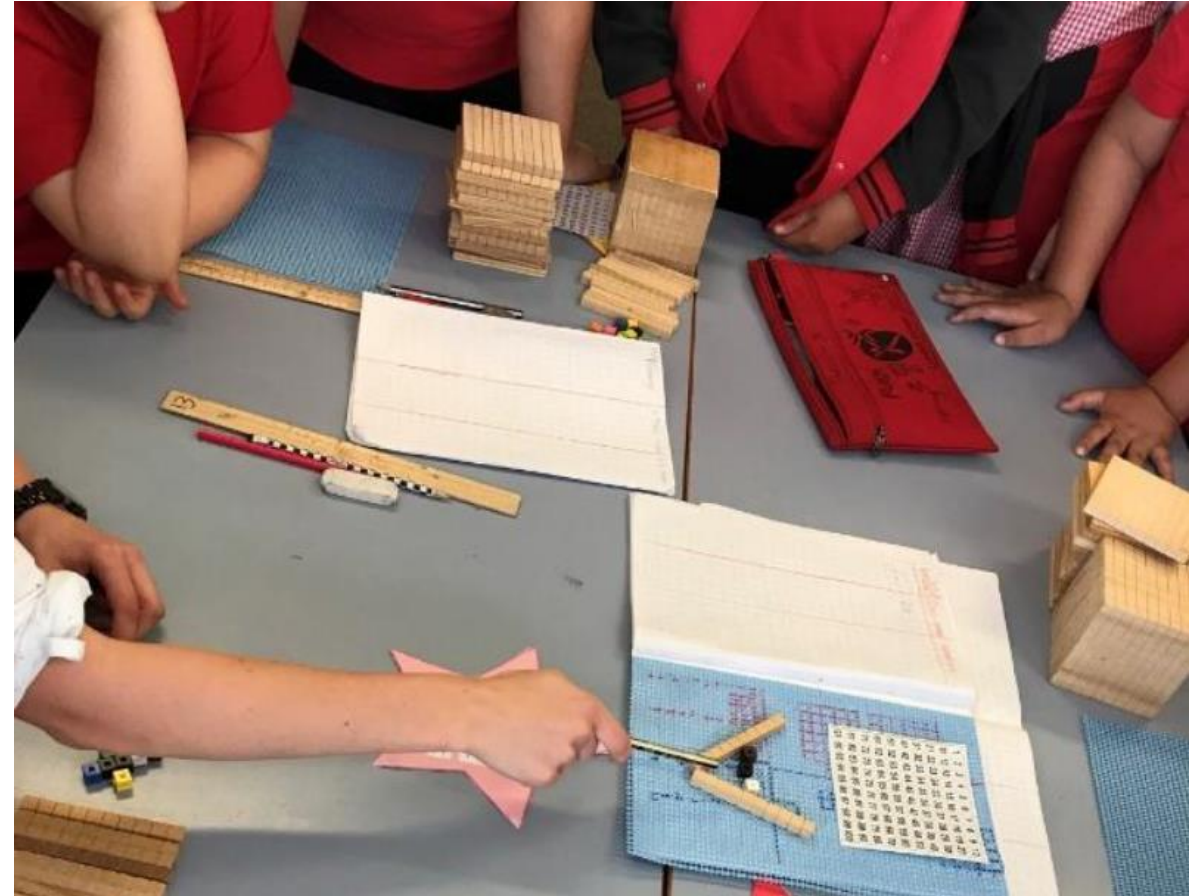


# 20 Hands-on Maths Tips

## Top Ten Maths

# They may be MAB, but call them 'place value blocks'

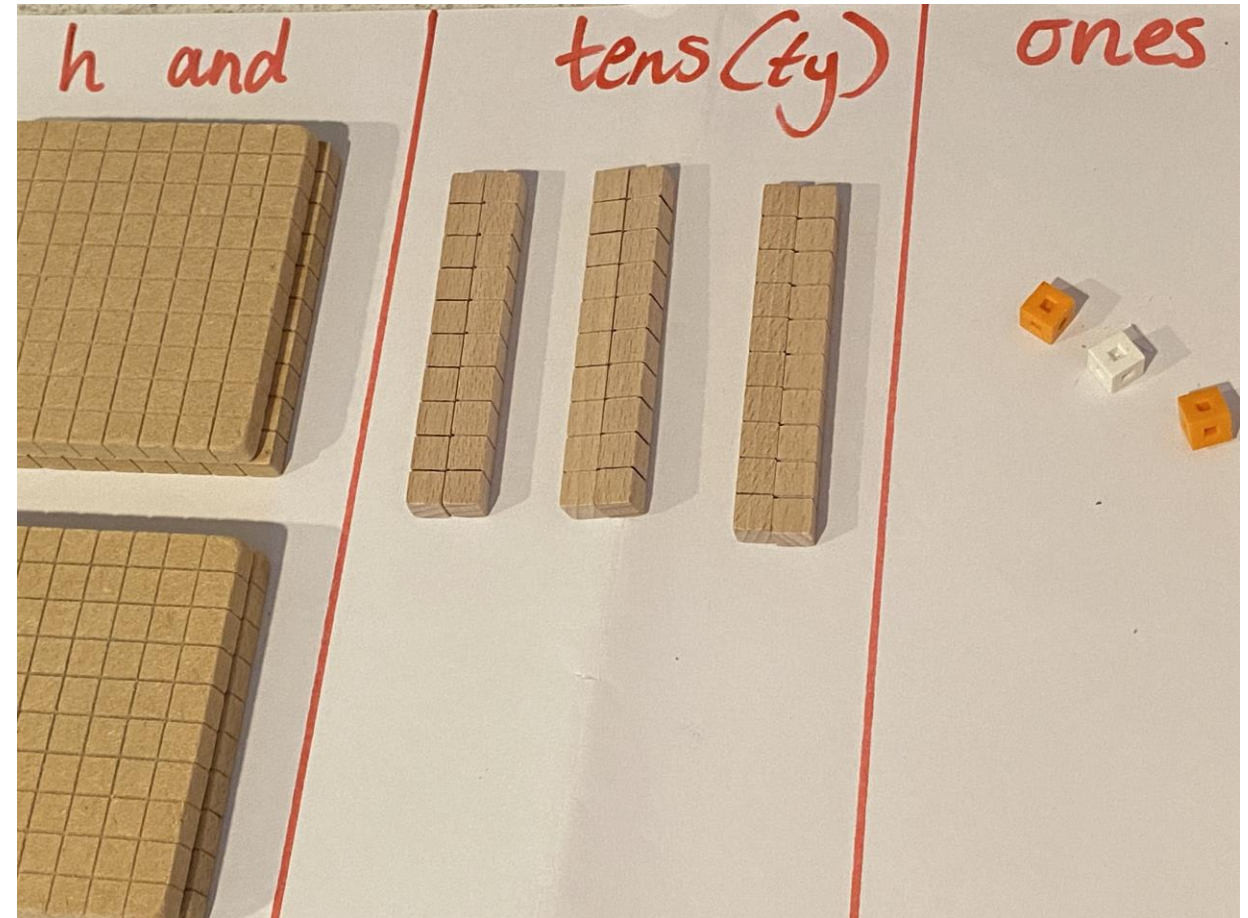
MAB stands for multi-base arithmetic block or multi-attribute block because one block is a gram, a millilitre and a  $\text{cm}^3$ , but it is primarily a commercial name for a product. Changing your whole-school language to **place value blocks** makes much more sense to reinforce the purpose for which we use these materials in the classroom.





# hundred and tens (ty) ones charts

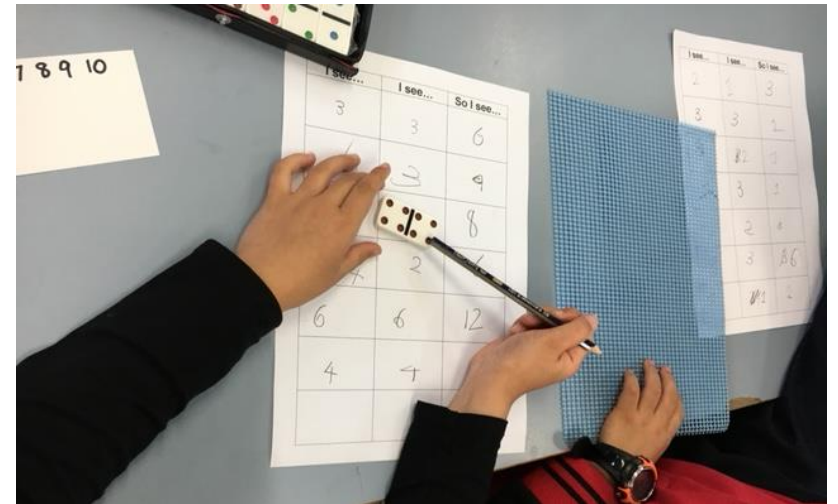
Read 456: “Four hundred **and** fifty-six.” Since we say ‘and’ orally, write it on charts as a cue for when students read back the number to their partner. Likewise, connect the meaning of the ‘ty’ suffix to the tens by visually writing this on, whenever H-T-O charts are in use (new template attached).



