TOP
The Power and Joy of Hands-on Numeracy
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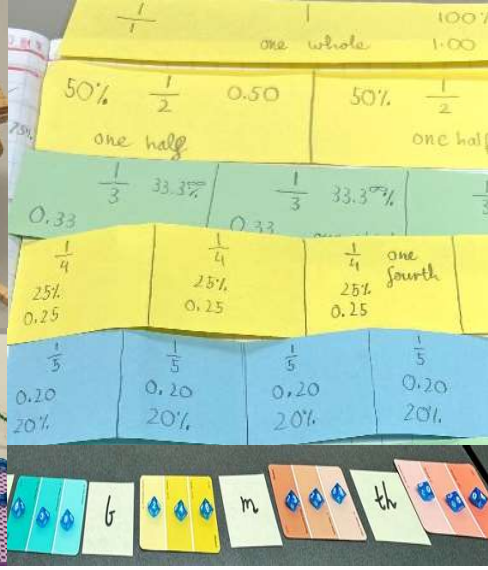
Multiplication Unit 10

Recommended for Year 7

Multiplying Fractions



Real-Life Numeracy Years 3-6

Planning Package

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

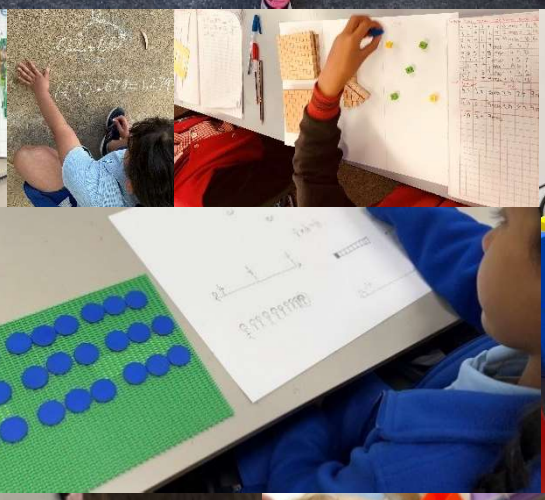
Ten years of development in Australian classrooms.

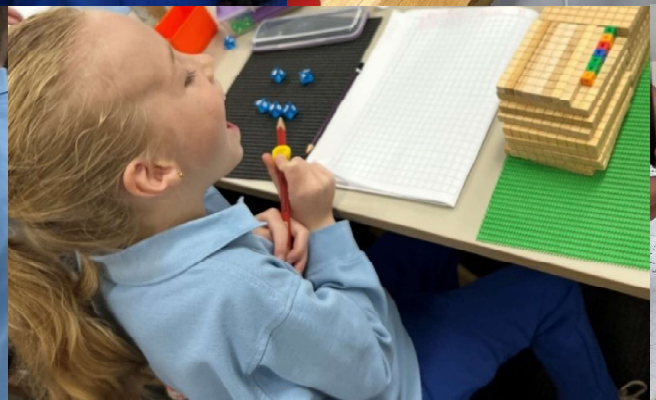
Genuinely high engagement and conceptual understanding in middle to upper primary numeracy.

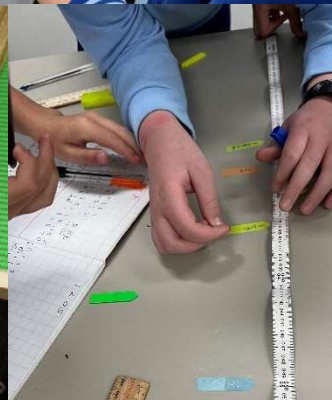
Comprehensive differentiation for wide ranges: Pre-planned and workable enabling and extending prompts for every lesson.

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

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







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

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

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

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

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

Multiplying Fractions Unit for Year 7

Multiplying Fractions

Hyperlinked Table of Contents

Multiplying Fractions for Year 7

Curriculum Links for the following lessons

This unit is recommended for Year 7 students.

Australian Curriculum V9 AC9M7N06 and Victorian Curriculum Version 2.0 (VC2M7N04) Number – Level 7: Use the 4 operations with positive rational numbers including fractions, decimals and percentages to solve problems using efficient calculation strategies

- choosing an appropriate numerical representation for a problem so that efficient computations can be made, such as 12.5%, 1/8, 0.125 or 125/1000
- **developing efficient strategies with appropriate use of the commutative and associative properties, place value, patterning, and multiplication facts to solve multiplication and division problems involving fractions and decimals; for example, using the commutative property to calculate 2/3 of 12, giving 1/2 of 2/3=1/3**
- **solving multiplicative problems involving fractions and decimals using fraction walls, rectangular arrays, algebra tiles, calculators or informal jottings**
- **developing efficient strategies with appropriate use of the commutative and associative properties, regrouping or partitioning to solve additive problems involving fractions and decimals**
- carrying out calculations to solve problems using the representation that makes computations efficient, such as 12.5% of 96 is more efficiently calculated as 1/8 of 96, including contexts such as comparing land use by calculating the total local municipal area set aside for parkland or manufacturing and retail, the amount of protein in daily food intake across several days, or increases or decreases in energy accounts each account cycle

Victorian Curriculum Version 2.0 (VC2M7N05) Number – Level 7: Multiply and divide fractions and decimals using efficient mental and written strategies, and digital tools

- investigating multiplication of fractions and decimals, using strategies including patterning and multiplication as repeated addition, with both concrete materials and digital tools, and identifying the processes for division as the inverse of multiplication

Western Australian Curriculum (ACMNA154) Real Numbers – Level 7: Multiply and divide fractions and decimals using efficient written strategies and digital technologies

- investigating multiplication of fractions and decimals, using strategies including patterning and multiplication as repeated addition, with both concrete materials and digital technologies, and identifying the processes for division as the inverse of multiplication

NSW Maths Syllabus Whole Numbers – Stage 3 – Multiplicative relations A

Use estimation and rounding to check the reasonableness of answers to calculations

- Use estimation to check the reasonableness of answers to multiplication and division calculations

NSW Maths Syllabus Whole Numbers – Stage 3 – Multiplicative relations B

Multiply and divide decimals by powers of 10

- Use mental strategies to multiply benchmark decimals by single-digit numbers
- Compare the relative place value of digits to multiply and divide a decimal by powers of 10
- Estimate the product of a decimal and a whole number to determine the magnitude of a calculator answer

NSW Maths Syllabus Whole Numbers – Stage 4 – Fractions, decimals and percentages

Round decimals to a specified degree of accuracy using approximations

- Round decimals to a given number of decimal places
- Apply the notation ≈ as a symbol of numerical approximation
- Reason why an approximation may be more appropriate than an exact answer and vice versa

Identify terminating and recurring decimals

- Use either dot or vinculum notation for recurring (repeating) decimals
- Classify decimals as recurring or terminating

Solve problems that involve the multiplication and division of fractions and decimals

- Compare and generalise the effect of multiplying or dividing by a number with magnitude between zero and one
- Represent multiplication and division of decimals
- Represent multiplication and division of fractions, including mixed numbers
- Multiply and divide decimals, using digital tools to solve problems
- **Multiply and divide fractions and mixed numbers, with and without using digital tools to solve problems**
- **Compare initial estimates with the results of calculations**
- Apply knowledge of fractions and decimals of quantities to solve problems
- **Apply knowledge of multiplication and division of fractions and decimals to solve problems**

Formative Assessment

A formative assessment cross-check is available in this unit's folder, including progressive learning goals and success criteria to keep track of growth for each unit.

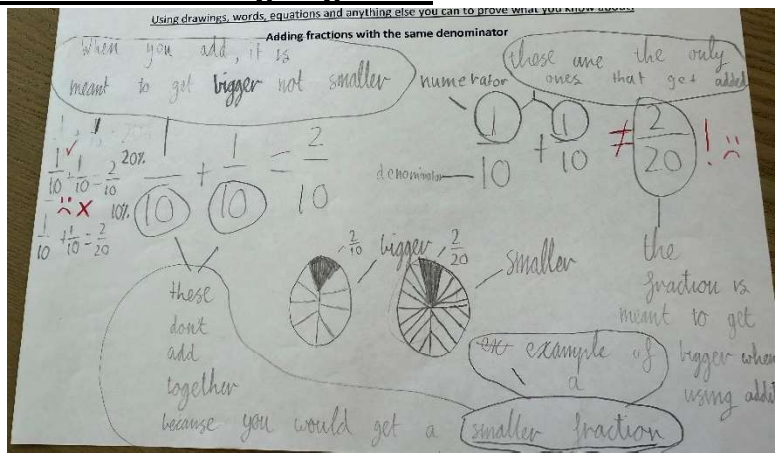
This includes a grid template or a notes template, whichever the teacher prefers.

