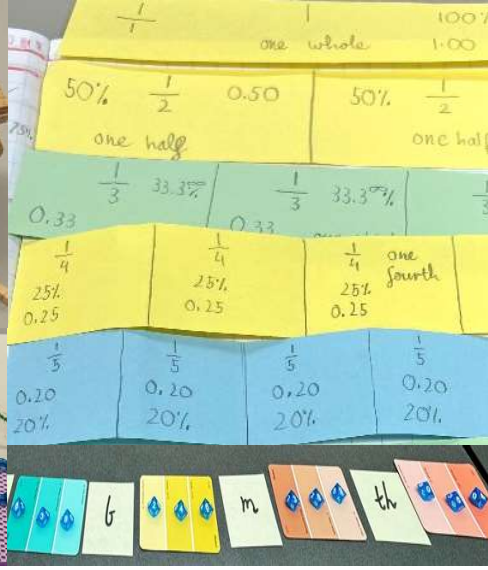


Real-Life Numeracy Years 3-6

Planning Package

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

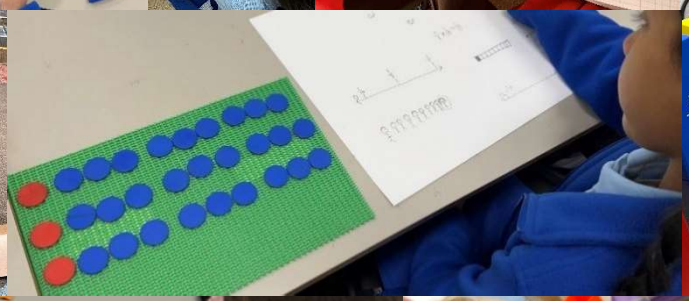
Ten years of development in Australian classrooms.

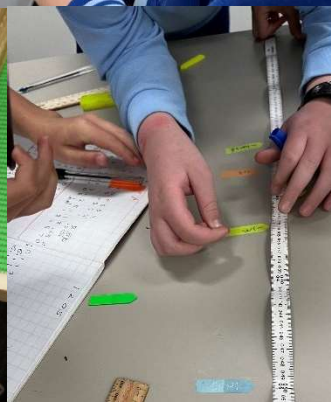
Genuinely high engagement and conceptual understanding in middle to upper primary numeracy.

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

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

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





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

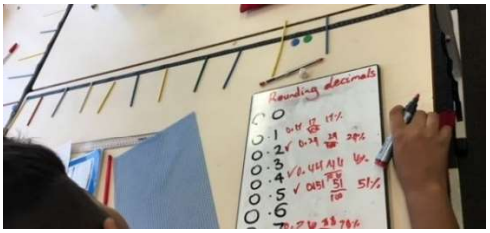
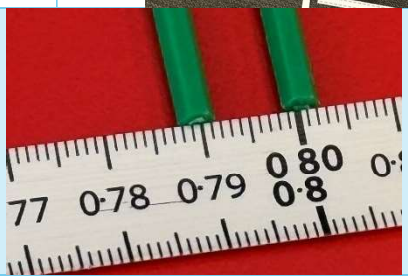
Units are designed as **a menu of options**, depending on the points-of-need for each class, with enabling and extending prompts included for every lesson.

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

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

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

Decimals for Year 5
Compare and Round Decimals
(beyond two places and above one whole)
Hyperlinked Table of Contents

Lesson 5 Compare Decimals Pages 110-130		**Lesson 6** Round Points Pages 131-143	
Lesson 7 Rounding Shootouts Pages 144-155		**Lesson 8** Decimal Puzzle Pages 156-164	
Lesson 9 Pin the Tail on the Donkey – Thousandths Version Pages 165-168			

Critical note: The *Year 4 Decimals Unit* establishes the core foundations and the multiple models of representing, visualising and connecting decimals to real-life for students.

If students have gaps or are showing 'shaky foundations' for decimal place value, it may be necessary to return to the *Year 4 Decimals Unit* before progressing further for Year 5/6 students.

Also note, whole number place value to at least the tens of thousands (*Year 3 Place Value Unit*) must be very solid (rounding, estimation, '10 of these is 1 of those' concept, renaming) before attempting any decimal content.

Critical note: These units focus on a place value-oriented understanding of decimals. The *Fractions Units* on Equivalence (*Fractions Unit 3*) and Converting between fractions, decimals and percentages (*Fractions Unit 7*) progress significantly further.

There are units in each upcoming concept focused on operating on decimals – one of the final units in the sequence of each operation (*Addition Unit 8, Subtraction Unit 7, Multiplication Unit 9* and *Division Unit 9*).

Accordingly, this unit does not represent the entire extent of the content on decimals for Years 5-7 students, as this content is mostly within the operations units. However, this unit contains the critical place value foundations for the operations units that are to follow throughout the year.

Place Value Unit for Year 5: Decimals

Curriculum Links for the following lessons

This unit is recommended for Year 5 students.

Australian Curriculum V9 AC9M5N01 and Victorian Curriculum Version 2.0 (VC2M5N01)

Number – Level 5: Interpret, compare and order numbers with more than 2 decimal places, including numbers greater than one, using place value understanding; represent these on a number line

- making models of decimals including tenths, hundredths and thousandths by subdividing materials or grids, and explaining the multiplicative relationship between consecutive places; for example, explaining that thousandths are 10 times smaller than hundredths, or writing numbers into a place value chart to compare and order them
- renaming decimals to assist with mental computation; for example, when asked to solve 0.6 ÷ 10 they rename 6 tenths as 60 hundredths and say, 'If I divide 60 hundredths by 10, I get 6 hundredths' and write 0.6 ÷ 10 = 0.06
- using a number line or number track to represent and locate decimals with varying numbers of decimal places and numbers greater than one and justifying the placement; for example, 2.335 is halfway between 2.33 and 2.34, that is, 2.33 < 2.335 < 2.34, and 5.283 is between 5.28 and 5.29 but closer to 5.28
- interpreting and comparing the digits in decimal measures, for example, the length or mass of animals or plants, such as a baby echidna weighing 1.78 kilograms and a platypus weighing 1.708 kilograms
- interpreting plans or diagrams showing length measures as decimals, placing the numbers into a decimal place value chart to connect the digits to their value

Australian Curriculum V9 AC9M5N04 and Victorian Curriculum Version 2.0 (VC2M5N04)

Number – Level 5: Recognise that 100% represents the complete whole and use percentages to describe, represent and compare relative size; connect familiar percentages to their decimal and fraction equivalents

- recognising applications of percentages used in everyday contexts, for example, the bar model used for charging devices indicating the percentage of power remaining, and advertising in retail contexts relating to discounts or sales
- creating a model by subdividing a whole (for example, using 10 × 10 grids to represent various percentage amounts) and recognising complementary percentages (such as 30% and 70%) combine to make 100%

- creating a model by subdividing a collection of materials, such as blocks or money, to connect decimals and percentage equivalents of tenths and the commonly used fractions 1/2, 1/4 and 3/4; for example, connecting that one-tenth or 0.1 represents 10% and one-half or 0.5 represents 50%, and recognising that 60% of a whole is 10% more of the whole than 50%
- using physical and virtual materials to represent the relationship between decimal notation and percentages, for example, 0.3 is 3 out of every 10, which is 30 out of every 100, which is 30%

Australian Curriculum V9 AC9M5N08 and Victorian Curriculum Version 2.0 (VC2M5N08)
Number – Level 5: Check and explain the reasonableness of solutions to problems, including financial contexts using estimation strategies appropriate to the context

- interpreting a series of contextual problems to decide whether an exact answer or an approximate calculation is appropriate, and explaining their reasoning in relation to the context and the numbers involved

Western Australian Mathematics Curriculum – Level 5: Recognise that the place value system can be extended beyond hundredths (ACMNA104)

- using knowledge of place value and division by 10 to extend the number system to thousandths and beyond
- recognising the equivalence of one thousandths and 0.001.

Western Australian Mathematics Curriculum – Level 5: Compare, order and represent decimals (ACMNA105)

- locating decimals on a number line.

Western Australian Mathematics Curriculum – Level 5: Use estimation and rounding to check the reasonableness of answers to calculations (ACMNA099)

- recognising the usefulness of estimation to check calculations
- applying mental strategies to estimate the result of calculations, such as estimating the cost of a supermarket trolley load.