# Get to know your students, set up and trial maths buddies, then lock them in for the year

By having consistent buddies, it saves considerable time and reduces behaviour issues, since they are chosen because they work well together. Using **set like-ability buddies** also ensures that you can extend and support each pair as they need it, rather than having a support student coast or an extension student become bored or frustrated by working in a mixed-ability partnership. Aim to choose buddies that are like-ability but also complement each other, for example, one is great at using materials, the other is great with oral explanations or recording their work.

If someone is away, their partner can choose to work on their own for the day, or join a similar like-ability partnership as a three. For some sessions, students work on their own regardless – they should not *always* be buddied, they need to stand on their own two feet as mathematicians



# Get to know your kids, set up and test maths buddies, then lock them in for the year

Occasionally, for behaviour reasons, support students may need to be paired with low-mid students, rather than with another support student, but often a girl-boy pairing can also overcome this. Teachers should not be organising buddies or handing back maths books at the start of every session – this adds up over the year to a significant loss of precious maths time.

If buddies are friends and work well together, that's great and can provide an extra incentive to work hard in order to remain maths buddies throughout the year.

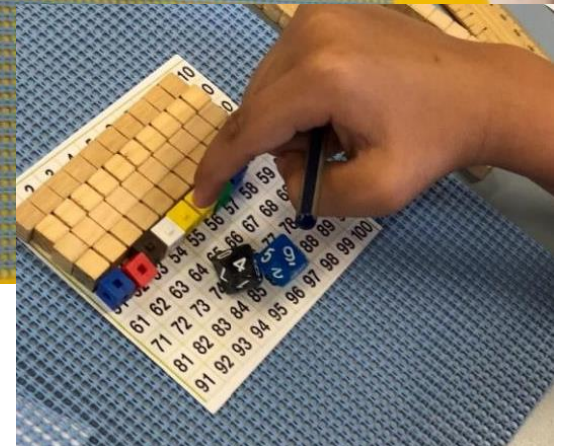
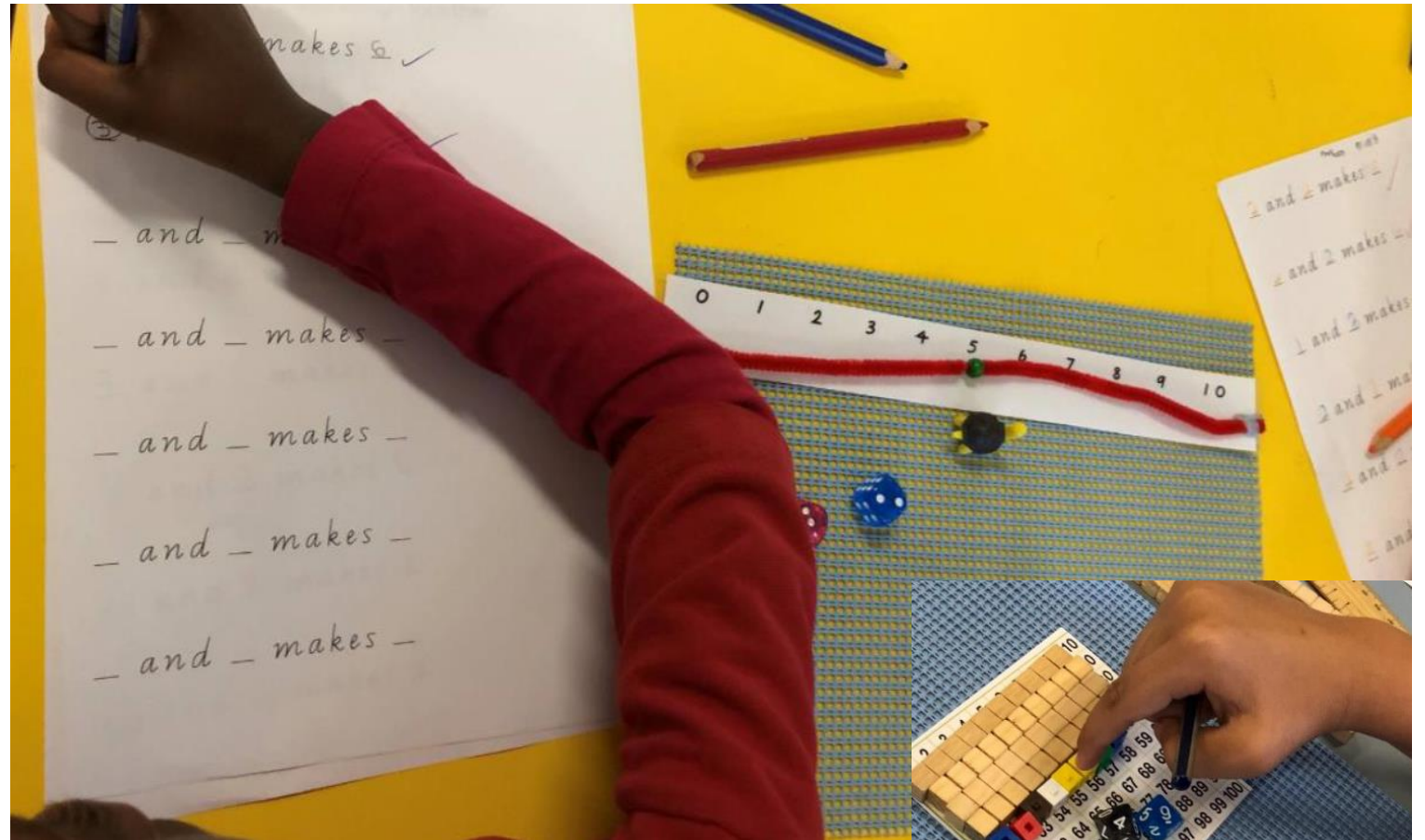
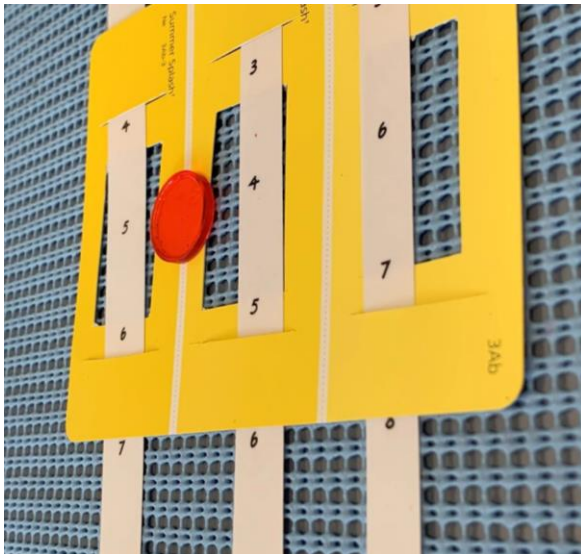
If students want to change after a term, or abilities have shifted, change the combinations. However, if a pair is working well and loving maths together, why change them?