Formative Assessment – Ongoing Cross-Check – Years 3-6 Fractions Units 1-10																		
Students	'out of' language L2-L4 3-6 UNIT 1	Halves, quarters eighths L2 EARLY YEARS UNIT 2	See and name in real-life L3 3-6 UNIT 2	Count by fractions L4 UNIT 2	Place on number lines L4 UNIT 2	Equivalence to one whole L3 UNIT 3	Equivalence to half L4 UNIT 3	Improper to mixed, mixed to improper L4 UNIT 4	Connect fractions to division L5 UNIT 5	Comparing fractions strategies L5 L6 L7 UNIT 5	+ and - same denom L5 UNIT 6	+ and - related denom L5 UNIT 6	Connect fractions to decimals and % L5 and L6 UNIT 7	Fraction of a quantity L6 UNIT 8	Common discounts (50%, 25%, 10%) L6 UNIT 8	Any % discount or increase L7 UNIT 8	x L7 U9	÷ L7 U10

Focus: Visualising, explaining and making sense of fractions	Term __ Weeks ____	**CODES:** Record these codes when you see a student applying this skill: **OUT OF:** 'Out of' language **NUMLINE:** Placing on number line **COUNT BY:** Counting by fractions, including above one whole **= 1** Equivalence to one whole **= ½** Equivalence to half **MIX/IMPROP:** Convert improper fractions and mixed numbers **COMPARE:** Visualises, uses benchmarks (½), reasoning to compare **+/- SAME DENOM** **+/- REL DENOM:** Add related denominators **CONVERT TO % AND DECIMALS:** Think $1 strategy **FRAC QUANT:** Calculate a fraction of a quantity **% discounts** **x** Multiply fractions **÷** Divide fractions		
Student	Student	Student	Student	Student
Student	Student	Student	Student	Student

Reflection Journals

A fractions reflection journal set of templates is also available, although we highly recommend students using their **own maths reflection journals on an ongoing basis.** These are used as notes to their future forgetful self during reflections, as well as glossary pages co-constructed with the teacher and whole class at the start of units. Ideally, students start their maths journal in a small, plain paper (no lines, no grids) neatly presented notebook in year 3, and carry it along every year (handed over to the next teacher) up to year 6, then graduate with it, taking it across to



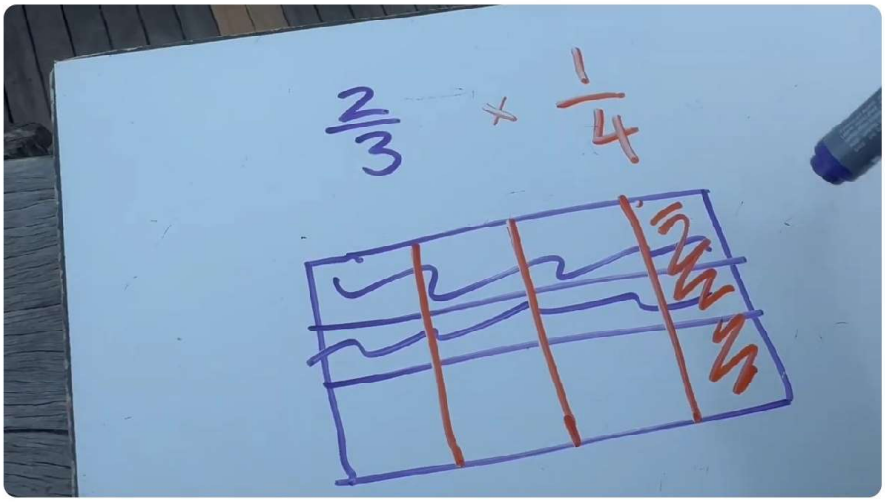
Video Modelling and Teaching Tips

Welcome to the storm!

https://www.youtube.com/watch?v=E9exLc1Sc0Q

The storm area model

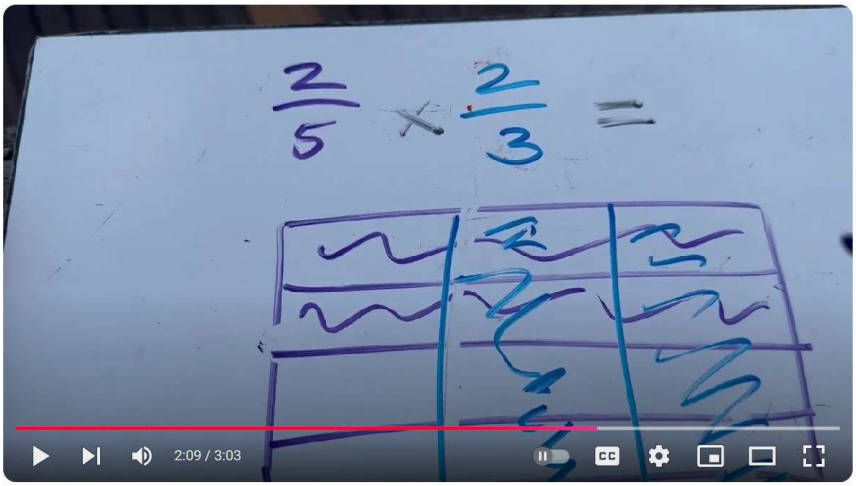
https://www.youtube.com/watch?v=-HZfiY3aKiE



The storm - multiplying fractions by fractions

The second storm

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



The storm v2 - multiplying fractions by fractions

Multiplying a fraction by a whole number using a circle model

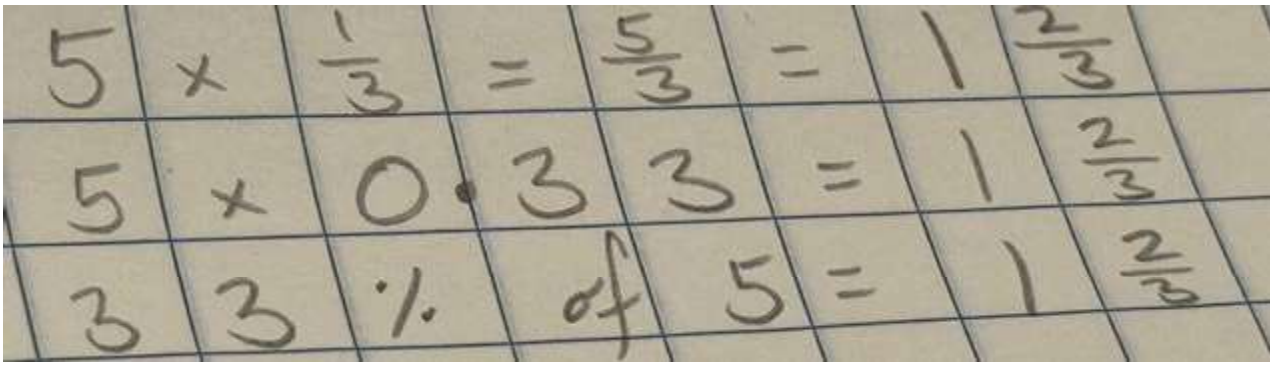
https://www.youtube.com/watch?v=ZZAPvyPOrYg

Multiplying a fractions by a whole number

Connecting to percentages, decimals and the inverse

Linking multiplying by a fraction to the inverse operation (dividing by its inverse, particularly where the numerator is one). For example, multiplying by one third is simply dividing by 3, because you are splitting the whole into 3 equal parts either way.

Also try to show equivalent number sentences whenever percentages and decimals can be linked, as shown:



Extreme extension option throughout this unit:

Negative powers are outlined during the *Lesson 1 extending prompts,* and able to be continued throughout most of the unit, as an ongoing extending prompt.

Read more: https://study.com/skill/learn/multiplying-fractions-using-fraction-models-explanation.html

Watch a Kahn Academy video of the same: https://www.khanacademy.org/math/cc-fifth-grade-math/5th-multiply-fractions/imp-multiplying-fractions/v/visualizing-fraction-products

Multiply Fractions Year 7 Lesson 4	**The Storm Area Model, followed by students creating their own real-life examples** **Learning intention: Multiply fractions using the area model.** **Maths vocabulary: area model, multiply fractions, north, east, south, west**

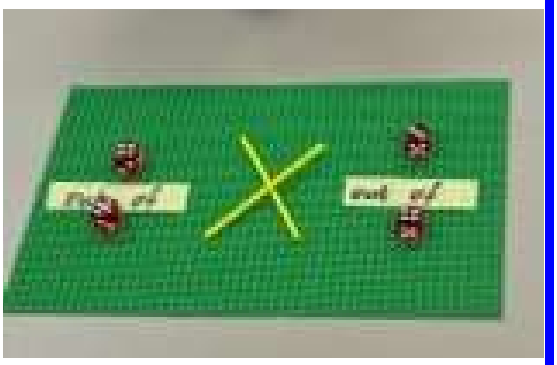
Real-life link:
Imagine the area model as a 'perfect storm' with weather coming in from one direction (east) and another weather system coming in from another direction (north) with both fronts set to collide into a perfect storm!

YouTube examples of 'perfect storms':
https://www.youtube.com/watch?v=Esz6ne9x9yM and https://www.youtube.com/watch?v=Z6uuGWCUuOc and https://www

Lesson summary: Students use the area model to multiply fractions where two storm fronts combine. Later, students use a mix of ingredients for a chocolate block.

Materials:

- A3 paper for whole-class modelling, then post-it notes for students to try.
- To generate each problem with dice, fraction mats ('out of' masking tape strips shown on next page), with bundling sticks to represent 'x' sign and dice in use.



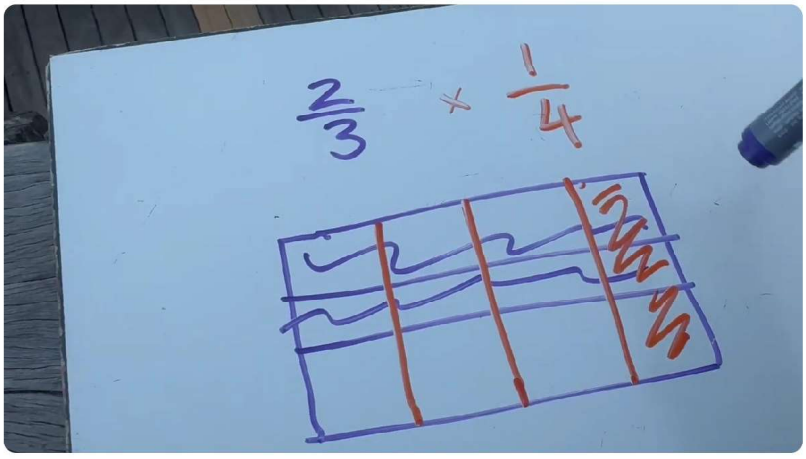
Best set-up: Whole-class model at a desk with materials. Deliver the extension towards the end of the at-desk modelling, so both mid-range and extension students see it.