NSW Maths Syllabus – Stage 3 – Represents numbers A

Decimals and percentages: Recognise that the place value system can be extended beyond hundredths

- Express thousandths as decimals
- Interpret decimal notation for thousandths
- Indicate the place value of digits in decimal numbers of up to 3 decimal places
- Use place value to partition decimals

Decimals and percentages: Compare, order and represent decimals

- Compare and order decimal numbers of up to 3 decimal places
- Interpret zero digit(s) at the end of a decimal
- Compare the place value of digits by determining numbers that are 10 or 100 times the original decimal number
- Approximate the size of decimals
- Place decimal numbers of up to 3 decimal places on a number line

Formative Assessment

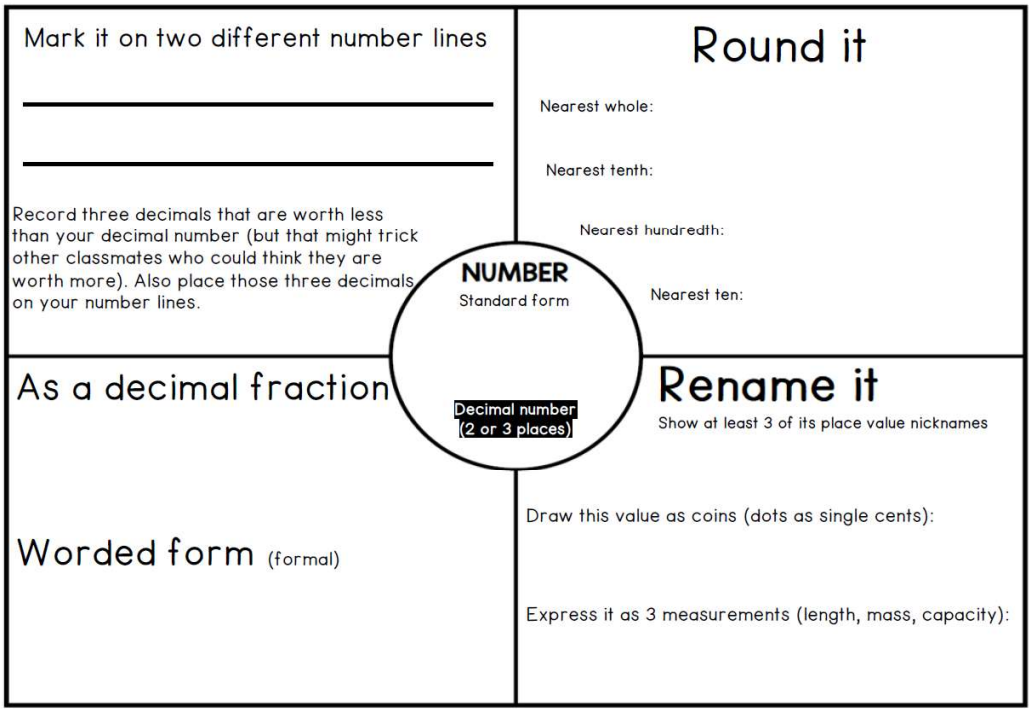
A formative assessment cross-check is available in this unit's folder with progressive learning goals and specific success criteria for this unit.

This includes a grid template or a section template for notes, whichever the teacher prefers to use.

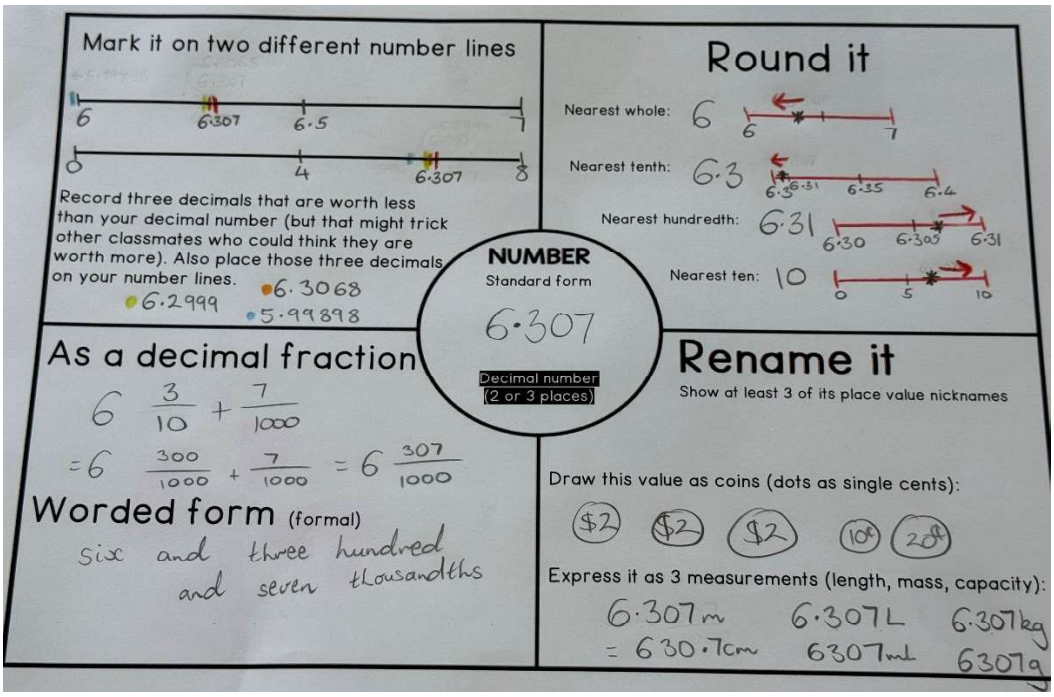
Formative Assessment – Ongoing Cross-Check for Decimals – Years 4 to 6												
Year 4 to Year 6 Decimals	Connect to money, $4.35 as 4.35, verbalising this is 4 wholes, 3 tenths (three 10 cent coins), 5 hundredths (5 single cents), and 4 dollars 35 cents **L4**	Connect to measurement, with half a metre as 0.5m and one quarter as 0.25m, connecting tenths to 10cm, hundredths to 1cm **L4**	Record as decimal fractions: 4.35 $= 4 + \frac{3}{10} + \frac{5}{100}$ $= 4 + \frac{35}{100}$ **L4**	Compare decimals to 2 places with place value (tenths are more than hundredths – 1 **out of** 10 parts v. 1 **out of** 100 parts) **L4**	Calculate change to the nearest 5 cents **L4**	Order decimals up with up to 3 places and accurately place on number lines **L5**	Convert common fractions to decimals and % **L5**	Round decimals to estimate answers **L5**	Rename decimals **L6**	Add and subtract decimals **L6**	Convert metric units in decimals **L6**	Convert any fraction to a decimal and % **L6-L7**
Students												

Focuses: Conceptualise and operate on decimals as real-life values, particularly money and measurement Years 4-6	Term __ Weeks ____	**CODES:** Record these codes when you see a student applying this skill: **$:** Connects decimals to money, able to verbalise and connect 4.35 to $4 dollars and 35 out of 100 parts of the next dollar, or 4 wholes, 3 tenths (ten cents) and 5 hundredths (single cents). **m/cm:** Connects decimals to measurement, initially with wholes as metres or litres and parts as centimetres or millilitres. **compare:** Compare ragged decimals (different places) not by applying a process ('adding a zero'), but with a conceptual understanding of place value using money/measurement/decipipe/decimat reasoning **change to 5c:** mental answers E ≒ **round & estimate** **+ - decimals**			
Student	Student	Student	Student	Student	

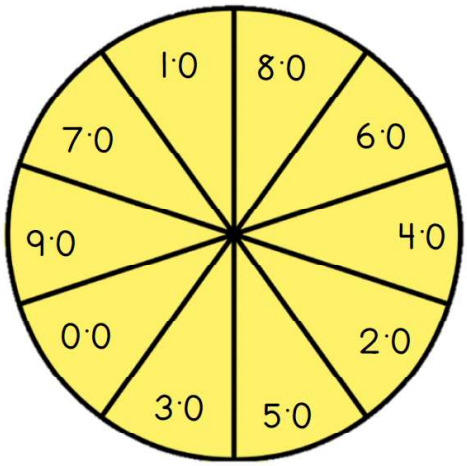
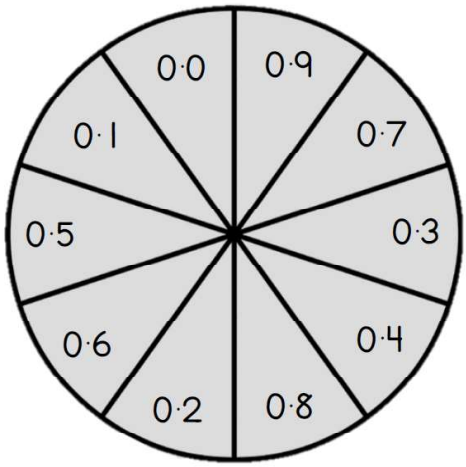
Decimal think board for ongoing formative assessment as exit tickets or maths journal reflection pieces throughout the unit:



Think board template



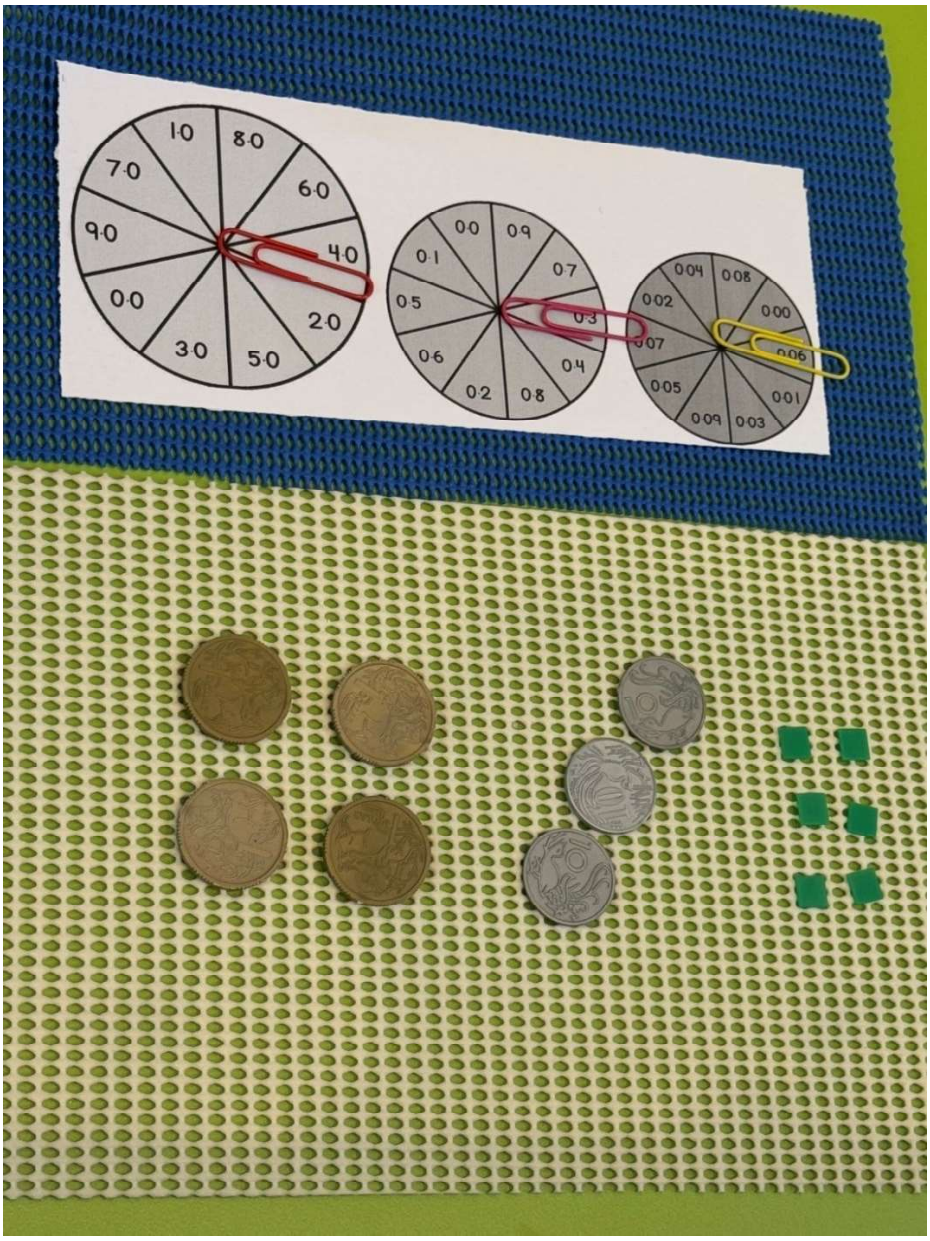
Warm-up Games

Warm-ups	Decimals
Spin and Make **Money and measurement version** **Focus: Connecting the abstract concept of decimals to the real-life contexts of money and measurement, and linking decimals to visual and physical models of these real-life contexts.**	Students use Australian coins to model wholes and tenths. **Makeshift spinner:** Students put a pencil tip inside a paperclip hole, then flick the paperclip to spin the two spinners on this template. **Decimal Spinners**   **Connecting coins and notes to decimals:** Students then make the spun amount using coins, connecting coins to these more abstract decimals representations. **Instructions:** As students make the number they have spun, dollars represent wholes, and 10-cent coins represent tenths (because 10c is 1 out of 10 parts of $1, so one tenth of one dollar). Tenths are just like ten cent coins – each tenth is 1 out of 10 parts of the whole, just as 10c is 1 out of 10 parts of the way towards making one whole dollar. **Critical language:** "0.1 is 1 out of 10 parts of $1, so one 10c coin." "0.6 is 1 out of 6 parts of $1, so six 10c coins." **Extra engagement:** Students can bring in fidget spinners from home (with an arrow marked on one of the three sides) to use on the template. **Compare:** After making their decimal in coins, compare it to their partner's. The partner with the larger decimal number scores a point. For additional challenge, score the entire number created, then add their total score at the end of the game.

Question: Which place matters more, the wholes or the tenths? Why?

Extension 1: If the first decimal place is the tenths, what is worth less than the tenths/the next lower place value in value? A tenth is 1 out of 10 parts, so what will the next place be worth?

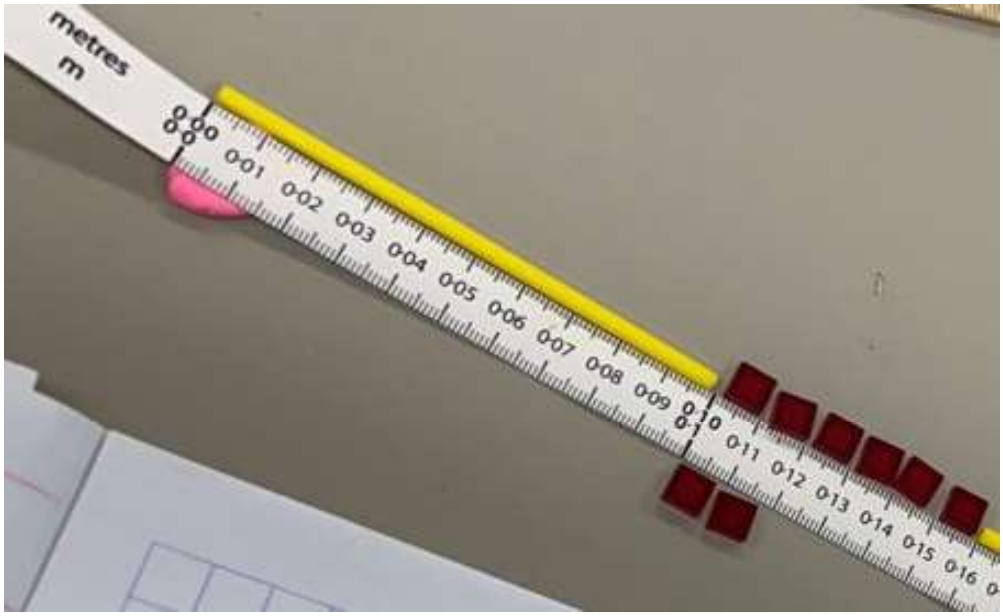
Use the decimal spinners – version 2 template to make numbers with wholes, tenths and hundredths. Occasionally, do not spin one place, creating zeroes, including internal zeroes by omitting to spin the tenths.