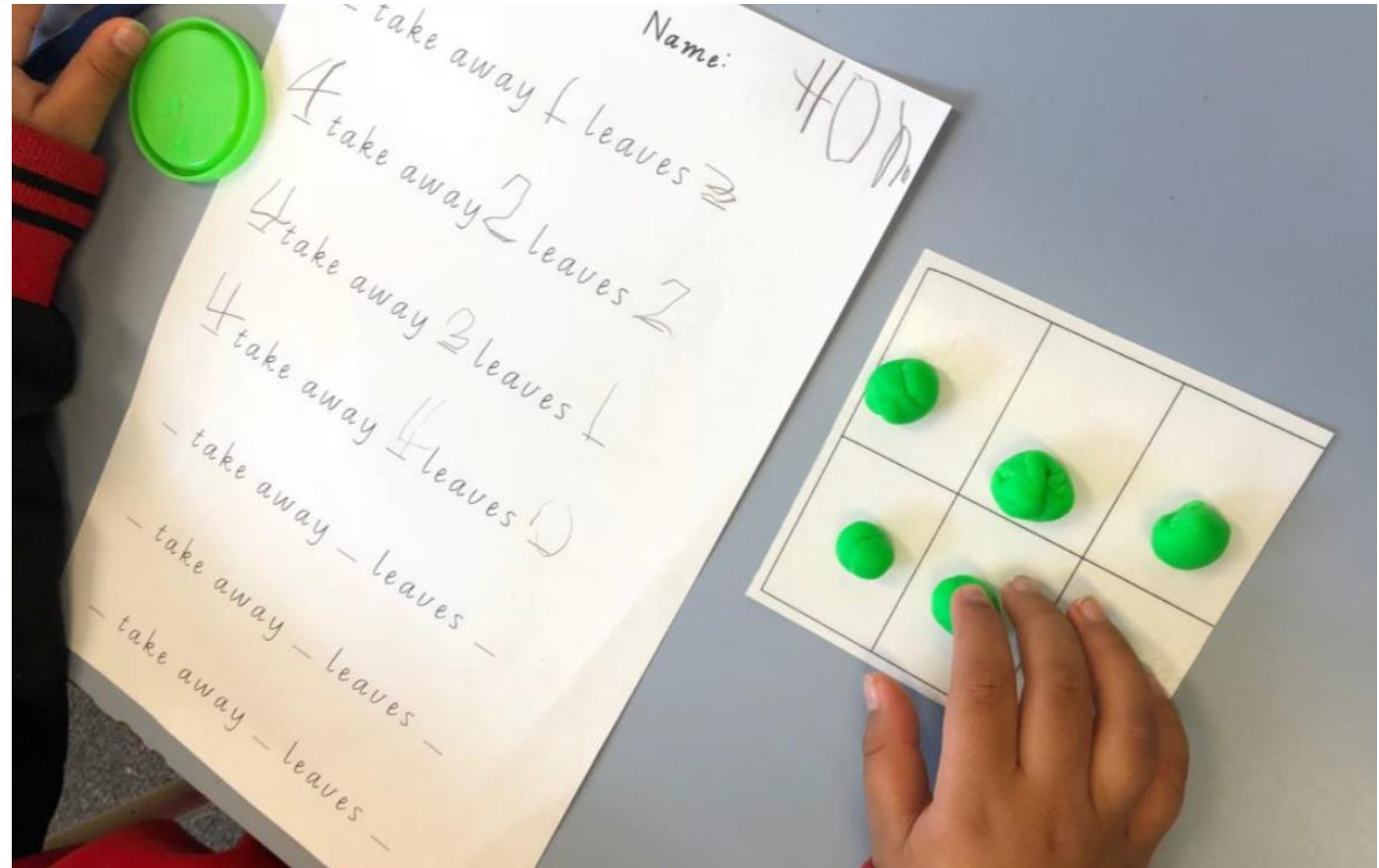
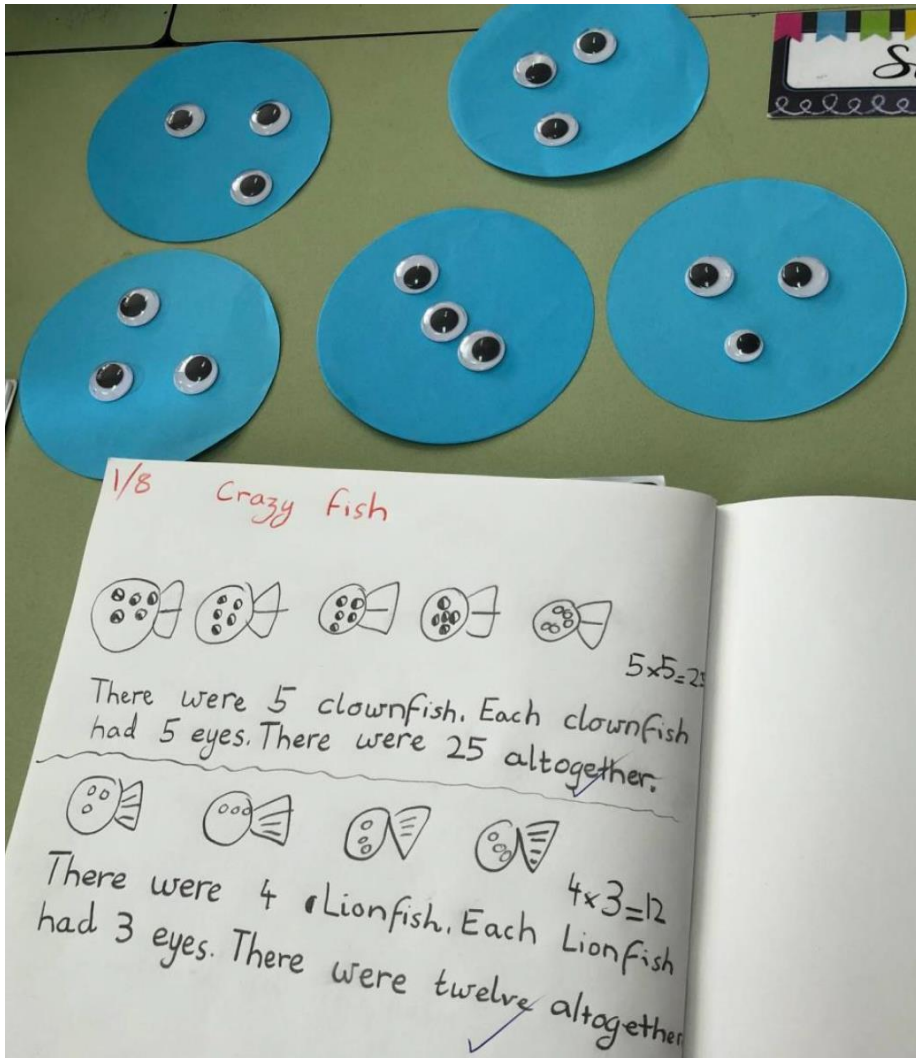


# Make one new material or template each fortnight

By the end of the year, you will have everything you need in terms of hands-on manipulatives for that year level and many others (since most of materials are very versatile). Compare this to a year of worksheet-based maths – by the end of the year, you have nothing to show for all that time at the photocopier.



# If you are a maths or team leader, stock up your craft cupboard during term one



**Most frequently used craft materials:** Play-Doh, googly eyes, buttons.

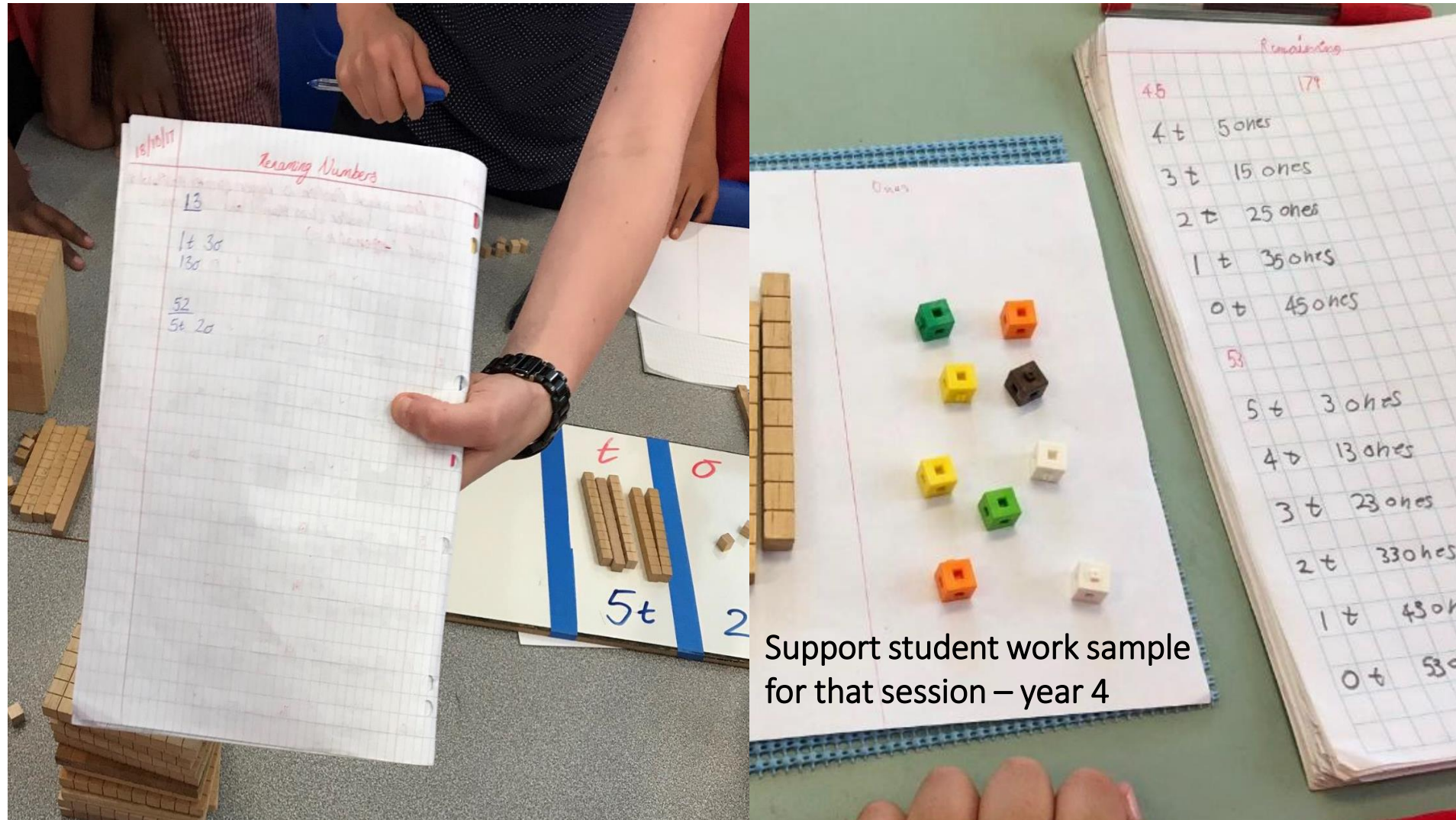
**Most frequently used templates:** mini place value charts, number bonds, 4- 6- 8- and 10-frames, number line bead sliders, H-T-O charts.