Welcome to the storm!

https://www.youtube.com/watch?v=E9exLc1Sc0Q

The storm area model

https://www.youtube.com/watch?v=-HZfiY3aKiE

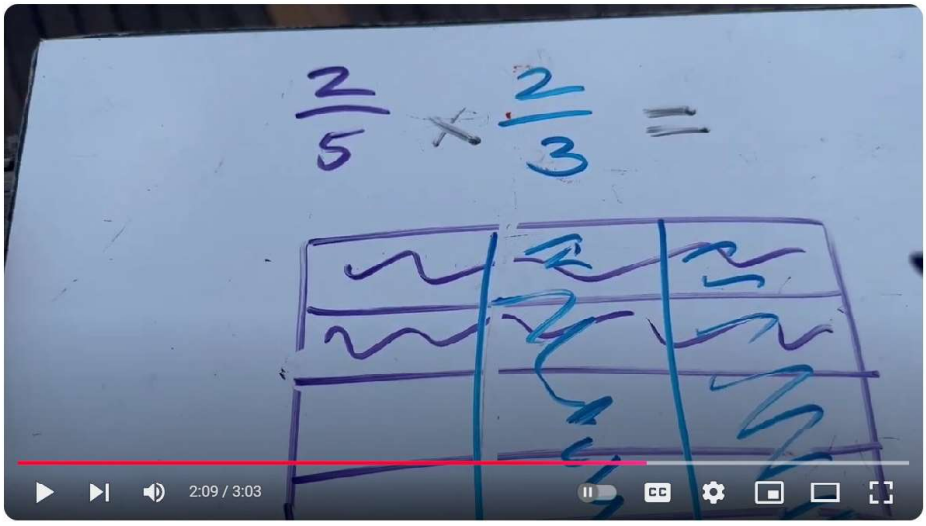


The storm - multiplying fractions by fractions

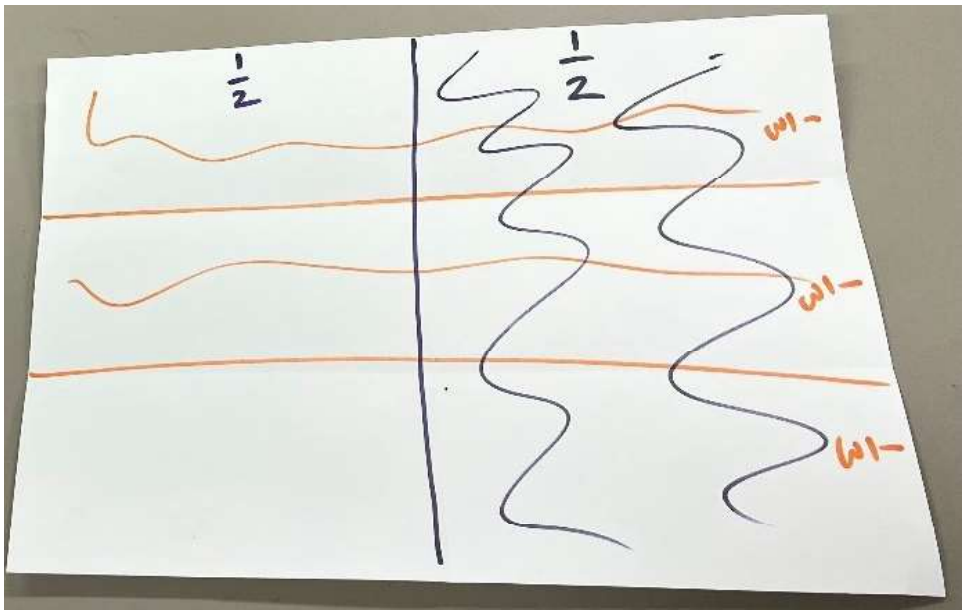
.youtube.com/watch?v=ScAONFkaQxA

The second storm

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



The storm v2 - multiplying fractions by fractions

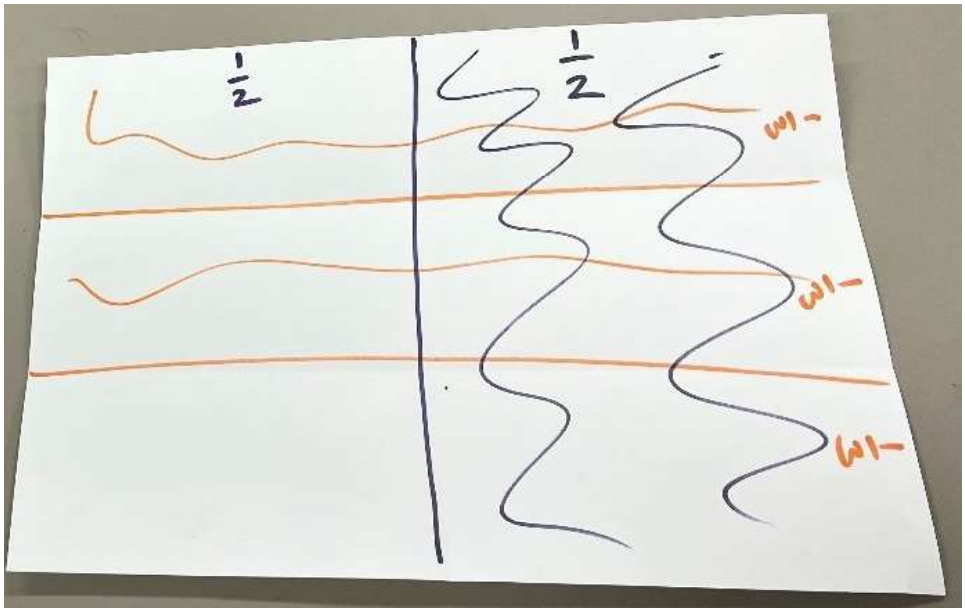


Weather forecast: There is a storm coming from the east that will hit half the town (eastern side).

There is a second storm coming from the north that will hit 2/3 of the town (northern two thirds).

Which parts of the town should emergency services put on alert, as likely to be hit by both storms at once?

Instructions:



1. Draw the first fraction (storm) from one side of the page – breaking it into halves. This shown the storm coming from the east will hit half the town (shade the half it will hit in the same colour you used to record it as a number = ½ shaded in purple).

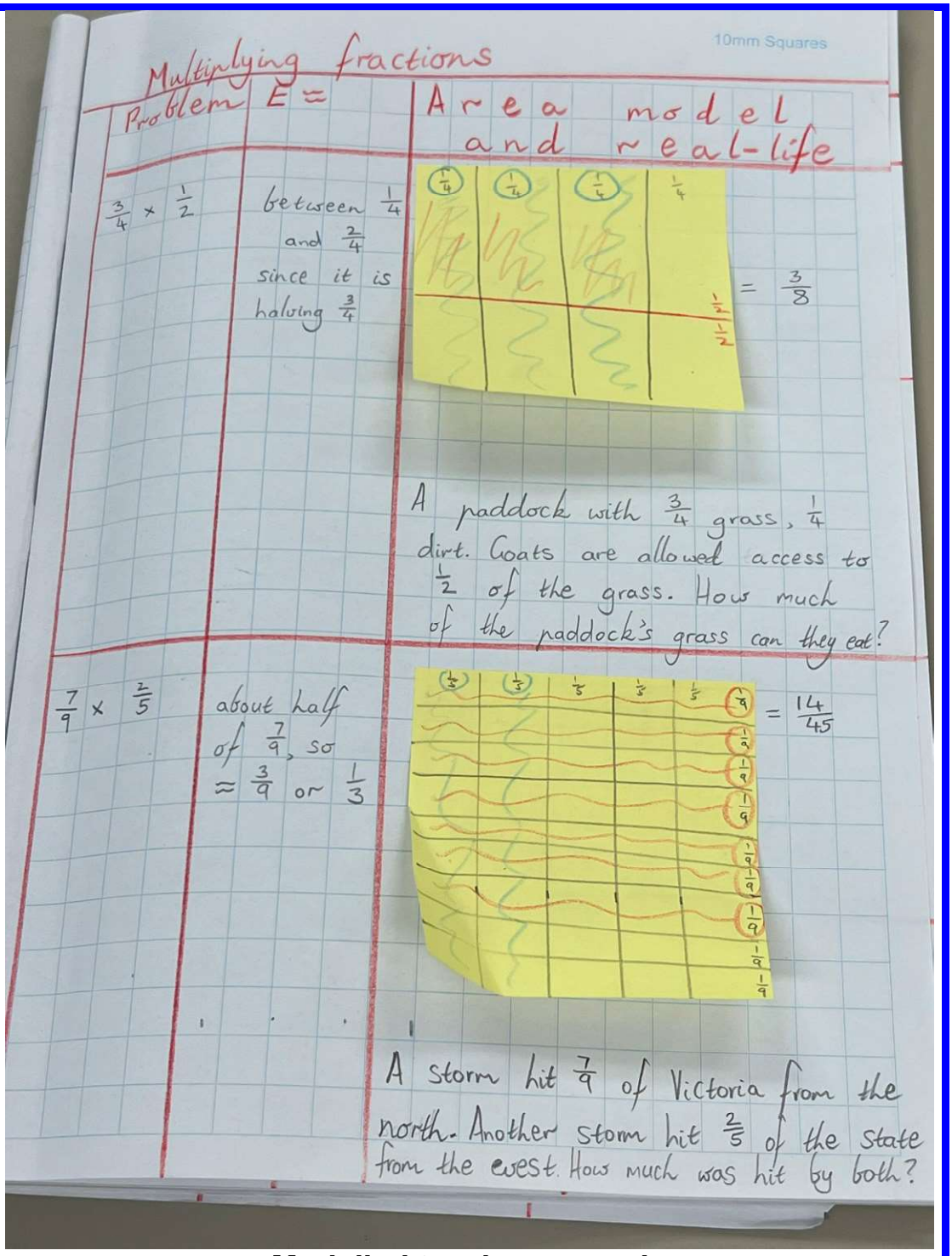
2. Draw the other fraction from the other side of the page – breaking it into thirds. The storm coming from the north will hit 2/3 of the town, so shade the 2/3 in orange, matching the colour used to slice the page into thirds.