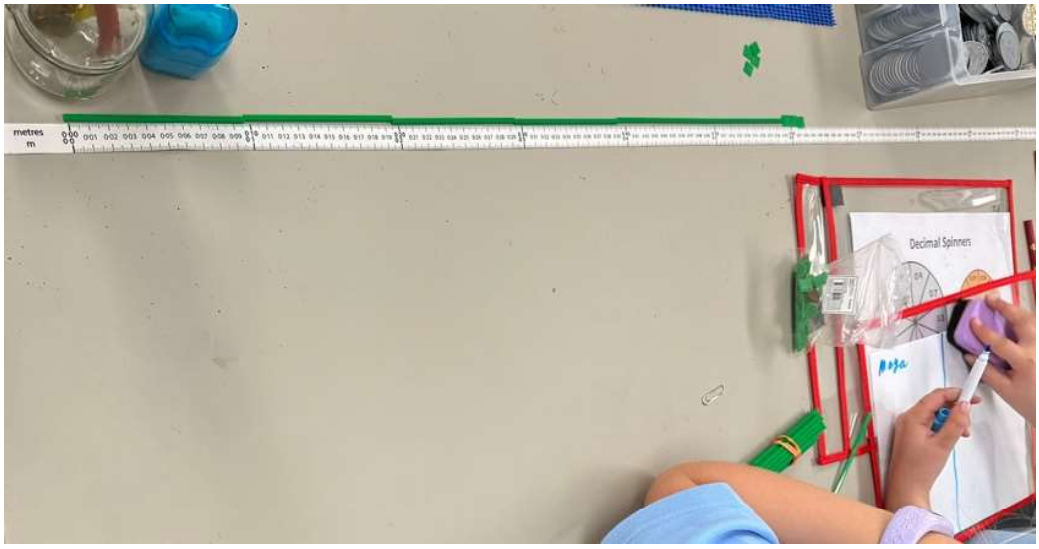
Critical tip: Students will need a makeshift representation for a 1^c coin, such as a counter, or (preferably) a deci-unit chip of $1cm^2$, or 1cm square of wrapping paper, or a $1cm^2$ grid square – anything that is $1cm^2$.

Linear decimal representations – connecting decimals to measurement: When using version 3 of the template, students can also model their spun number along a measuring tape.

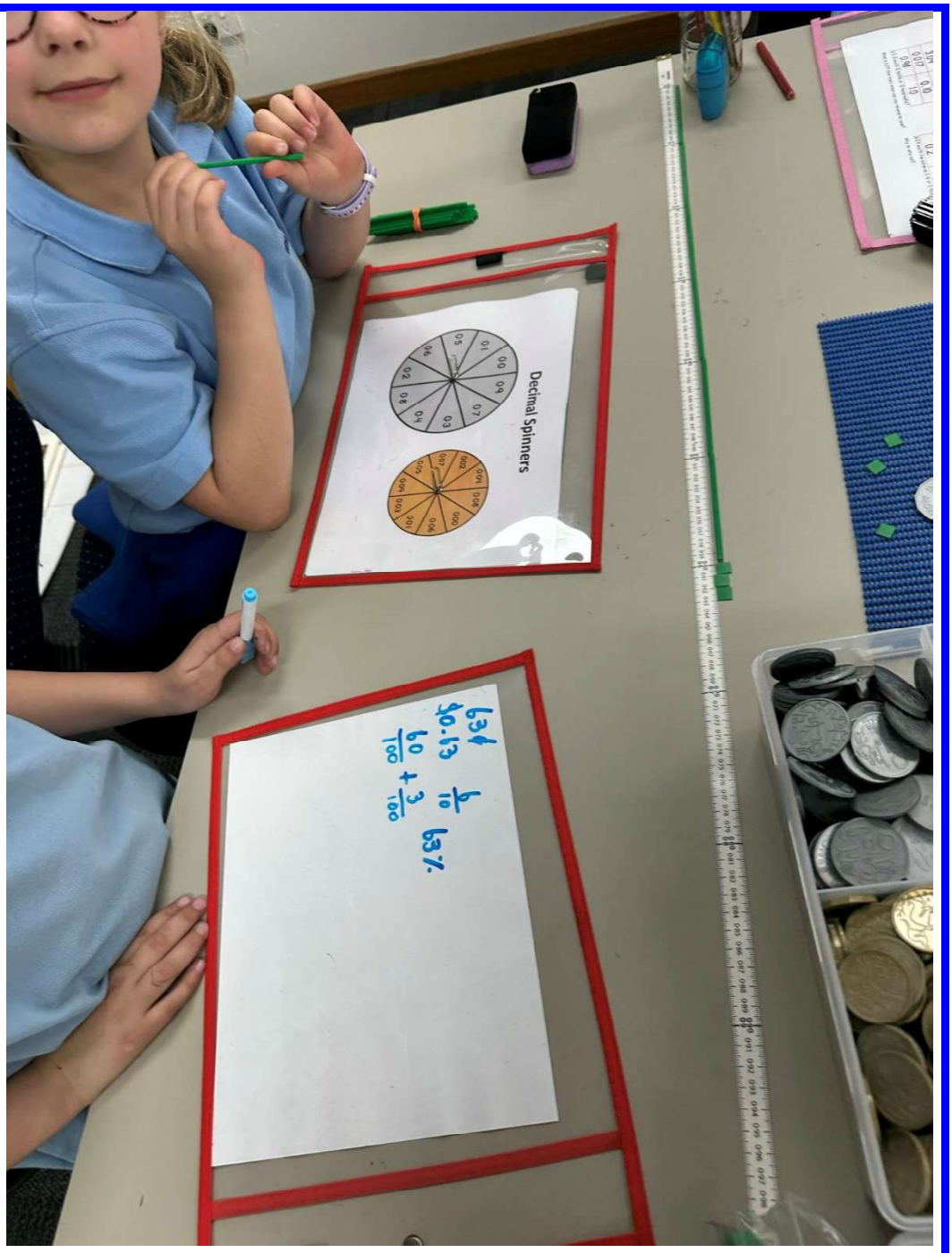
Use tenths sticks (10cm – or straws cut to 10cm lengths) and hundredths tiles/strips of paper (1cm lengths), to build the number spun.



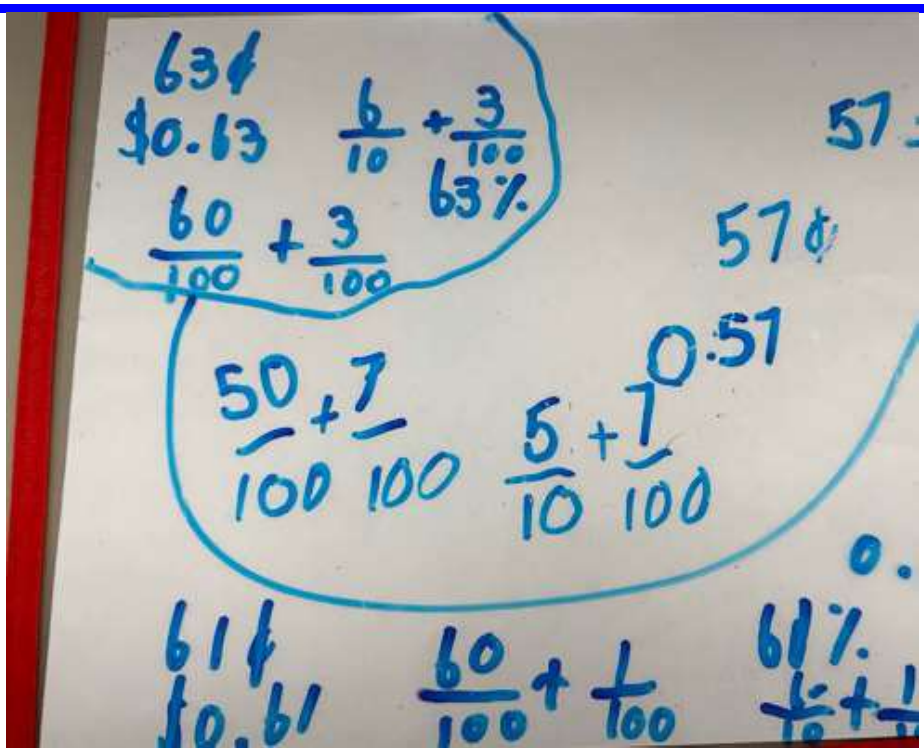
0.16 made on the 'north side' of the decimal measuring tape, having spun 0.1 and 0.06.
The other partner can then build on the 'south side' of the measuring tape.



Warm-up in action using tenth sticks and hundredths tiles to construct the spun decimal number along the decimal measuring tapes.