# Show students how it should look using an example maths book (not the main whiteboard)

This is the one habit that will have the most significant impact on the standard of students' recording in workbooks.

By showing students in your own example maths book, you set a high standard for recording, neatness and show them exactly how it should look in their books or on the recording template. This avoids students having to mentally transfer your modelling from a whiteboard to their own books.



Support student work sample for that session – year 4

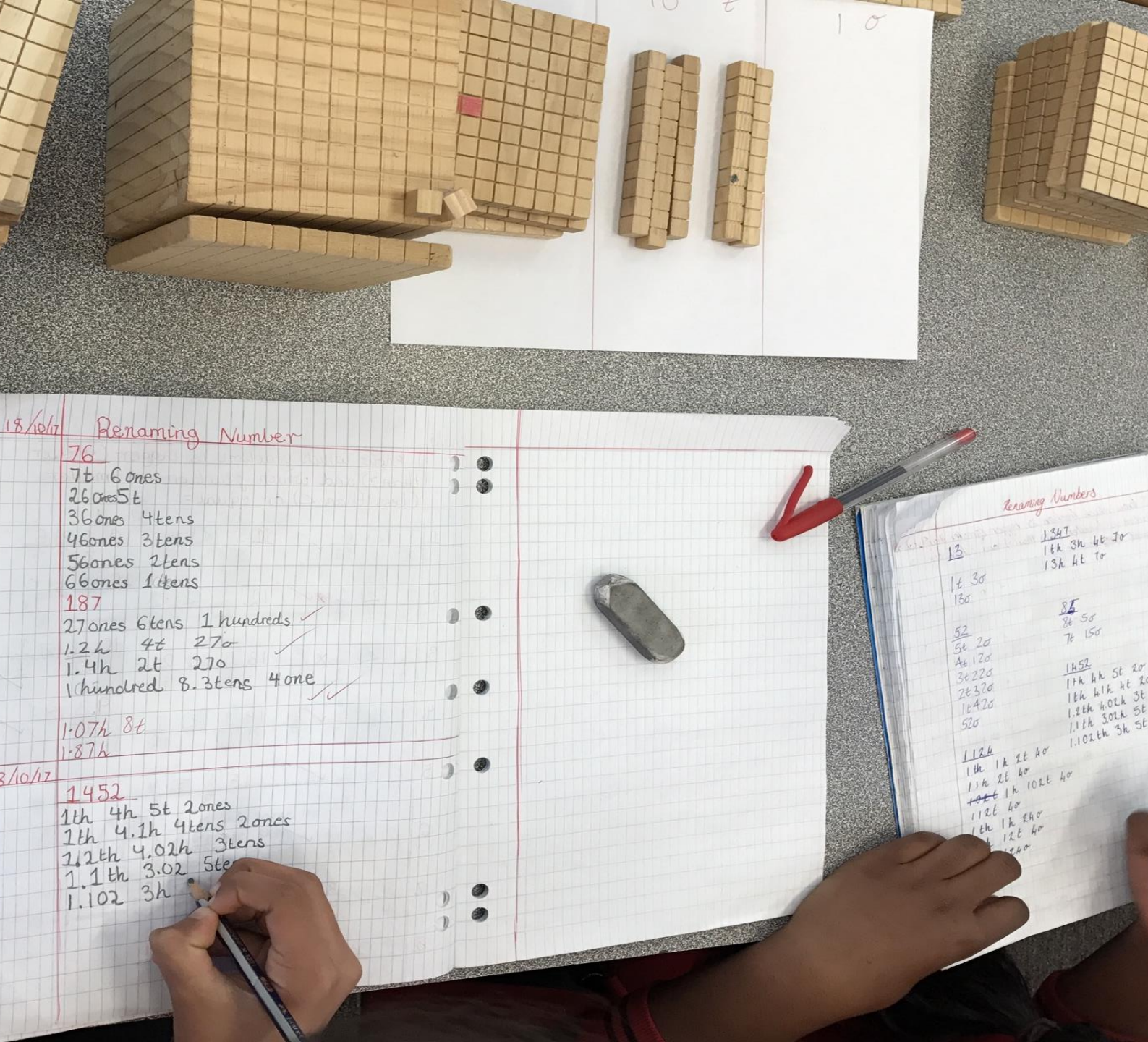


# Create great bookwork habits and set high expectations from the start

For example, do maths books have margins or not? Agree as a school and lock it in forever.

During the very first day of school, practice writing one digit per grid box in years 2-6. Also practice margins, ruling up straight columns based on different fractions ("rule your page into thirds"), demonstrate folding tips to make the columns equal and writing neat headings in red pencil. Set your expectations very high from the start of term one, and keep them high, to avoid workbook nightmares by term four.

We recommended blank books up to year 2, grid books and blank in year 2, then 1cmx1cm grids for years 3-6.

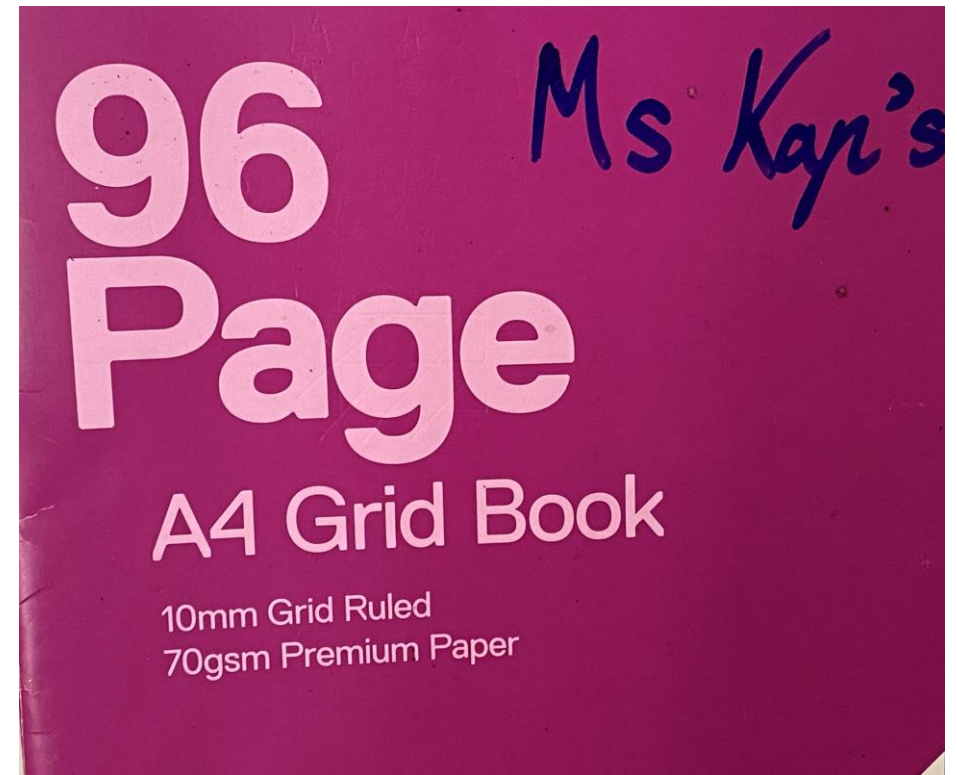




# Keep your example maths book for future years to help remember and refine great lessons

While the whiteboard is rubbed off every day, by keeping all your example modelling and workbook set ups in one book, you will be able to use and refer back to them – forever!