3. Where do both colours overlap? That is the proportion of the town that will be hit by both storms. It is 2 out of 6 parts = $\frac{2}{6} = \frac{1}{3}$

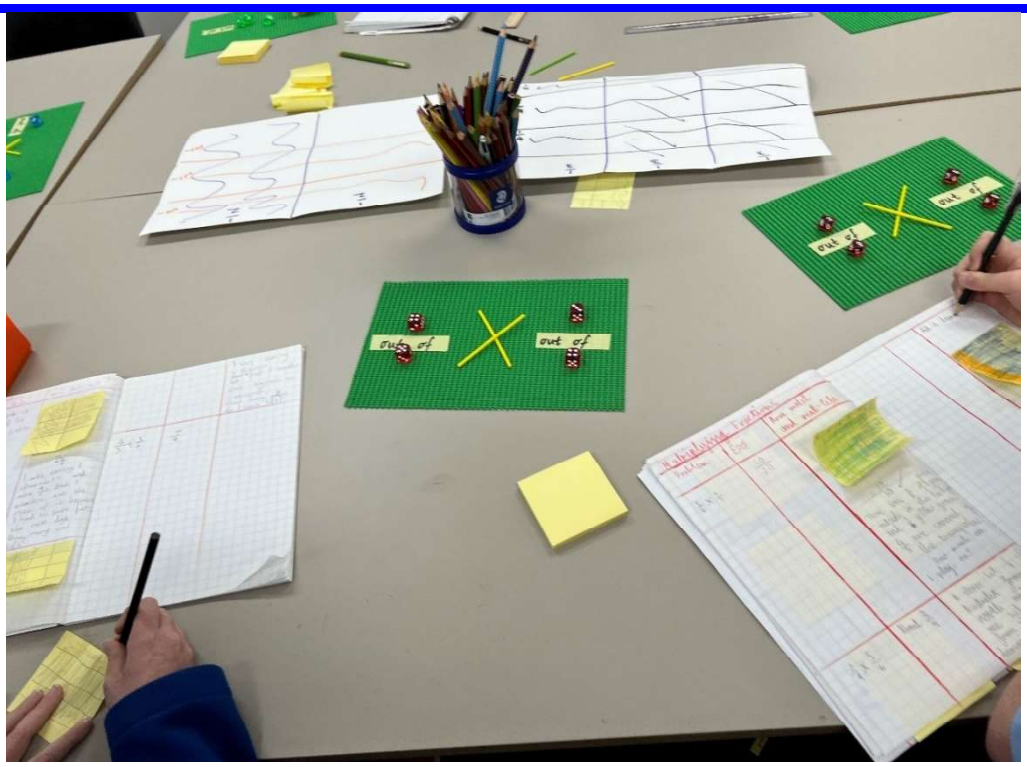
4. **Record the resulting equation of the storms: $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$**

5. **For future examples, try to create a new scenario where you might multiply fractions in real-life (not just the storm example repeatedly).**

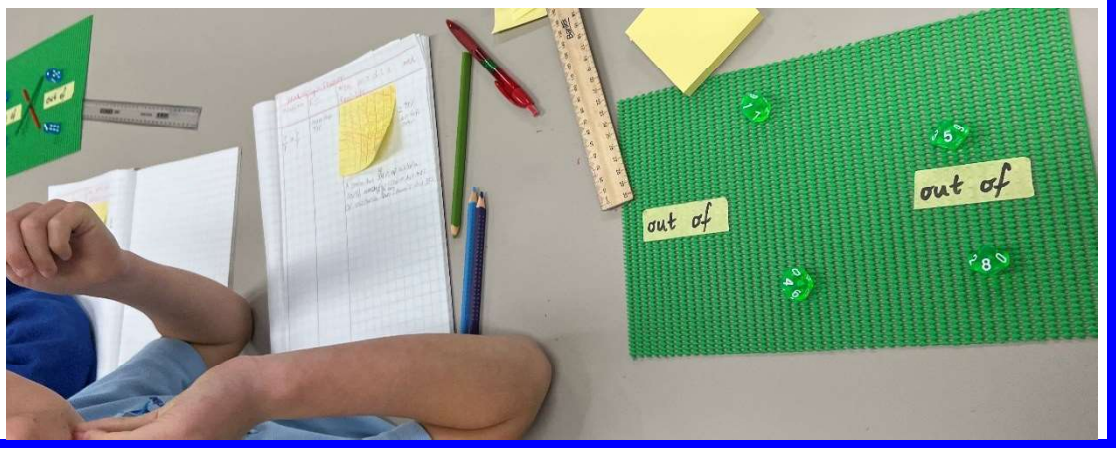
   See examples from the work samples on the following pages.