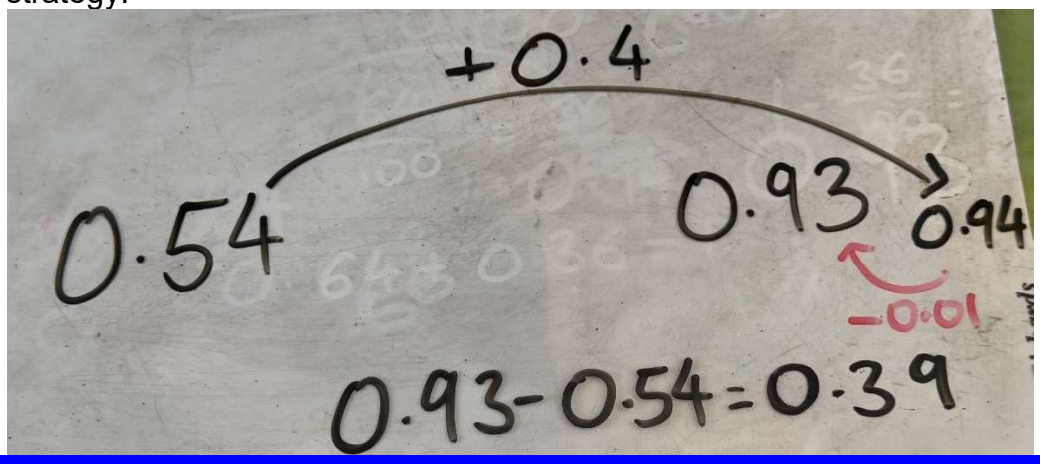
Warm-up in action



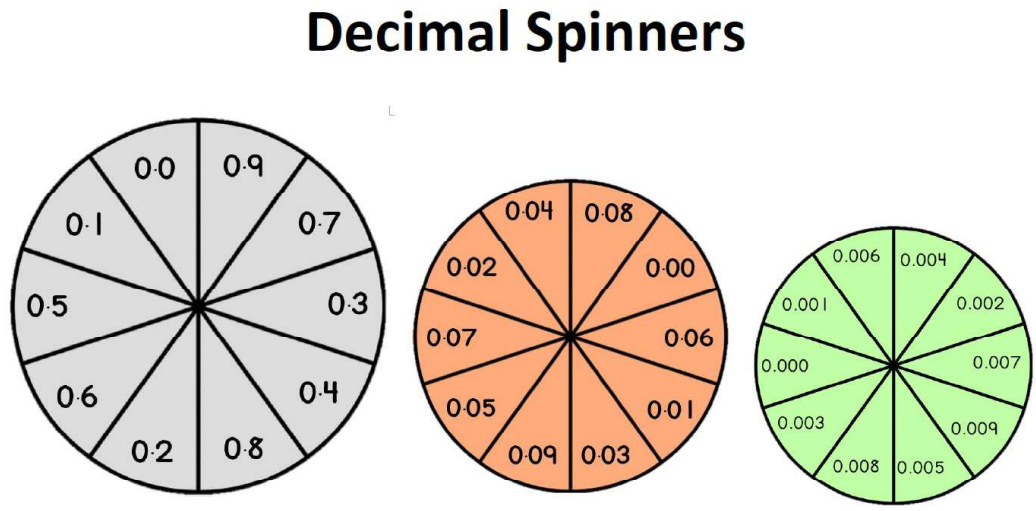
Extension 2: Work with a partner each using the decimal spinners – version 2 template, then add their decimals together. Estimate the answer first, by rounding to the nearest whole number. Use the E≈ to record their estimate.

Extension 3: As an extra extension, aim to add the two spun numbers mentally. Then justify your strategy to your partner, which must be a mental strategy (not a vertical algorithm).

Extension 4: Spin two numbers (one by them, the other by their partner) to calculate the difference between their number and their partner's number, using a jump the difference strategy or other efficient mental strategy.



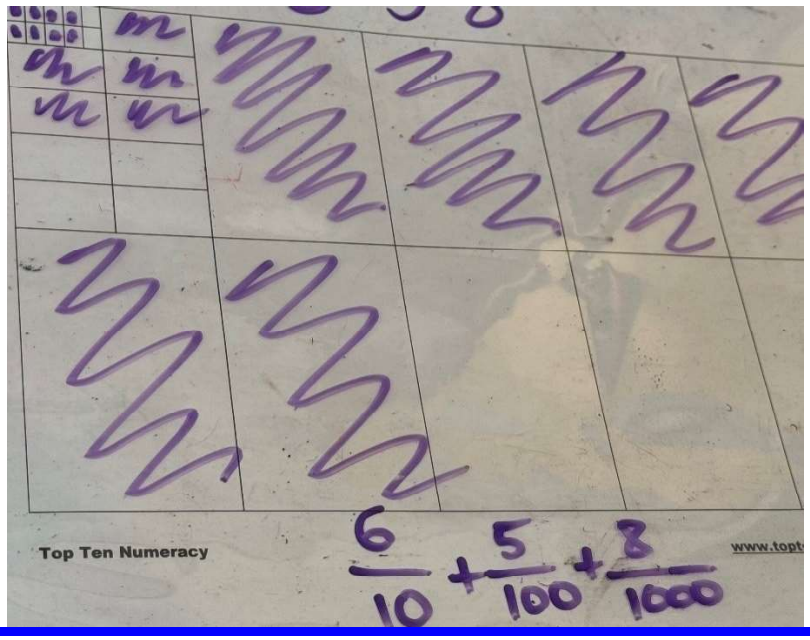
Extension 5: Use version 4 of the template in combination with either *Extension 3 or 4*.



Thousandths version of Spin and Make

When students are ready to progress to the thousandths, decimats can be used in conjunction with version 4 of the spinner.

Spin two decimal numbers (one per maths buddy) – make and compare using decimats in a write-and-wipe sleeve



Running Decimals

Focus: Connecting measurement to decimals to understand the size of one tenth, compared to one hundredth, compared to one thousandth.

Take students out to run a kilometre. This will give them a real sense of the distances they are working with during this investigation. Bring out a mini whiteboard or piece of paper so you can show them the decimal and fraction notations as you say them.

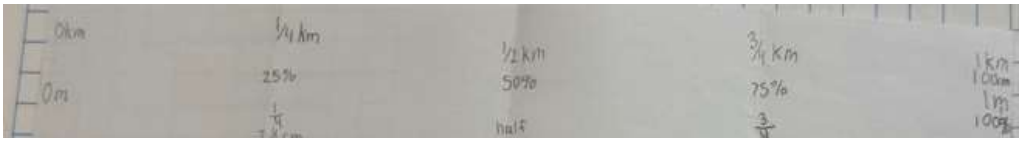
After 1km…

Now we're going to run an extra tenth, 0.1km or 1/10th of a km (100m). Was that as far or not?

Now let's run an extra hundredth, 0.01 kilometres or 1/100th of a km (10m). How far did that feel?

Now let's run an extra thousandth, 0.001 kilometres or 1/1000th (1m). How far did that feel?

What's worth more, a tenth, hundredth or thousandth?
A thousandth sounds large, but it is 1 out of 1000 parts, so it is actually really small, because the 'th' means parts.



Connecting decimals to measurement.

Decimals
Year 5
Lesson 1

Kangaroo Long Jumps!

Learning intention: Connect metres and centimetres to wholes, tenths and hundredths, recording using decimal and fraction notation.

Maths vocabulary: metres / wholes, ten centimetres / tenths, one centimetre / hundredths, decimal (0.00), fraction (out of, as in 1 out of 10 parts, or 1 out of 100 parts of one whole), estimate, length

Hook: If you could have any superpower, what would it be? I would choose flying. Some humans sort of already can in a way: https://www.youtube.com/watch?v=9QGlOoutwLY

YouTube hook – Watch these animals jump: https://www.youtube.com/watch?v=elEWk5NELsI&ab_channel=EzraBridger

Lesson summary: Students jump like a kangaroo (legs together and one big leap – no run-ups!). Measure and record their jump in metres and centimetres, decimal and fraction notation.

Materials:

- 150cm decimal measuring tapes (Top Ten Toolbox).
- Chalk or counting sticks to mark each landing position.
- *For the follow-on option:* three 10-sided dice per student and blank white A4 paper.

Best set-up: Set up books into 3 columns with headings **before** going outside. Whole-class model inside, then outside again, particularly emphasising the recording.

Modelling: Ask three students (roughly the same athletic ability level) to jump.

Measure their jumps only in whole numbers, for example, as 1m, 2m or 3m (no decimals or cm).

Why do we need decimal numbers? (To mark numbers that come between wholes, otherwise everyone would just jump 1, 2 or 3m).