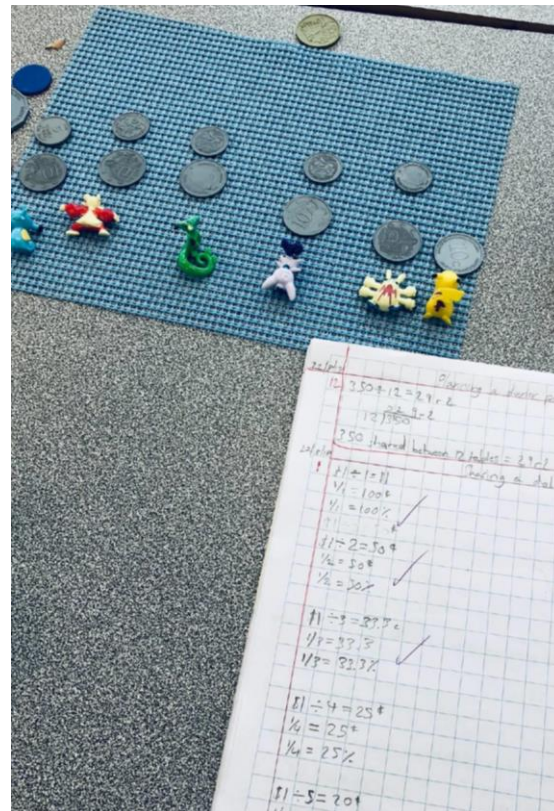
Sky divers	Equivalent to all (whole)	Equivalent to half ( $\frac{1}{2}$ )	Battle
4	$\frac{4}{4}$ $\frac{1}{4} + \frac{3}{4} = \frac{4}{4}$	$\frac{2}{4}$	$\frac{1}{4} < \frac{3}{4}$
5	$\frac{5}{5}$ $\frac{3}{5} + \frac{2}{5} = \frac{5}{5}$	can't make $\frac{1}{2}$	$\frac{3}{5} > \frac{2}{5}$





# Even though our sessions are materials-based, students are always recording

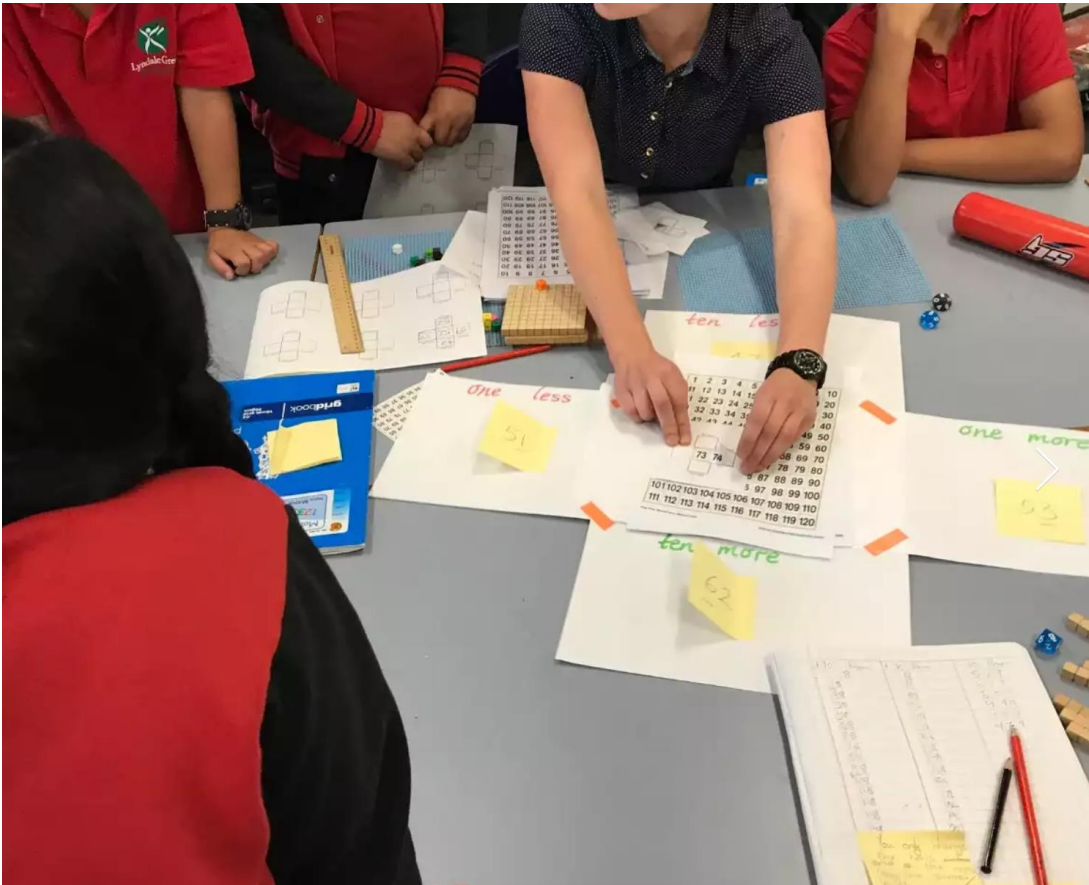
We emphasise recording to ensure that students are explaining their mathematical thinking (orally to their partner when we roam and hear it, but also in their books while we are with other students). Recording is also used to safeguard a strong work ethic throughout the session, as we can instantly see the level of work that has been done. It also helps us quickly assess how each student is finding the challenge level of the task at a glance – then extend or support as needed.





# Show students how the task looks – at a student desk and never at the whiteboard

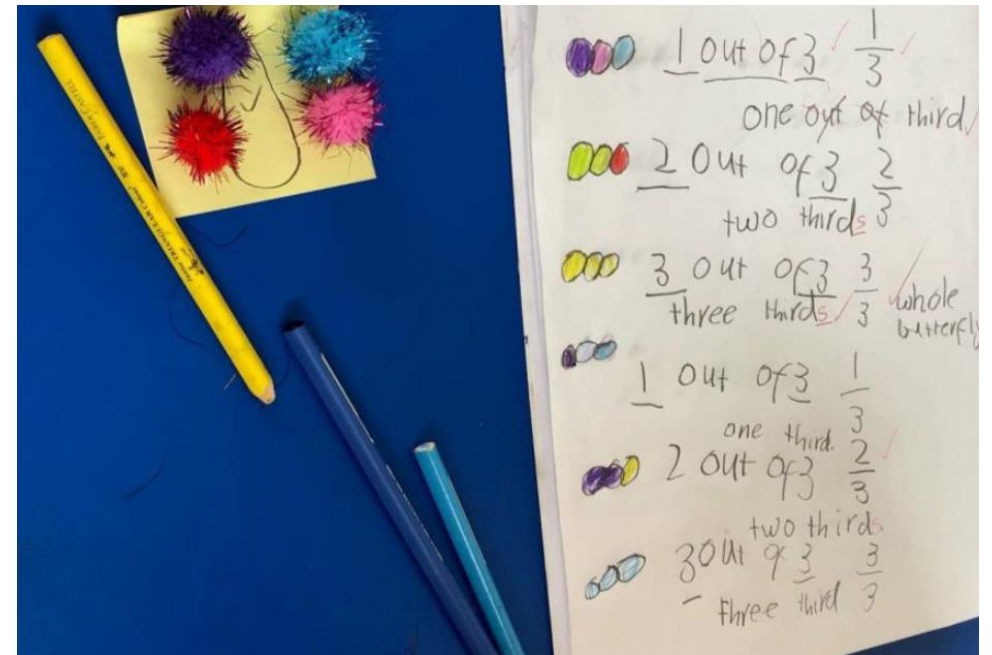
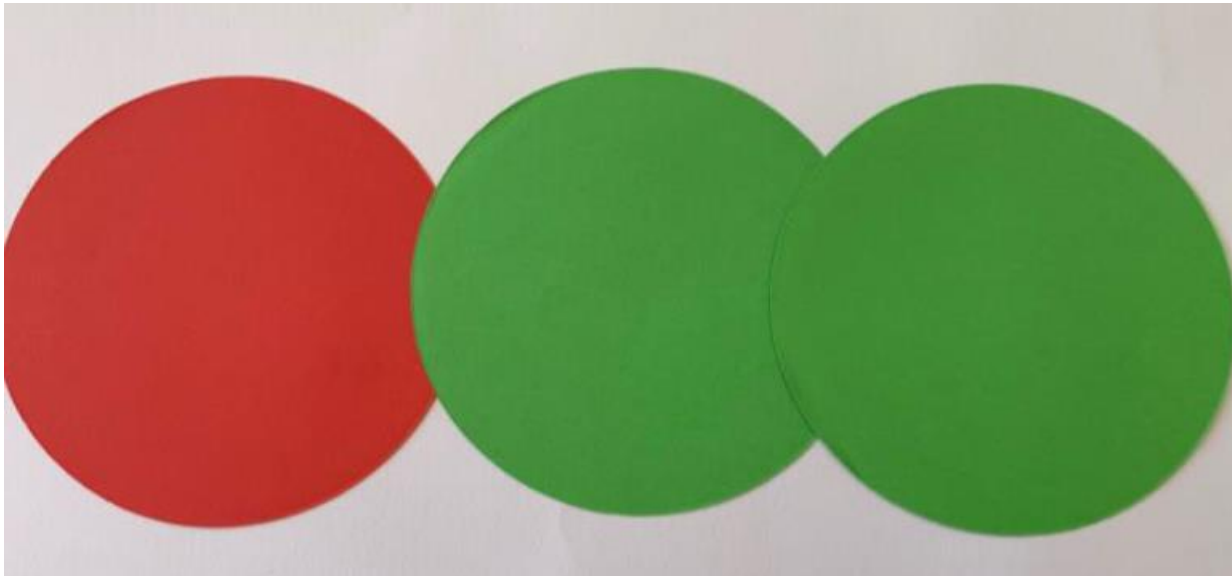
This makes all the modelling with materials possible and so powerful, compared to modelling on the whiteboard alone. It also enables you to show students what could go wrong (misconception alerts) and how the task works, with materials, recording and everything else in action for students in the exact same context in which they will be working.