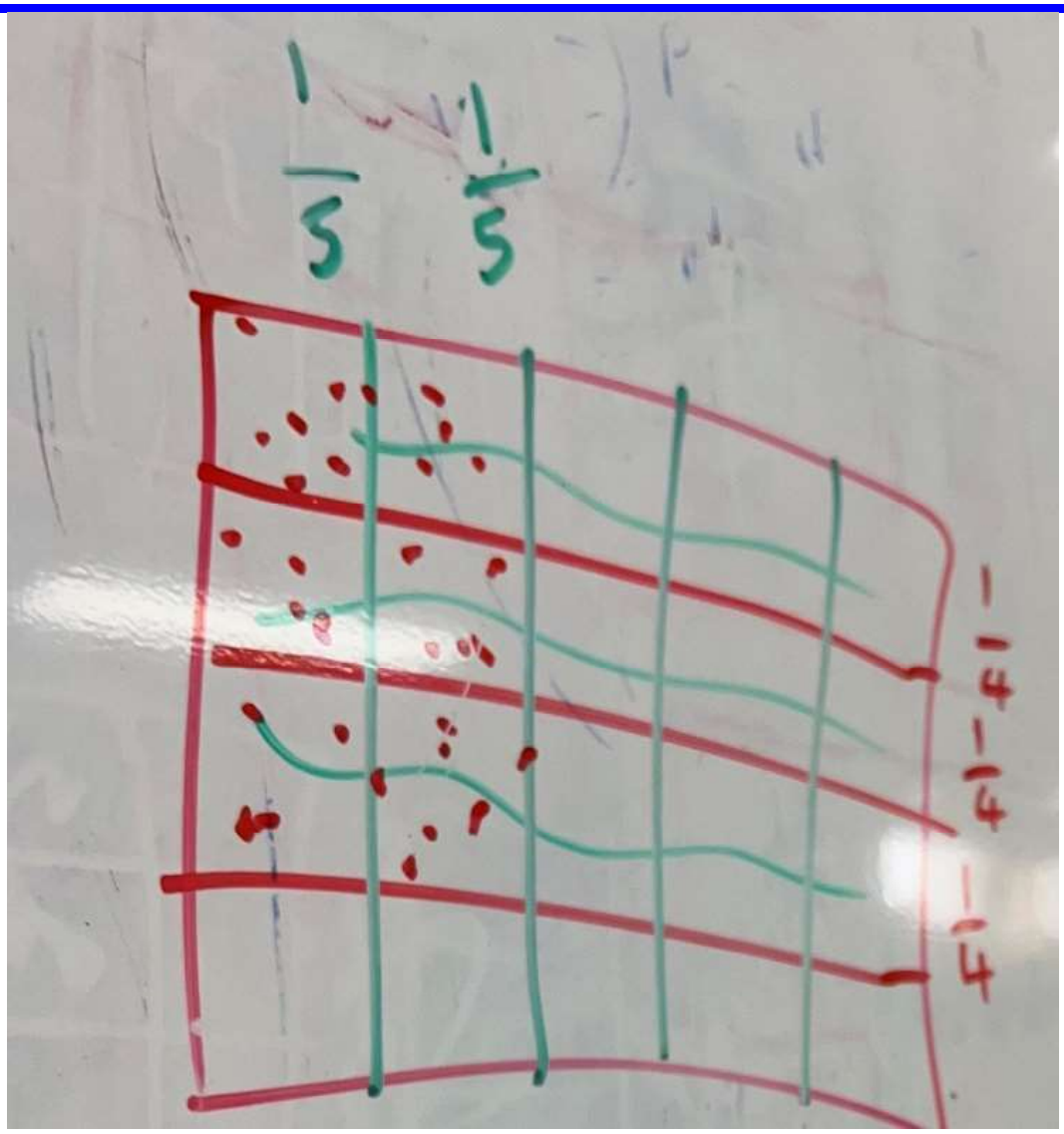


Modelled teacher example

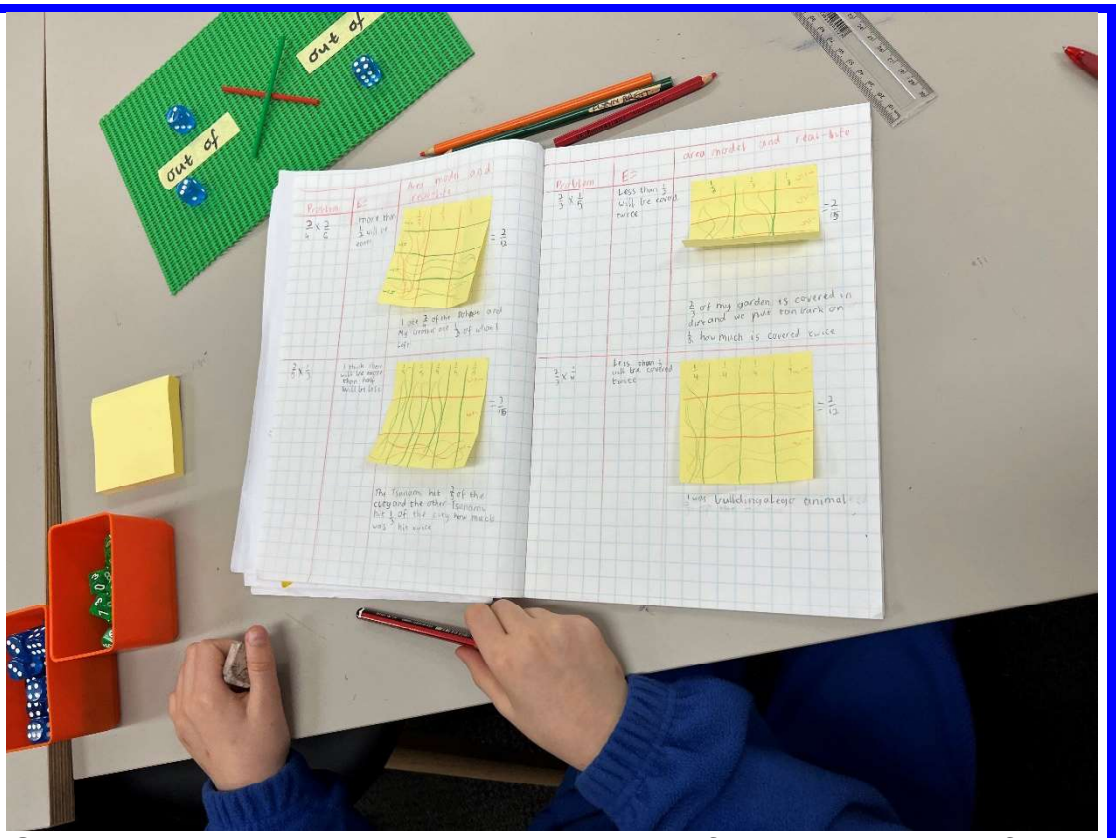


Lesson in action with dice on fraction ‘out of’ mats and sticks arranged in a multiplication sign to generate the ‘storm’ equation

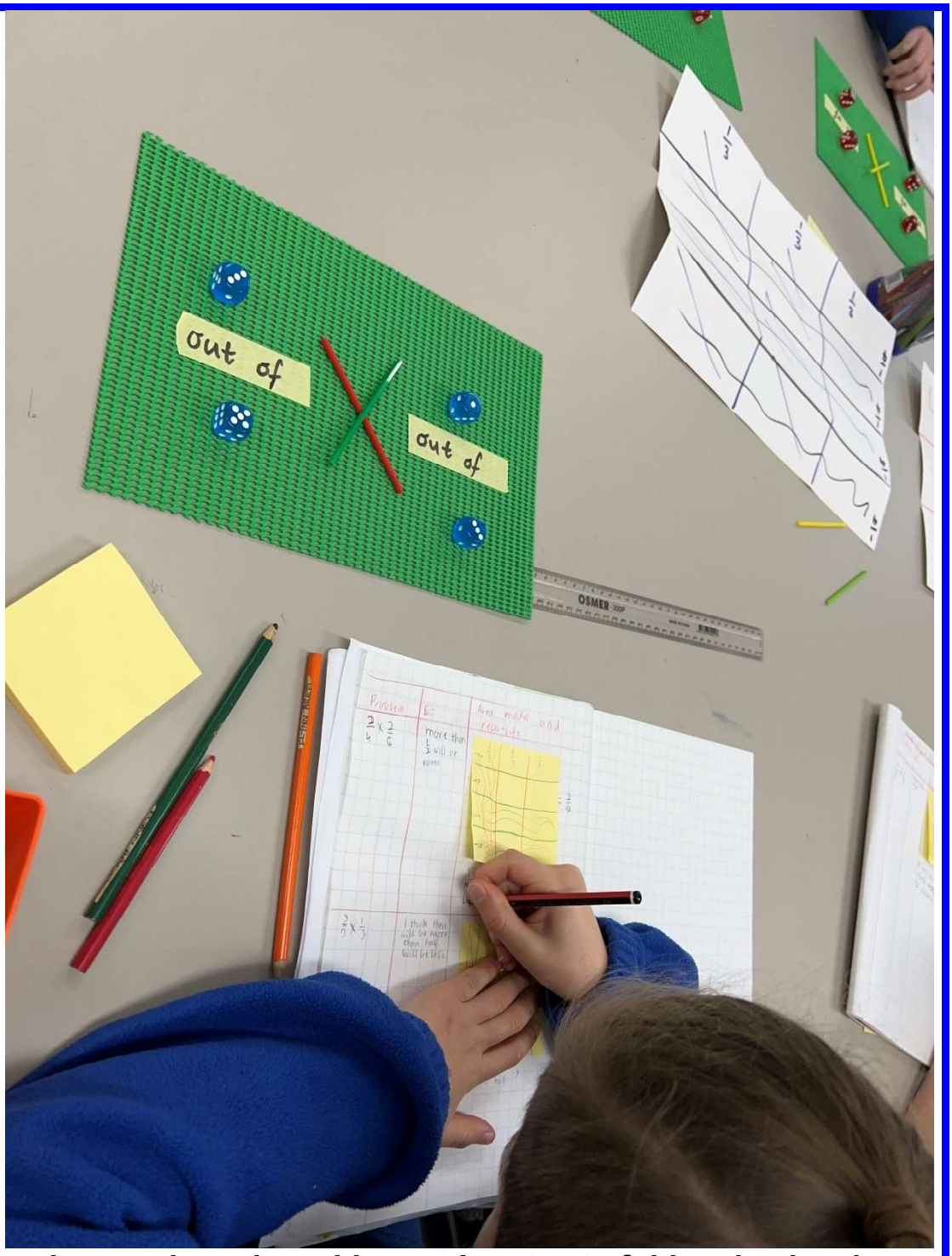




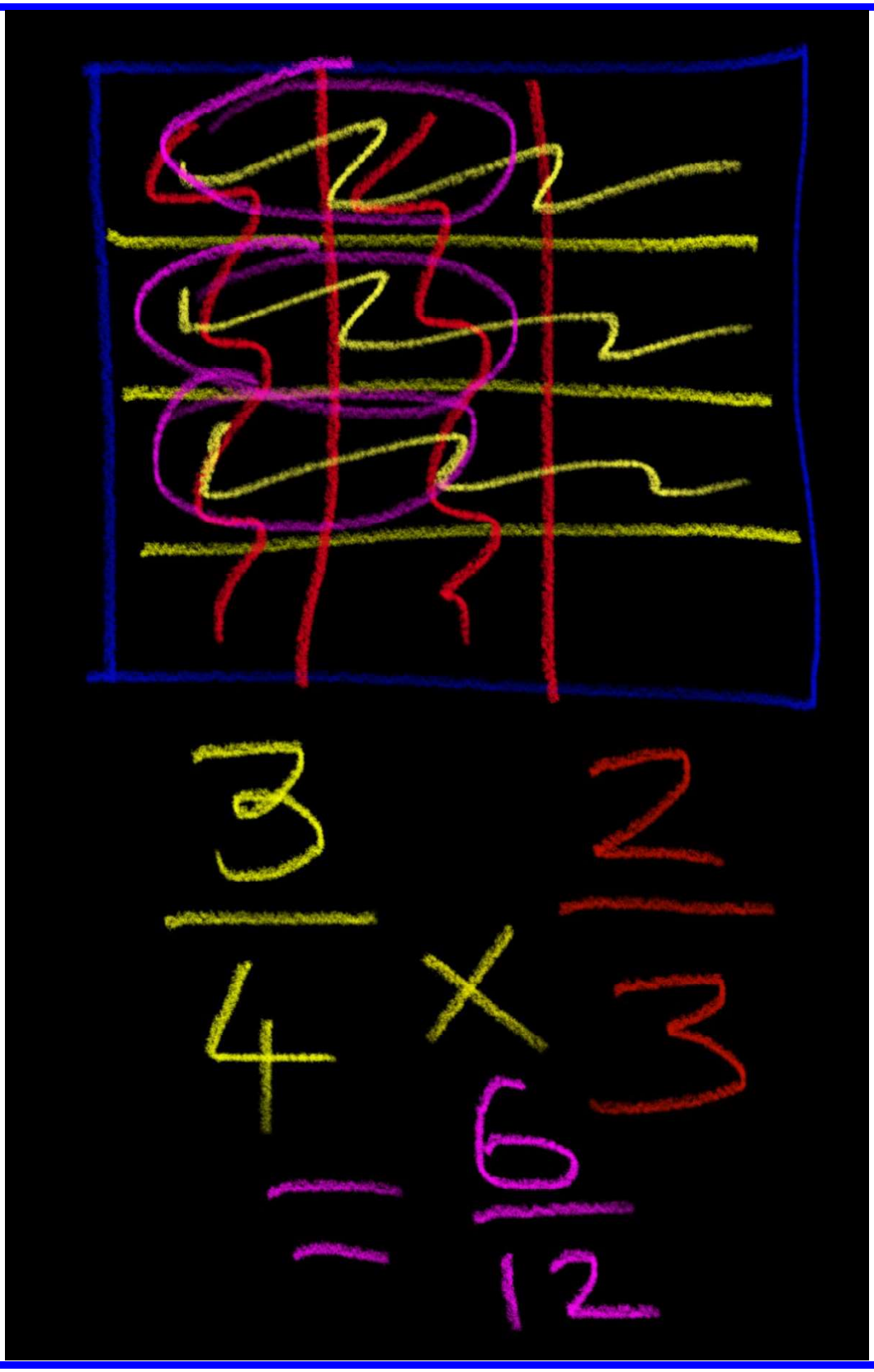
$\frac{3}{4}$ x $\frac{2}{5}$, with the area model showing that 6/20 of the village will be hit by both storm fronts.