Real kangaroo jumps: https://www.youtube.com/watch?v=0Ao9kGYYkD4&ab_channel=YuryTheEnglishTutor and https://www.youtube.com/watch?v=d5lkzlIJsL0&ab_channel=DayDreamTV and just for fun https://www.youtube.com/watch?v=Zol82ES0aPY&ab_channel=DailyPicksandFlicks

In measurement, metres are the wholes and centimetres are the parts.

How many centimetres are in one metre? 100! So, 1cm is 1 out of 100 parts – how do we say that as a decimal? 1 out of 100 parts, or one hundredth (out of 100 parts).
What would 10cm be? 1 out of 10 parts of one metre, or one tenth.

The 'th' means parts (tenth – out of ten parts). 1cm is one out of 100 parts of one metre, or one hundredth (out of 100 parts).

Students' turn – buddy practice: Students take turns in their pairs to take a kangaroo jump from a set starting point, for example, with the class lined up along the line of a basketball court. Their partner marks the back of their foot with chalk or a stick.

Both students **estimate** and record each jump.

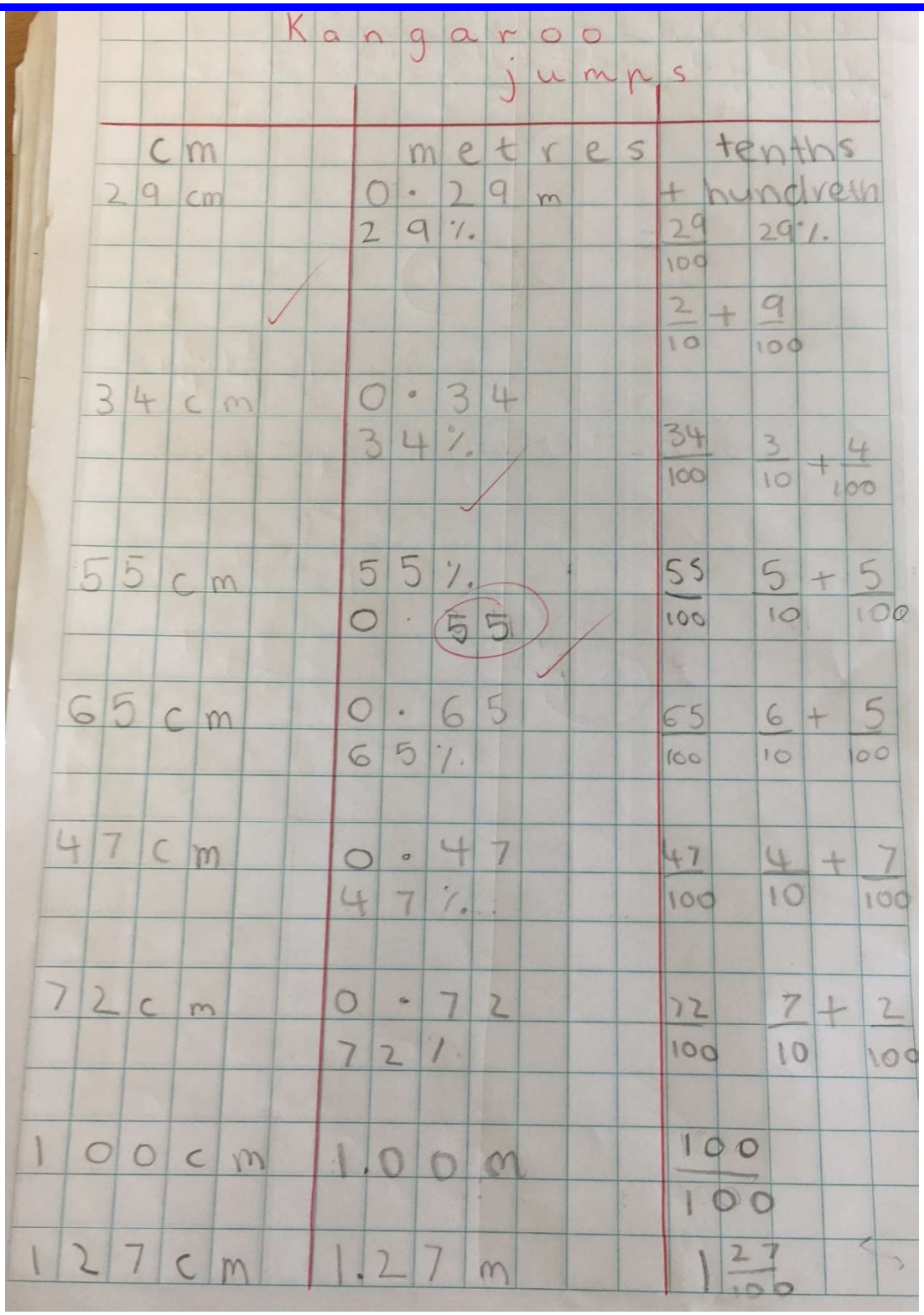
Students **estimate** (make a thinking guess about) the **length** of each jump before measuring it. Students then measure, and record like so:

Jump in m and cm	Jump as a decimal	Jump as a fraction
Estimate: E≈ 1m and 40cm Actual length: 1m and 20cm	1.20m 1.2m	$\frac{20}{100}$ "1 whole metre and 20 out of 100 parts of the next metre." $\frac{2}{10}$ "1 whole metre and 2 out of 10 parts of the next metre."

"We use the decimal point to show where the whole metres end and the parts begin."

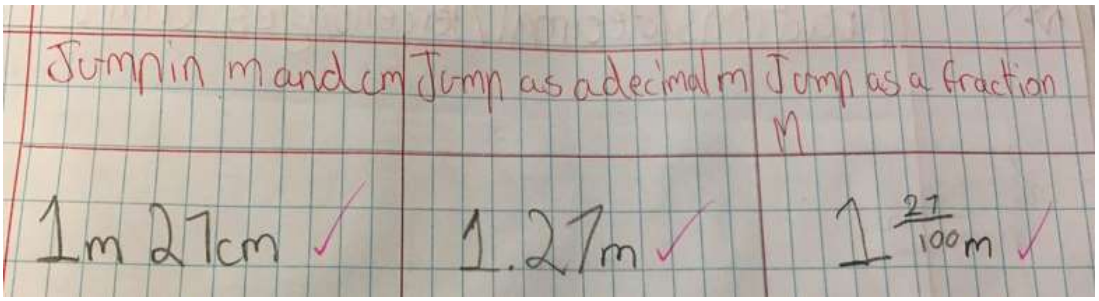
Estimating using real-life and visual benchmarking: In terms of estimating, what is a good way to visualise one metre? What is one metre similar to?