# During the modelling around desks, use giant/enlarged materials and templates

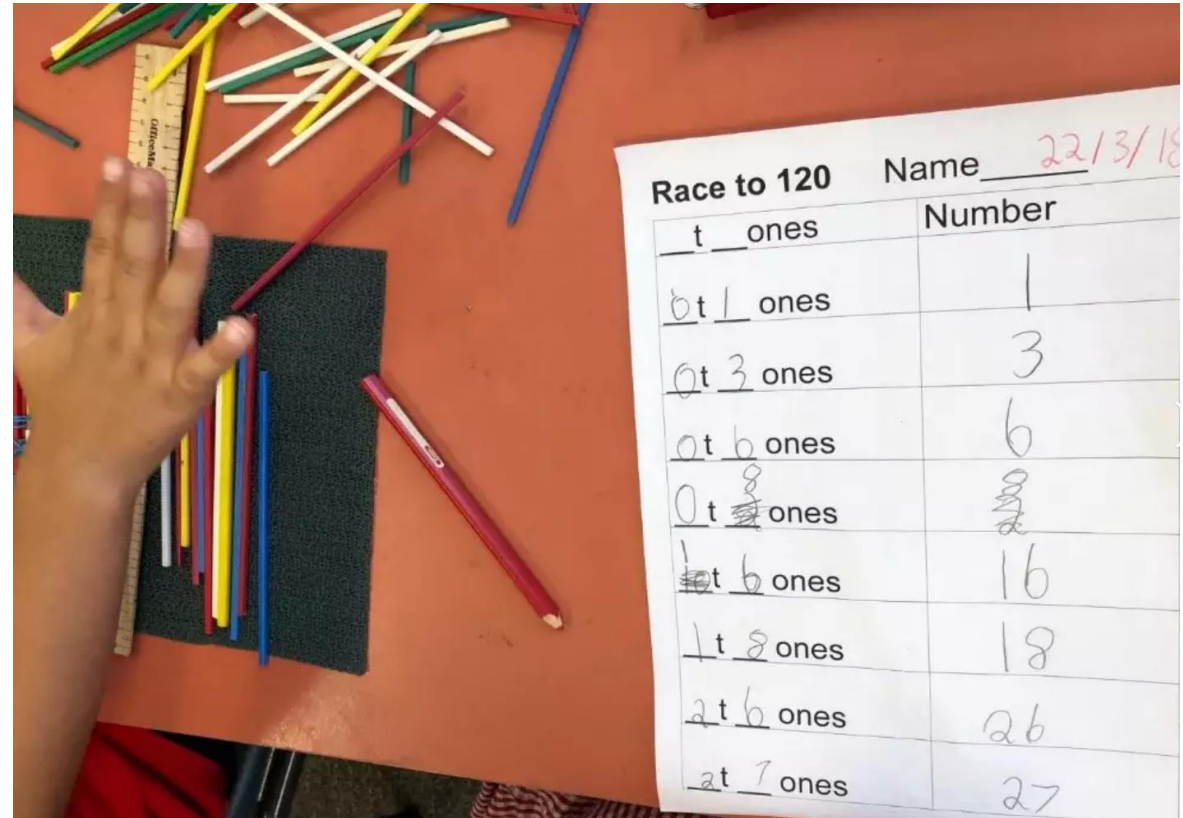
For example, for the fractions evolutions task where caterpillars (3 parts) evolve into butterflies (4 wings), then students also record fractions from starfish (out of 5), and other animals with different numbers of legs, students use pompoms on post-it notes at their desks. However, to model initially, it can help to use kinder circles on a white A3 background, to ensure that all students can see. Towards the end of your modelling, switch to the same materials that students will be using, or use both throughout your modelling. Also enlarge recording templates to A3 when using these to model. For better visibility, use both a maths book **and a mini whiteboard** to show recording.



# Plan for 3, not 5 sessions

Instead of planning 5 maths sessions every week, plan 3 rich tasks that could easily be double sessions or repeated two or even three times. Add a new hook or change the type of materials (from straws to beads), or simply repeat the same task with two levels of extensions planned for those students who earn these 'upgraded/extra challenge' versions of the task.

The second session is often the best – students know how to record and how to use the materials. This means that they can focus all their efforts on the mathematics of the task to form a strong understanding of the underlying concepts and patterns they are seeing from using their repeated use of the materials. The second session is when most of the magic happens – so if the first session goes well but students need more time or would benefit from more practice, repeat, repeat. If anything, we should feel guilty about moving on too quickly, not about repeating rich tasks.





# Teach in blocks

Be the turtle, not the super speedy bunny! Be the chuga-chuga little engine, not the express train of content coverage.

Our student gains are among the very highest in Australia. Firstly, it is a credit to the passionate and hardworking teams at our PD schools. It is also because we tackle units step-by-step, providing teachers and students with time to make mistakes and consolidate skills. We do not move on after one week, before the depth of the learning is done.

This ensures students and teachers have time to master each step, working through the gaps identified by assessments, formatively assessing and responding to how students are developing throughout each unit, and achieving long-term retention through repeated practice.

Place value is a focus for weeks 1-7 of term one. It is then further consolidated through the continual use of place value blocks (MAB) throughout other units, as well as estimation before carrying out each operation. However, it requires and deserves a long period of time to master through a block unit, as do all critical concepts – rather than being rushed through, or leap-frogged for a week every term, to ‘cover’ other topics.

**Year 2 Suggested Sequence**

	Weeks 1 to 4				Weeks 5 to 7			Weeks 8 to 10 or 11		
Term 1	PLACE VALUE							LOCATION	GRAPHING	
	Warm-ups focused on subitising, partitioning and skip-counting by 2, 5 and 10							1.5 weeks	1.5 weeks	
	Two-digit numbers Place Value Unit 12	Two-digit numbers Unit 12	Teens Unit 13	Three-digit numbers Place Value Unit 15	Three-digit numbers Place Value Unit 15	Three-digit numbers Place Value Unit 15	Round and estimate Place Value Unit 14	Interpret simple maps and relative positions of features	Questions of interest and data displays as lists, tables and picture graphs	
Term 2	ADDITION				MONEY	SUBTRACTION			TIME	
	Warm-ups focused on 10 facts, doubles facts and partitioning the numbers 6 to 9 (Addition Units 4-6)							2-3 weeks		
	Partition Addition Unit 4 10 Facts Unit 5	Doubles Addition Unit 6 until fluent	Near doubles Addition Unit 7	Build to 10 Addition Unit 8	Calculate totals Money Unit 2	Count back Subtract Unit 3	Backwards 10 facts Subtraction Unit 5	Backwards doubles Subtraction Unit 6	Analogue time Start with minutes, connection to the 5s pattern and how the clock actually works (not rote-based o'clock, half past, quarter to)	Seasons  Calendar work
Term 3	MULTIPLICATION			LENGTH AND AREA	SHAPE	ADDITION & SUBTRACTION			PATTERNS	CHANCE
	Ongoing warm-ups relating to skip-counting by 3, 4 and 9 (10 and 1 less) (Patterns Unit 2)							Ongoing seasons of the year song		
	Skip-count Multiply Unit 2 Repeated addition Multiply Unit 3	Repeated Addition Multiply Unit 3	Arrays Multiply Unit 4	Formal units for length Informal units to compare areas	Describe features of 2D and 3D shapes	Difference between Subtract Unit 4	Fact families Subtraction Unit 7	Fact families Subtraction Unit 7	Missing elements Patterns Unit 3	Formal probability language
Term 4	DIVISION			FRACTIONS		LOCATION	PLACE VALUE			MASS AND CAPACITY
	Ongoing warm-ups relating to skip-counting by 3, 4 and 9 (10 and 1 less) (Patterns Unit 2)							Ongoing seasons of the year song		
	Daily estimation warm-up (estimation 180 website or props brought in by students or teacher) (Place Value Unit 14)									
	Create equal shares Division Unit 2	Quotition and skip-count to divide Division Unit 3	Quotition and skip-count to divide Division Unit 3	Halves, quarters, eighths Fractions Unit 2	Proper Fractions Fractions Unit 3	Half and quarter turns Slides and flips	Three-digit numbers Place Value Unit 15	Renaming Place Value Unit 16	Renaming Place Value Unit 16	Informal units for capacity, balance scales for mass

# Teach 3 strategies for every operation

For addition, spend considerable time on the jump and split strategies, aiming for students to master two-digit additions mentally using these, and only then focus on the vertical algorithm.