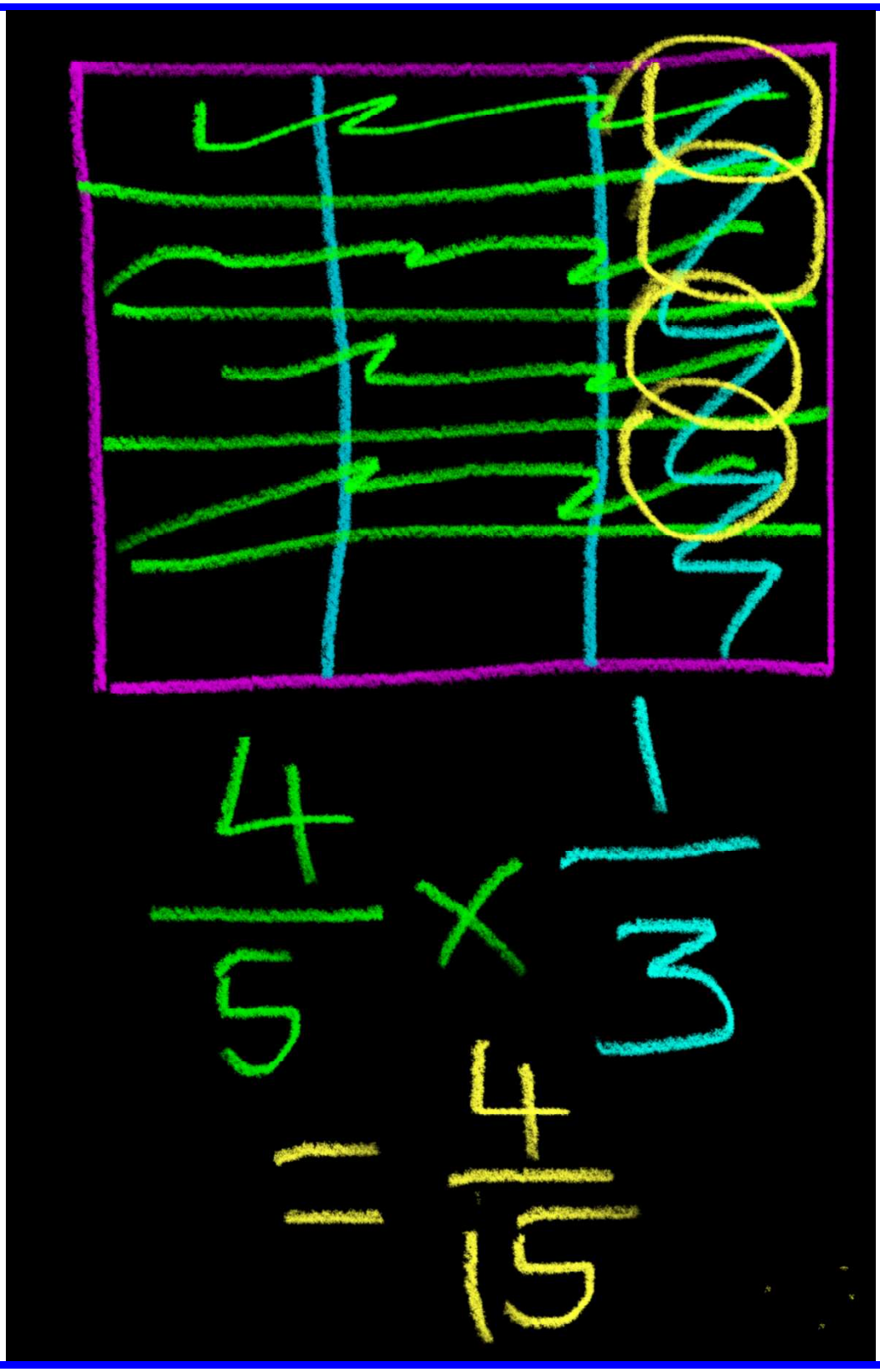


Student bookwork during 20-minutes of work time thus far in the session (4 completed examples with matching worded problems and area models for each storm).



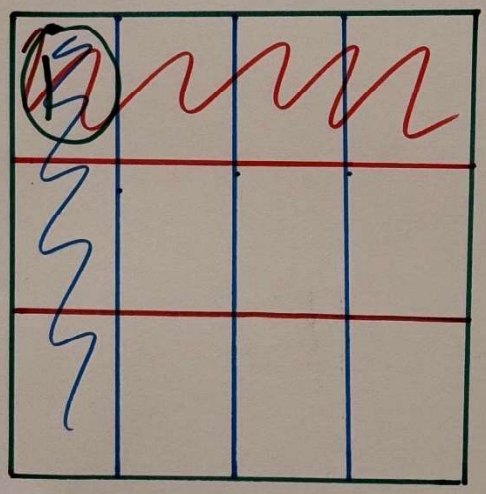
Lesson in action with post-it notes to fold and solve the multiplication of fractions with the storms fractions generated by dice rolls onto the fraction mats.