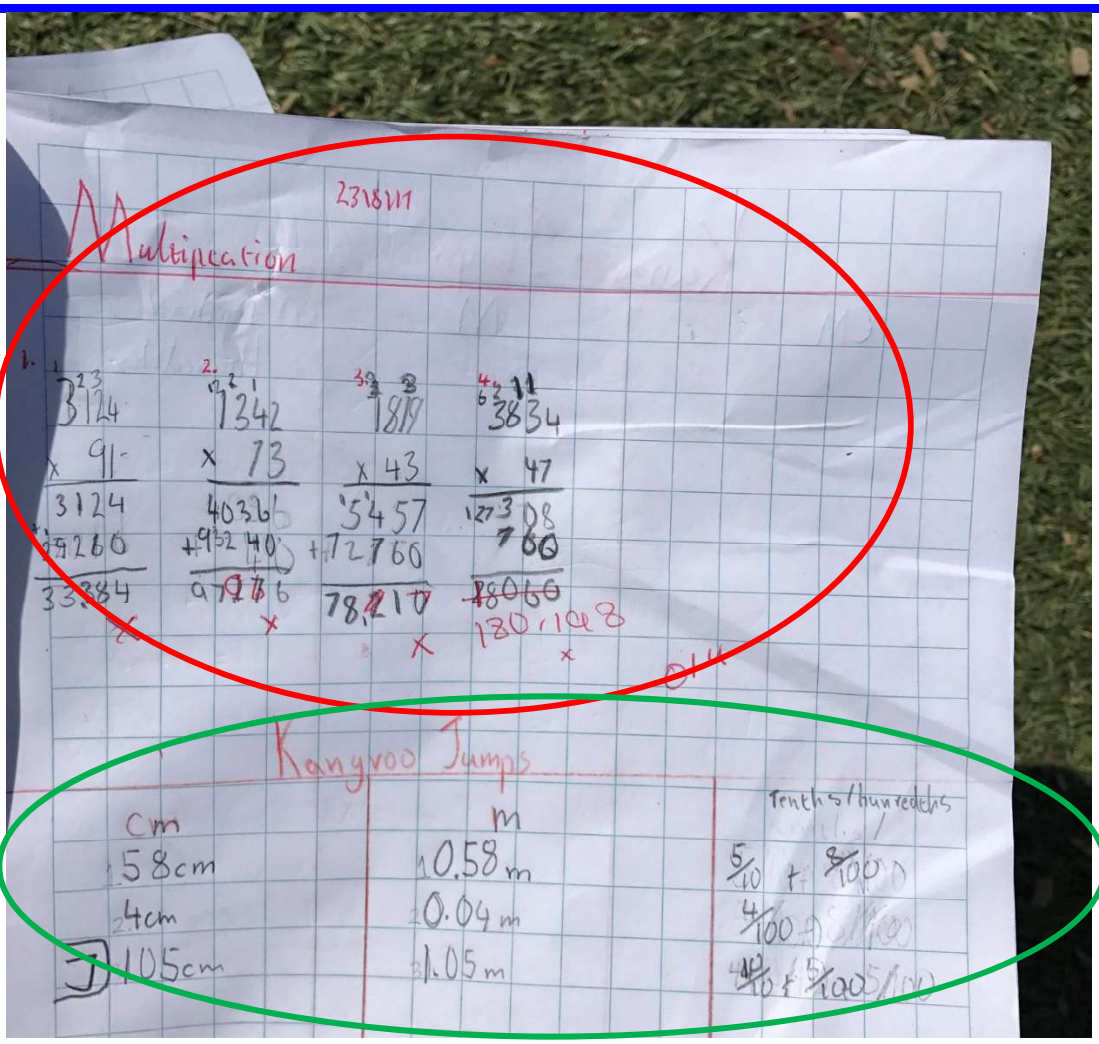
Encourage students to use their body to help them estimate, such as the length of one arm, seeing if that measurement is close to 1m, then using that to help visualise and estimate the length of their jumps.
How could you estimate 30cm? Visualise a ruler!
How could you estimate 10cm? Visualise a tens block (MAB).



Student work sample – Thomastown East PS

Students can also write down the measurement next to each chalk mark landing spot, which helps them compare their jumps and improve the accuracy of future estimates.





This bookwork shows the same student during their regular class lesson, the day prior, struggling to make any sense of a vertical multiplication algorithm on paper/the board. One day later, the student showed all conversions of their kangaroo jumps (centimetres to metres, decimal fractions, including above one whole) accurately, during a Top Ten modelled decimals lesson run by one of our numeracy coaches the following day – **engaging outdoor maths with real-life links, that is the difference!**

Follow-on option: Return to class to calculate their total metres jumped and the difference between each jump.

Questioning prompts:

- If your jump is less than 1m, how do you write the decimal notation?
- What is worth more, one tenth of one metre (1 out of 10 parts) or one hundredth of 1m (1 out of 100 parts)? Let's show it. You jump 8 tenths and your partner jumps 8 hundredths – show students how different tenths are compared to hundredths, by having them stand at each point along a line.

Reflection: Which is the better jump – 0.5m or 0.08m? Ask students to write down what they think, then mark those points with coloured counters along the measuring tape and compare. Repeat with lots of examples, emphasising that the number in the tenths is how many ten centimetre lots there are (0.5 is 5 lots of 10cm, or 5 of the 10cm counting sticks), whereas the number in the hundredths is only worth the ones of centimetres, such as 8 of the 1cm tiles.

Which is the better jump exit ticket quiz on the board:

0.21 or 0.3? Longer is larger misconception.
0.42 or 0.299?
0.09000 or 0.32?
2.0 or 0.7? Forgetting the value of wholes misconception.
3.0 or 0.44?

Support: Record by focusing on whether it is more or less than 1m at first.

Their recording could look like this:

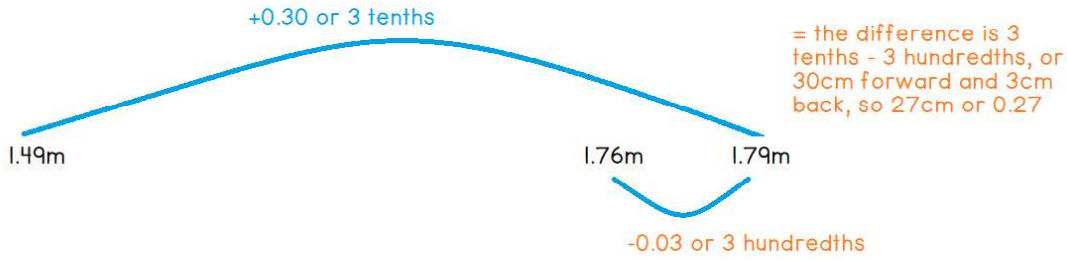
Centimetres	More or less than 1m	Decimal notation
Estimate: E≈ 150cm Actual: Length = 134cm	More than 1m	1m and 34cm When ready: 1.34m

Extension 1:

- Record improper forms, for example, 1m and 47cm as 147/100m.
- Record simplified fractions, for example: $1\frac{6}{10}$ m as $1\frac{3}{5}$m.
- Record their jump as a percentage of 1m. For example, if their jump is 1.54m, it is 154% of 1m, because it is more than 1m.

Extension 2: Mentally try to work out the difference between their jump and their partner's each turn. The best strategy can often be to 'think addition/jump the gap,' as shown below:

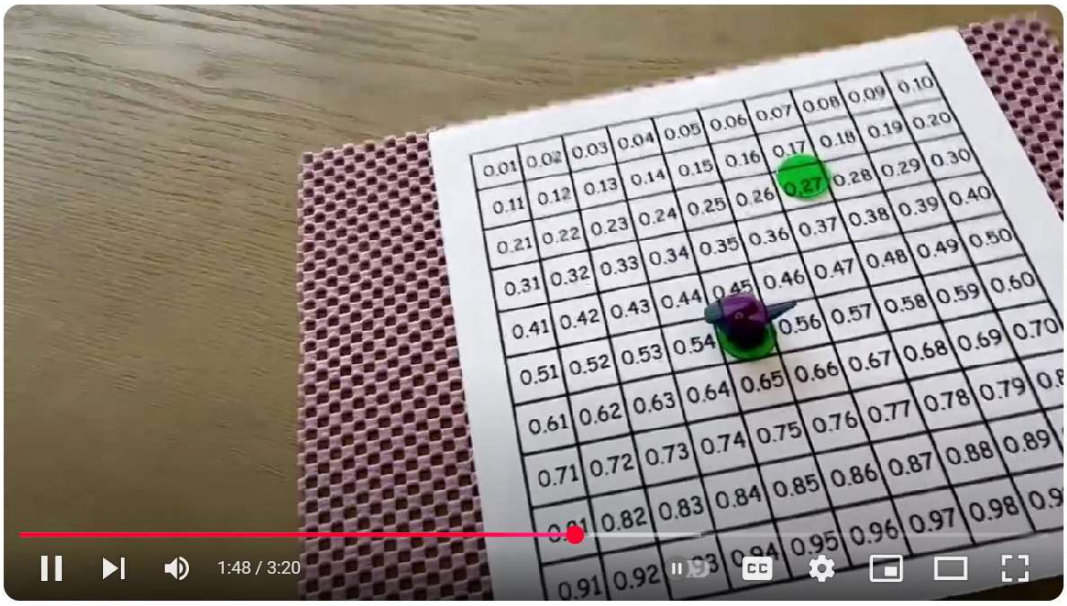
Jump the difference strategy:



For more assistance with calculating the difference between decimals, use a decimal 0.00 to 1.00 chart for practice.

Place two transparent counters on the chart, then jump a character from one decimal number to the other, working out the difference using jump strategy (jumping the rows in tenths, stepping forward or back in hundredths), because the rows are 1 out of 10 parts, and the individual squares are 1 out of 100 parts.

Video PL snapshot for teachers only (not intended to be shown to students)



Jump difference strategy with decimal chart

https://www.youtube.com/watch?v=MOfKXXc3rJY

Extension 3: Research the current long jump world record before going outside. For every jump they take, work out the difference between their jump and the world record, using a similar strategy to the one above, but with a greater level of difference because the numbers will be further apart.