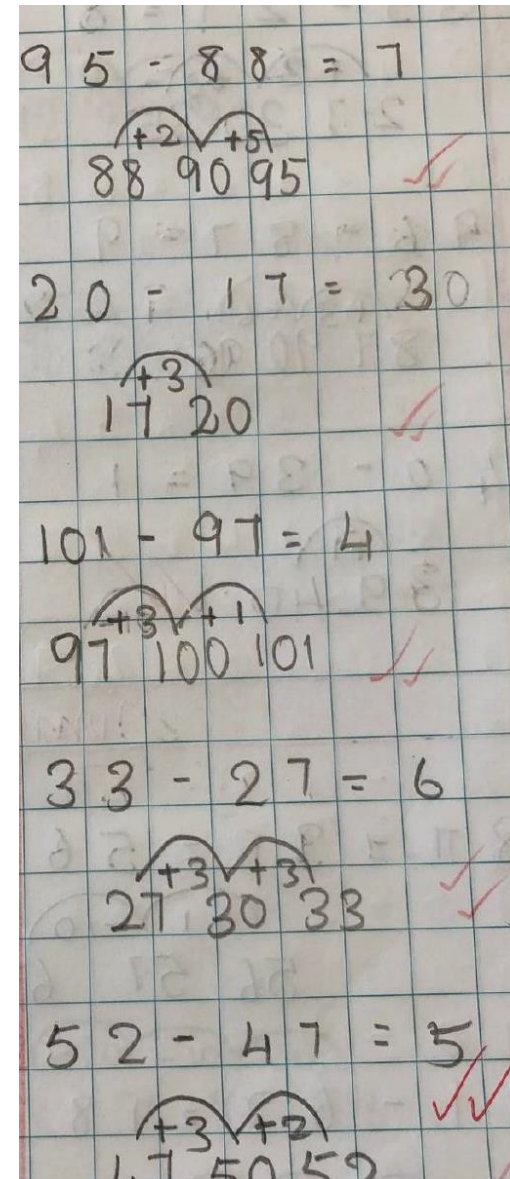
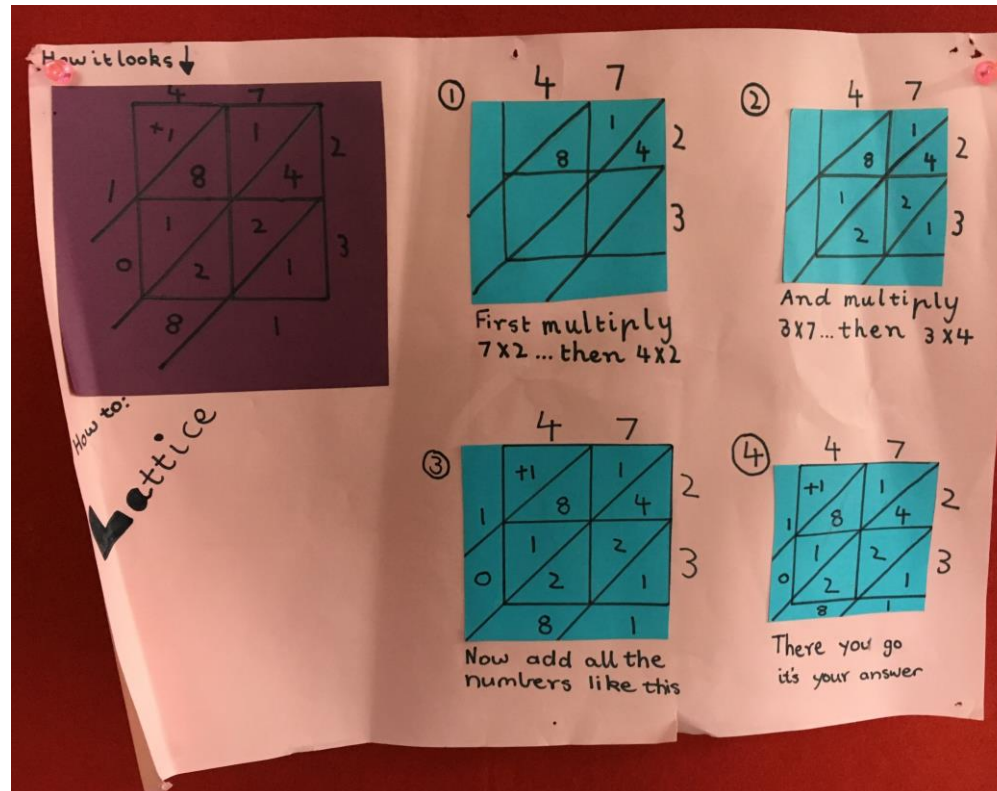
For subtraction, teach the vertical method, but only after:

- Spot the gap strategy (difference between on a number line), for example,  $84 - 78$ . Start at 78, jump 2 forward to 80, then 4 more to 84 – the difference is 6!
- Jump back strategy (jump strategy starting from the higher number).

Also try:

- Get to 9 strategy, for example,  $1003 - 784$ , let's make the starting number 9, so take away 4 from both, making it  $999 - 780$ , that's easy now!

For multiplication, show students the traditional vertical algorithm, but also the lattice (most students' preferred strategy once shown) and grid. For division, show short division, but also the estimate and multiply strategy.





# Always estimate first $E \approx$

For measurement, this is critical because estimates are often used as answers for some tradies, particularly painters. However, also require that students estimate before any large equation or working with decimals. That way, when  $0.42 \times 5$  becomes 21.00, students will know this cannot be right and recheck their work, since they estimated 5 groups of 40¢ to be \$2, not anywhere near \$20.

	Estimate (m)	Distance (m)
With Wind	17m	23m 16cm 23m 20cm
Against Wind	15m	15m 29cm 20m 30cm
Back Tennis Court	20m	21m 95cm 22m

$$426 \times 74$$
$$E \approx 400 \times 80$$
$$\begin{aligned} 8 \times 4 &= 32 \\ 8 \times 40 &= 320 \\ 8 \times 400 &= 3200 \\ 80 \times 400 &= 32000 \\ &\approx 32000 \end{aligned}$$
$$\begin{array}{r} 426 \\ 3 \overline{) 31524} \\ \underline{12} \phantom{00} \\ 16 \phantom{00} \\ \underline{12} \phantom{00} \\ 4 \phantom{00} \\ \underline{4} \phantom{00} \\ 0 \phantom{00} \end{array}$$
$$= 31524$$

✓ close to E

# Use the same warm-up all week and strategically target skills that take longer to build

Digit formation involves creating long-term muscle memories (avoiding reversals) and can take a considerable time to consolidate. The teacher of this class used digit roads every day throughout the first term of school, as warm-ups or warm-downs, and the results showed by term two – her students' digit formations were incredible!



Other skills that take a long time to build include subitising, partitioning (all the ways to make the numbers 5 to 9 in particular), skip-counting, times-tables and division fact families. Be strategic and prioritise the long-term skills that your class needs when choosing your warm-ups each week. Although it is nice when it does, the warm-up does not need to directly link to the main part of the lesson. This is particularly so during measurement and geometry, statistics and probability sessions, when you may choose to run warm-ups that target points-of-need for revision based on the post-assessments for number units.



# Deliver your in-class extension at the end of the fishbowl or in the warm-up time

When do you find the time to extend your higher students?

- ❑ **Option A:** At the end of the fishbowl modelling (demonstration around the desk with materials), explain the extension twist to both high and mid-range students. By years 3-6, we generally explain the extension version to everyone within the fishbowl. In early years classes, we generally send the other students off to start work, avoiding the extending prompt causing them confusion. Mid-range students start with the main task, but can earn the ability to try the extra challenge or, if they have shown they are capable during the previous session, can start it straight away. Most of the time, extension students begin from the extension challenge (they are rarely asked to 'complete' the main task first).
- ❑ **Option B:** On Monday, introduce the week-long warm-up game. For the rest of the week, students are expected to start that warm-up straight away, without delay at the start of maths. This provides 4 days of warm-up time to provide extension modelling to your high students (while other students are working on a warm-up game that has already been modelled on Monday). We roam during warm-ups too, so we do not use all 4 of these warm-up days for extension, but they are available as needed, particularly if the extension is quite complicated or multi-levelled.
- ❑ **Option C:** As needed. Since this is not a rotation-based structure, you are never stuck with one group for long periods of time while the rest of the class needs to sit down and be quiet. If they are truly working at their point-of-need, each student will need feedback and some assistance during most sessions. As we roam, we provide a decent portion of our time to our mid and high students. We support our struggling students too, but we do not act as their brains by spending 70 out of 90 minutes with them, and we never bring them to the floor if they have started to associate 'the floor' with 'my teacher does my thinking and my work.'

# 3 Class Maths Habits Each Term

Choose three focuses **for your class** that you want to deliberately target incidentally each day, or as often as possible as whole-class maths habits throughout the term.

Due to the incidental time devoted to these every day and the power of a consistent term-long focus, this will have a significant impact, so be strategic about what you choose.