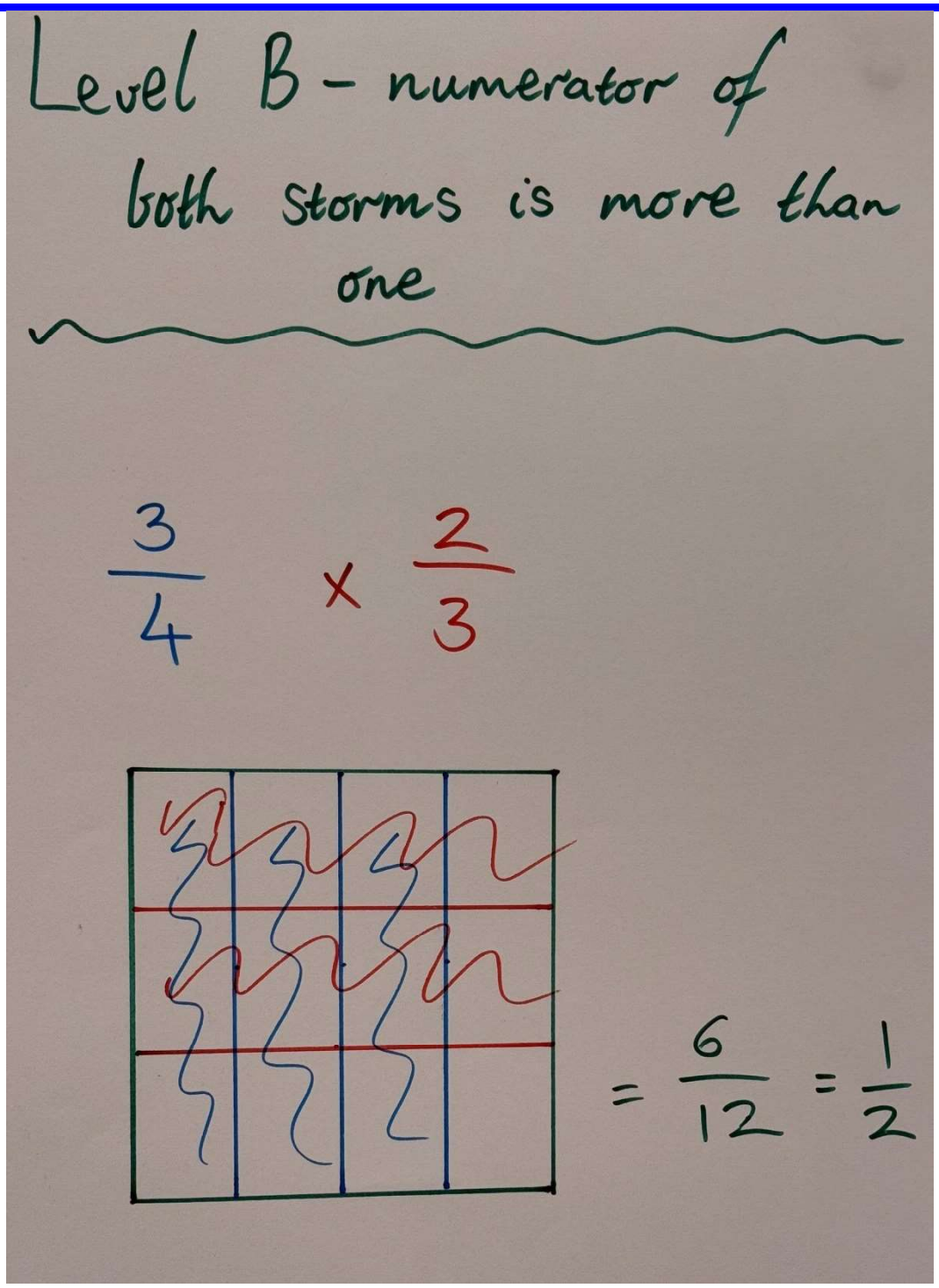


Level A - numerator of both Storms is one

$$\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

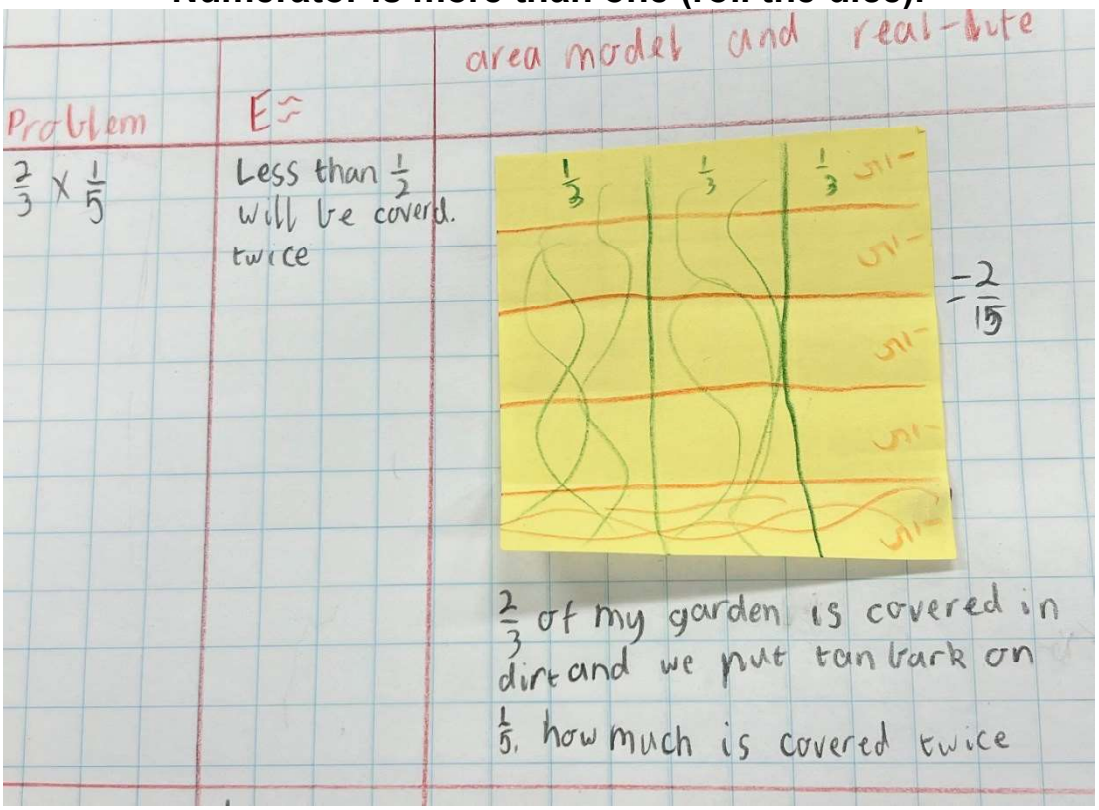


1 out of 12

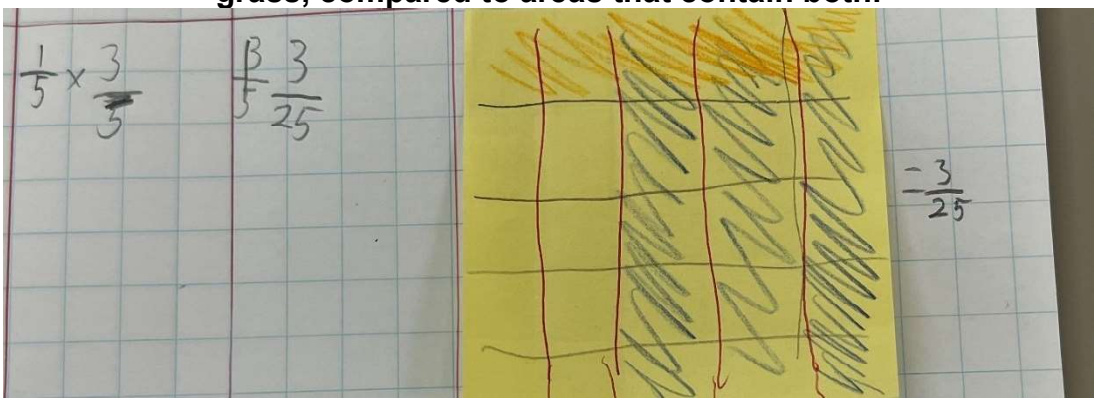


Support level challenges:
Start with both numerators set to the value of '1' (place rather than roll the dice).

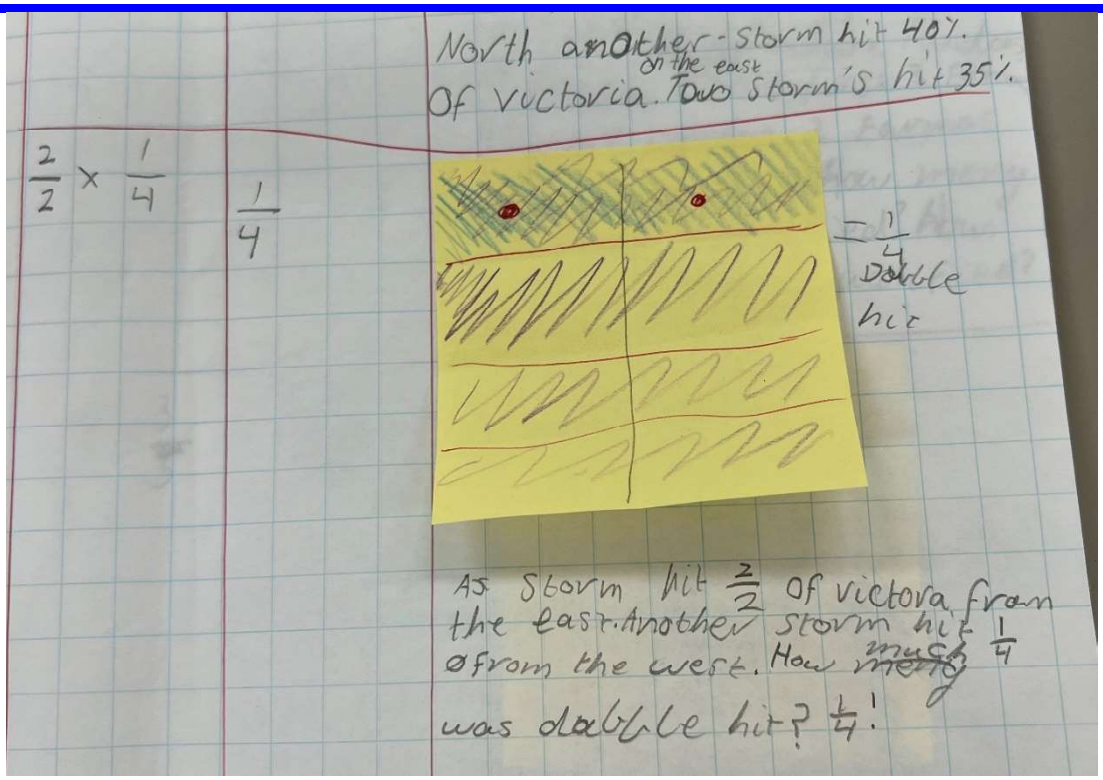
Mild level challenges:
Numerator is more than one (roll the dice).



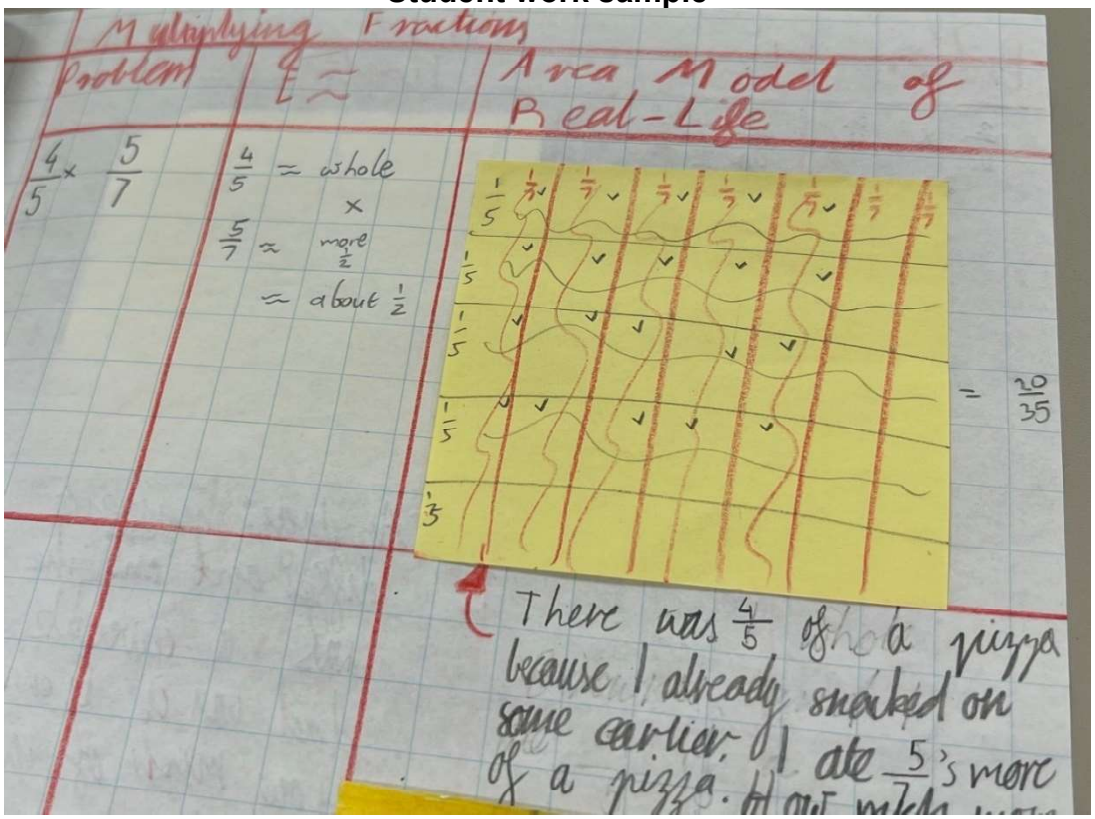
Student work samples – showing students creating their own scenarios, such as the amount of bark in their backyard, compared to grass, compared to areas that contain both.