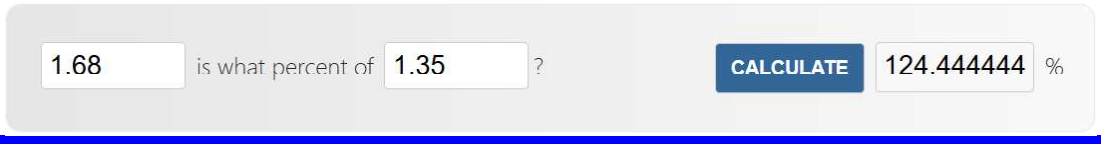
Write this in red pencil (how far off the world record) and try to work it out mentally using a think addition/jump the gap strategy (rather than the vertical algorithm). Then students show their strategy on paper (open number line, or switch strategy, or similar) to check, but no vertical algorithms are permitted.

Extension 4: Mentally work out the approximate percentage of their jump compared to their partner's. For example, let's say their jump is 1.35m and their maths buddy jumps 1.68m. 10% of 1.68m is about 17cm (0.17m), and their jump is about 2 lots of 17cm less (roughly). So that means their jump is 20% less than their buddy's.

Immediate feedback option for extension 4:
https://percentagecalculator.net/

For the other buddy, whose jump was 1.68m and their partner's was 1.35, they need to first consider a percentage of their buddy's jump. From 1.35 as the whole or 100%, 10% is about 13cm, and they jumped 33cm more, so that is about 26cm (two lots of 13cm) plus another half of 13cm, so about 25% more, or 125% of their buddy's jump.

Immediate feedback: https://percentagecalculator.net/



YouTube hook: Watch this compilation of Olympic-standard long jumps https://www.youtube.com/watch?v=9QGlOoutwLY&t=44s&ab_channel=henryfrayne

Follow-on option: World record long jump!

Research the current world record for long jump. At the time of writing, it is 8.95m.

Game instructions: Students fold an A4 page into eighths (half of half of half). Students write 8.95m in the top section of the page (top fold) and 0m in the bottom section.

To win the game, students must now fill the other sections with numbers that are in order (lowest at bottom, highest at the top).

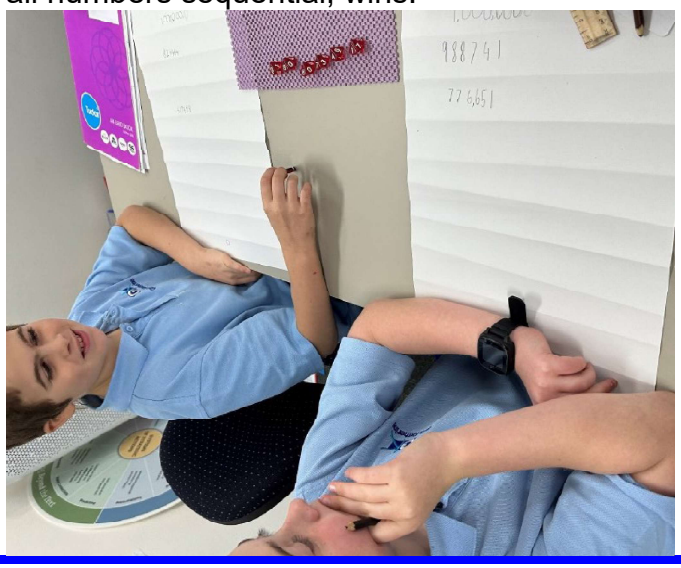
Students use a counter or nut as a decimal point. Roll three 10-sided dice, creating a decimal number.

Now, the key is to think carefully and strategically, then write the rolled number into one section in your gameboard.

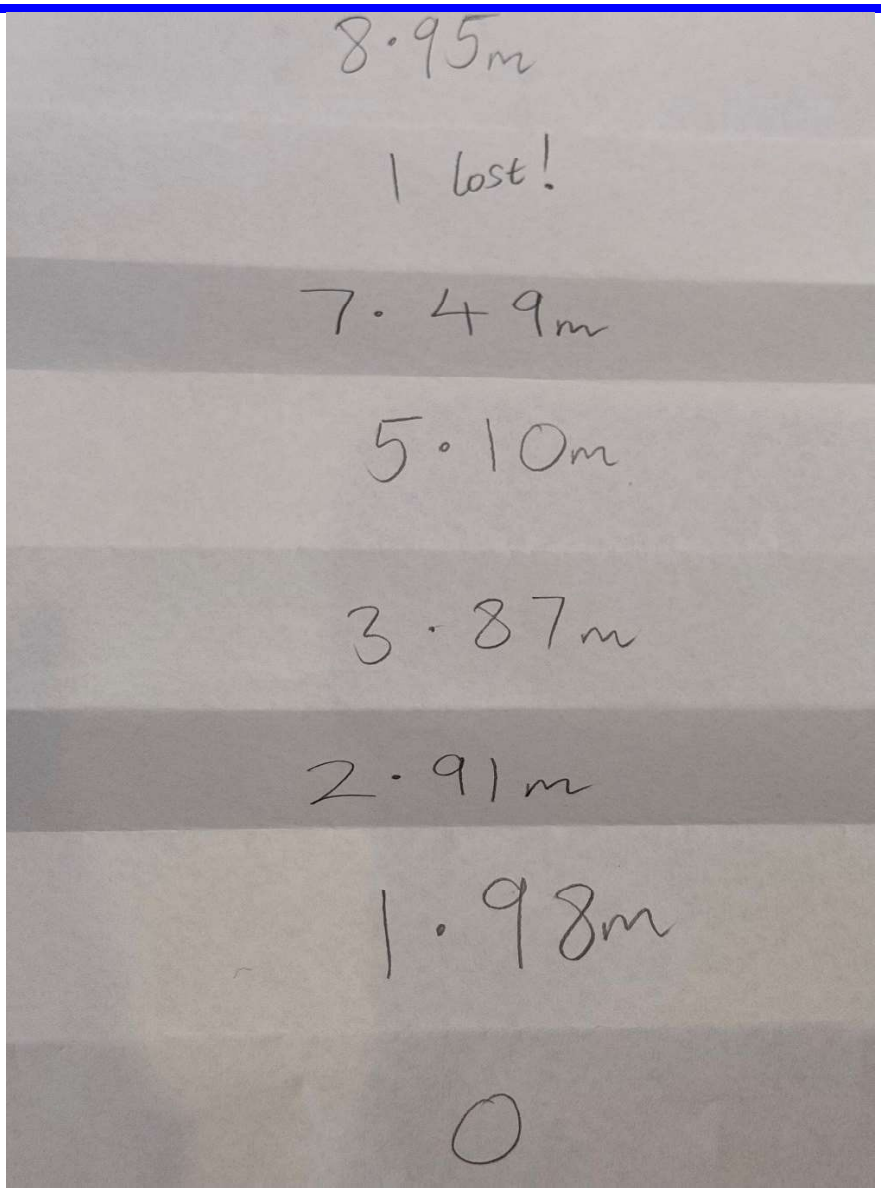
= 4.95m

As the game goes on, if you cannot make a number that fits in order (from 0.00m to 8.95m), given the other numbers that are already on your game board, then it is either bad luck or bad strategy – you miss that turn!

The first student to complete the 'long jump ladder' with all places filled and all numbers sequential, wins!



These students are playing the higher place values version of the same game – the set-up is the same, except less dice and with a nut/counter used as a decimal point between the dice rolled for the decimal version.



	Questioning prompts: • Did anyone regret where they placed a number? Why? • What number did you write at the halfway point? What do you wish you put there in hindsight? • Has anyone made it nearly impossible for themselves to win? How? **Post-game strategy chat, before the next game is played:** What whole number is the world record close to? 9m! So, what is 9m split into 8 parts. How much will each part roughly be worth? Think about where you want to place numbers carefully, because if you place two really far apart decimals next to each other, then you might have to miss more turns than your partner. If you place a number that's too big close to the lower end of the game board, then you will probably waste lots of turns.
	Support 1: Roll two dice only (for wholes and tenths).
	Support 2: Use 0 at the bottom and 100 at the top, focusing on whole numbers, rolling two 10-sided dice. Then create a 0 at the bottom, 1000 at the top gameboard and roll three 10-sided dice.
	Extreme support: 0 at the bottom, 20 at the top, rolling a 20-sided dice to fill the blanks between.
	Extension: Roll 4-dice and create numbers with wholes, tenths, hundredths and thousandths.
	Extension rule: Your maths buddy (who is like-ability, so on par competitively and hopefully also a strategic thinker) can choose how many dice you get to roll for each turn, so long as it is not the same number they chose for your last turn.