Year 1: Counting to 120 by ones	Year 2: Seasons and months	Year 3: Telling the time
<ul style="list-style-type: none"><li>• Keep track of the days at school using a giant 120 chart and dots on ten frames.</li><li>• Use warm-ups to consistently focus on this skill. For example, students race to 120 against their partner, using dice and a 120 chart. Change the rules regularly to keep interest high (an odd number is worth double, so if you roll 5, you can move 10 forward; place green counters in 5 spots – these act as ladders that move you 2 tens forward, and so on).</li><li>• YouTube sing along at the start of every day, during the morning roll, counting by tens to 120.</li><li>• Abacus challenge during any spare moments (waiting for a specialist). One student makes a number on an abacus, other students figure it out using 'tens-ones thinking' (4 rows and 3 ones, 4ty3). Extensions figure out how many more are needed to fill the 100.</li></ul>	<ul style="list-style-type: none"><li>• Make a 'seasons' box that students can contribute to every Monday, for example, old goggles, shells, a bag of sand, and so on, for the summer box.</li><li>• End all maths sessions with a 'seasons and months of the year' whole-class YouTube sing along.</li><li>• Provide time for students to create their own personal calendars at the start of the term, adding new classmates' birthdays to these, then updating and using their calendars to help remember special events throughout the term and year.</li></ul>	<ul style="list-style-type: none"><li>• Encourage all students to wear an analogue wristwatch and emphasise this with parents during met and greet interviews.</li><li>• Stop the class 3 times a day and ask, "What's the time?" Students record the time on a little strip of paper or post-it stuck to their desk. Support students just record the minutes (focusing on the longer hand and skip-counting by 5s to figure this out), while extension students record the current time in as many ways as possible (40 past 1, 20 to 2, 1:40pm, 13:40, 1 and 40/60, 1 and 4/6, 1 and 2/3).</li></ul>



# Think about how to hook them in

A hook can be anything that makes you and your students excited about the lesson ahead. It usually takes 2-5 minutes. It can be a picture story, a made-up story from the teacher, a few Google images, a funny YouTube clip – anything that brings a fun or real-life context to the maths ahead and shows students your own enthusiasm. For example, for shark teeth addition, we play clips of Shark Week with Great Whites launching at seals in South Africa.

For turnaround facts, one of our team recalled this Futurama scene – “Change places!” <https://www.youtube.com/watch?v=8tYXfssLOSM>

For peg addition, we show students some pictures of puppies on clotheslines.

Google images and YouTube are filled with amusing content. However, sometimes the best hook is a picture story from the school library or a story from your own life. Hooks are where you can get creative, and they are how students fall in love with maths and see it everywhere, so they are worth the effort.



# Chant and dance to develop vocabulary

Create chants and mini dances to develop the language of maths.

“Vertical” (stand up straight), “horizontal” (arms out like a plane flying along the horizon), “diagonal” (ninja fighting arms).

“Subtraction starts with a lot” (hands up), “ends with a little (hands down).”

The rows and columns dance for arrays (*New Early Years Pack Multiplication Unit 4 Templates* – 3 second video of the dance).





# Start with the real-life language

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Addition: and

---

Subtraction: take away or difference between

---

Multiplication: equal groups

---

Division: shared between, equal shares

---

Fractions: out of

Renaming: the same number but giving it a  
nickname

# Extra opportunities for maths vocabulary

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Sport balls monitors = spheres monitors

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Newsletter monitors = quadrilaterals monitors

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Desk and classroom neatness monitors =  
angles and symmetry monitors

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Rule your page in half, into thirds, quarters,  
fifths

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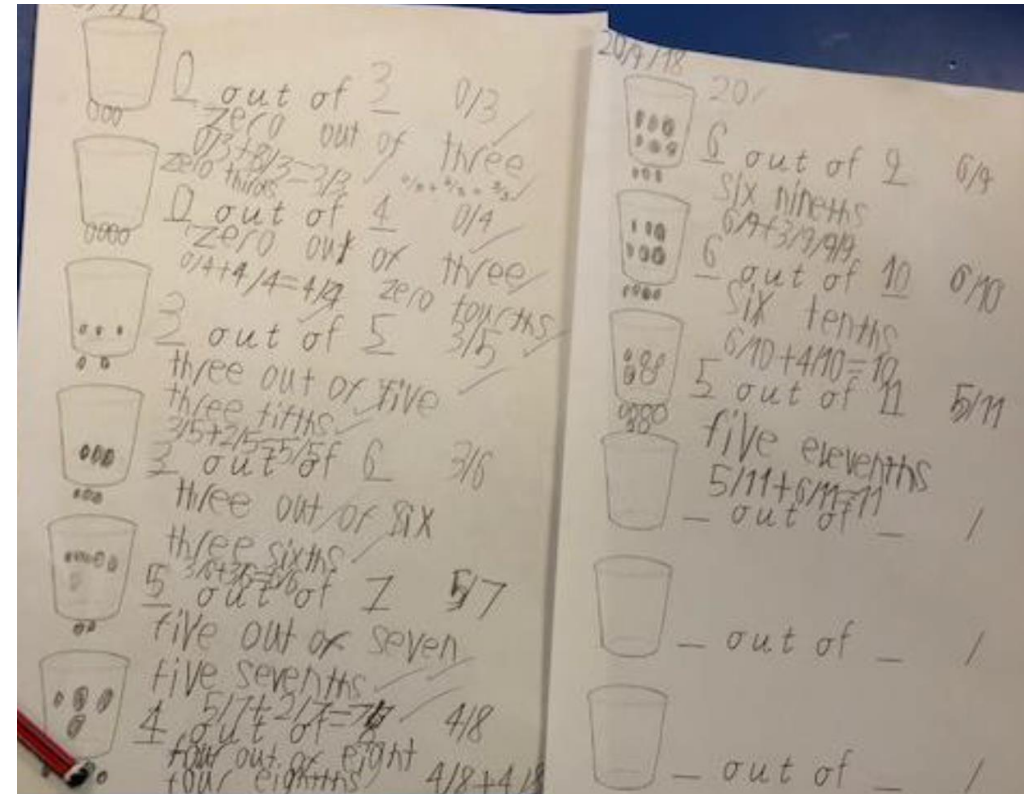
Create a key/legend for you and your partner's  
work (Bert: blue, Ernie: yellow)



# Behaviour warnings at the start of 'high-energy' sessions

If a session is going to be particularly high-energy, for example, fractions basketball or skip-counting budgie skateboarding, give the whole class a behaviour warning at the very start of the session. Always require recording and be vigilant about the work rate, setting a minimum number of examples that students must complete (if needed).

Also start with a promise of 5 minutes of free play with the materials at the end of the session (for example, ramp-building for the skateboards, super long free throws after fractions basketball). However, this 'free play end-of-session time' can be taken away if students do not use the materials for maths during the lesson.



# Involve your students' most influential teachers – their parents

Run a family maths night, where games are played in each classroom and a short presentation is delivered based on the key skills for each year level. Emphasise your whole-school approach to maths (for example, focusing on students enjoying maths, using materials to make sense of it and developing a range of flexible strategies; rather than rote-based methods, which may be all that parents experienced during their time at primary school).

There is also a *Home Learning Partnerships note (New Early Years Pack A Unit 2 – Templates)* with an explanation of games and activities that are great for setting strong foundations for family maths at home during the first year of school.





# Try to see maths in the world – that's the best source of inspiration for great lessons



Train your mind to see maths in the world as much as you can.  
Notice how lessons can start out of everyday contexts and current student interests.

Angle of the wings – design a popsicle stick plane and fly it at different starting angles with the same 10cm take-off pull-back using a rubber band.



Shape walks and hunts – composite 3D shape: hexagonal prism with a hexagonal pyramid on top.



# Use our units in the way that suits you best

We designed the units to help with planning, so we would love you to use them in whatever way you prefer to plan. Our units are a sequential menu of great options, but it is your unique creativity and enthusiasm in their delivery that will create the most memorable and powerful learning experiences for your class.

- ☐ Most teachers prefer to **print each unit**. Many teachers post-it note pages for a specific day of the upcoming week.
- ☐ Some teachers prefer to work electronically, **screenshotting or using page references to the units in their weekly planner**. You can also search by key word in your file browser, which is particularly quick if you know the name of the template you want (which is always referenced by name in the *materials* section of each lesson plan in the New Early Years Pack).

We do not want our units to be a strict or prescriptive resource that you must complete in full or follow to the letter. We also want teachers to continue to use other great lessons that have worked for them in the past from their own repertoire and other sources of rich tasks too. Many teachers change the materials based on what is readily available, adapts the hooks to match their students' unique interests, and so on – our lessons are great base camps, but you and your class are the climbers. **Most of all, we want students to love and enjoy maths by providing teachers with practical ways to achieve each critical skill within genuinely fun, hands-on maths sessions. We hope you have a terrific 2020, full of fun hands-on maths!**



# Top Ten Mathematics

New Early Years Pack (50 units with 500 brand new lessons)

Numeracy Picture Book Libraries

Years 3-6 Pack

Maths Toolboxes

[www.toptenresources.com](http://www.toptenresources.com)