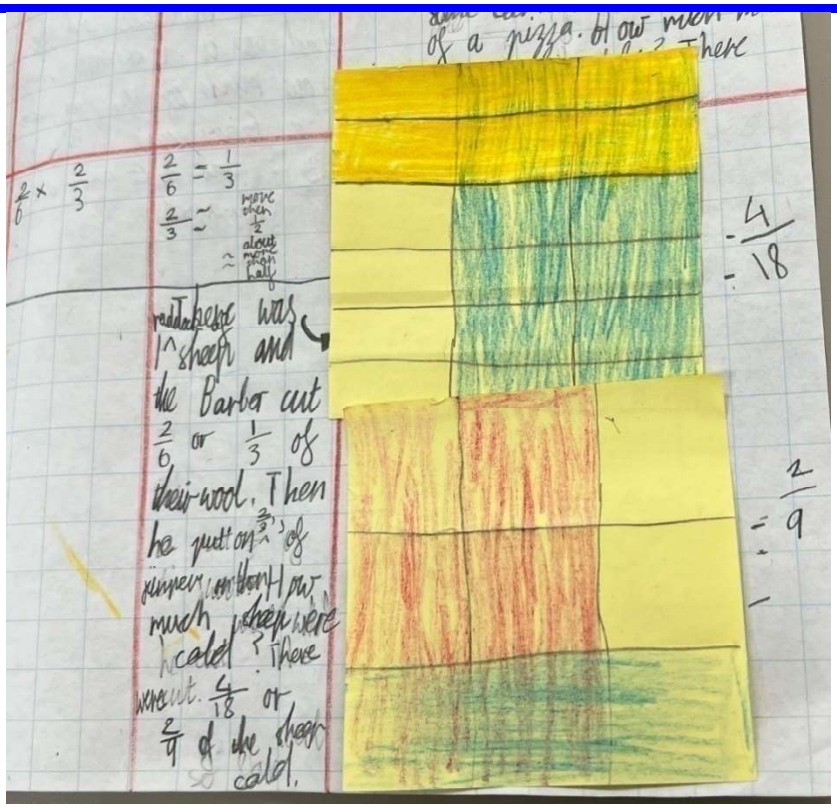
Student work samples



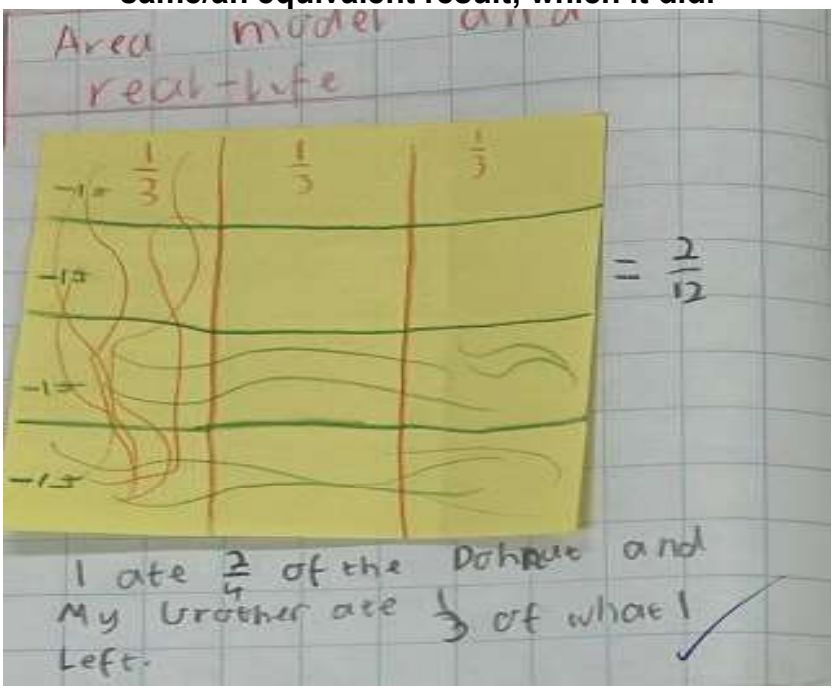
Student work sample



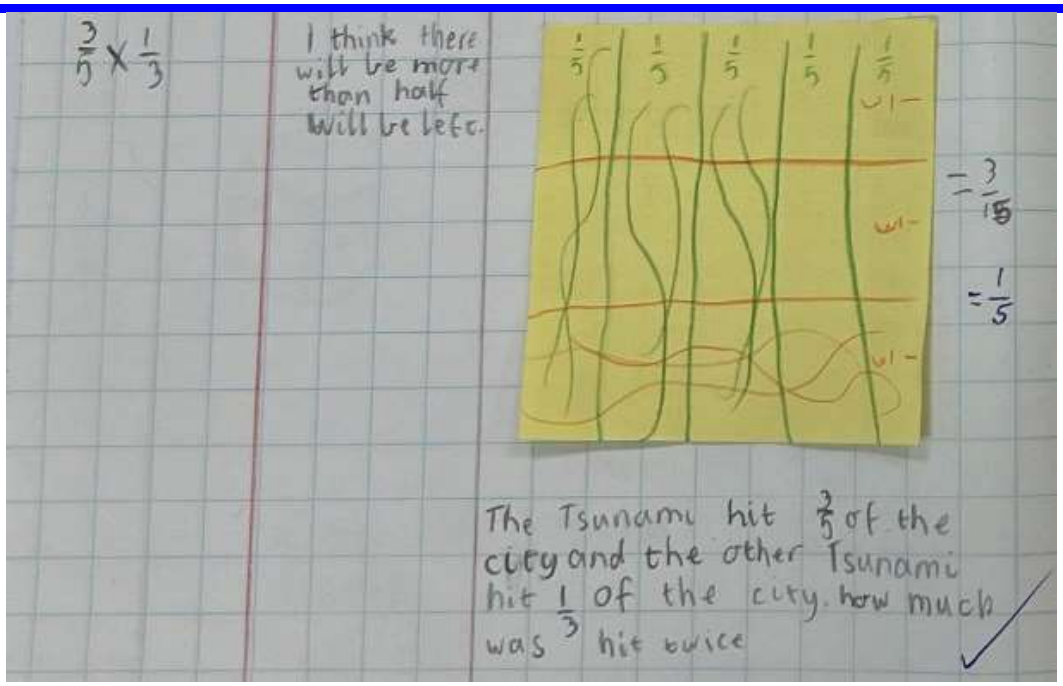
Student work samples relating to eating a portion of food, then later in the day eating a portion of the remaining amount of the same food.



Shown above, this student showed the regular area model for this problem, as well as a simplified version (simplifying the 2/6 to 1/3 prior to calculating the multiplication) to see if this would produce the same/an equivalent result, which it did.



Above, the brother ends up eating 2/12 of the total/original portion of the donut by eating 1/3 of the 2/4 or half of what was left for him.



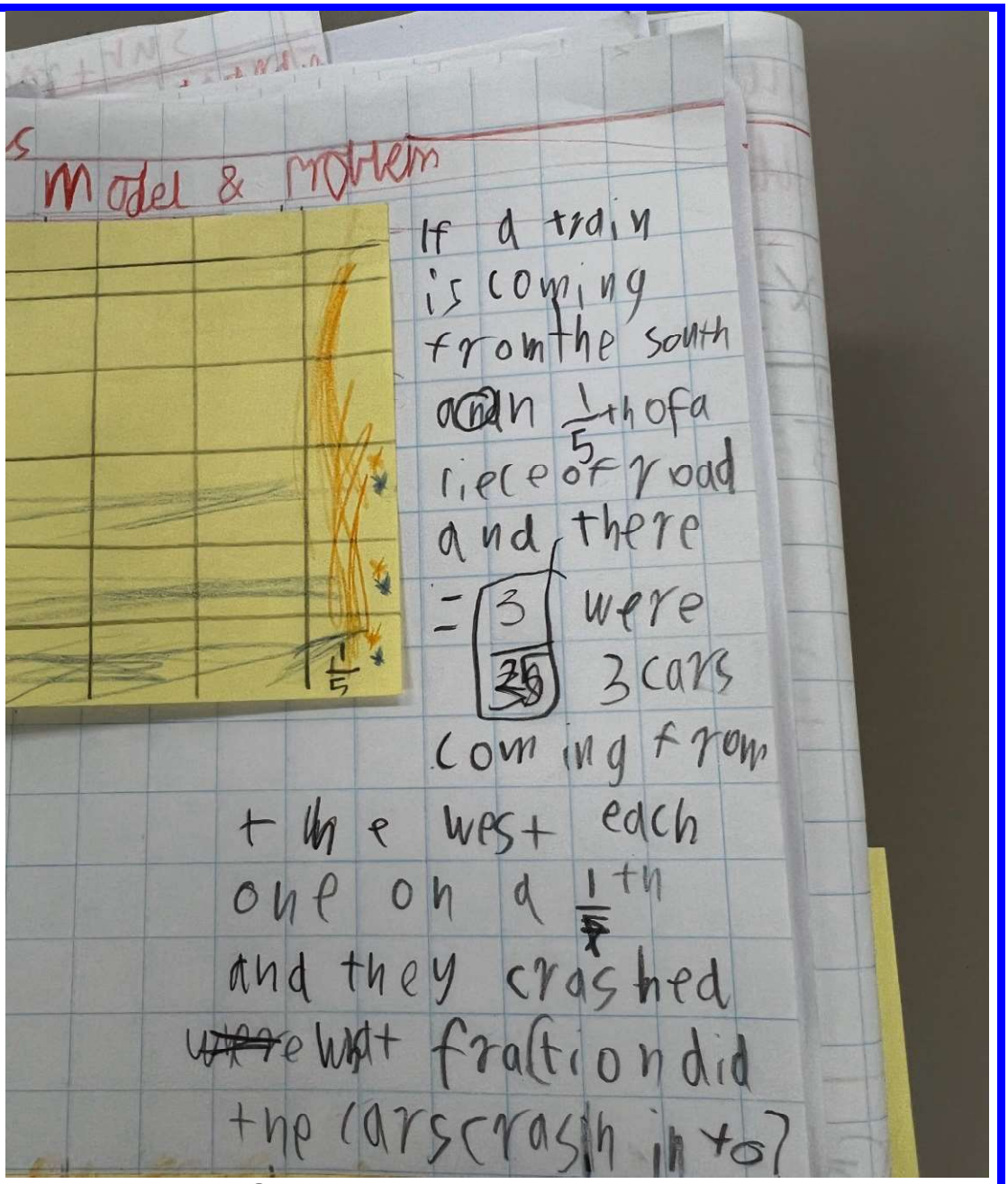
Student-generated scenarios for multiplying fractions

Student work sample – starting with the storm scenario, then **creating other scenarios of their own imagination** for multiplying fractions, such as:

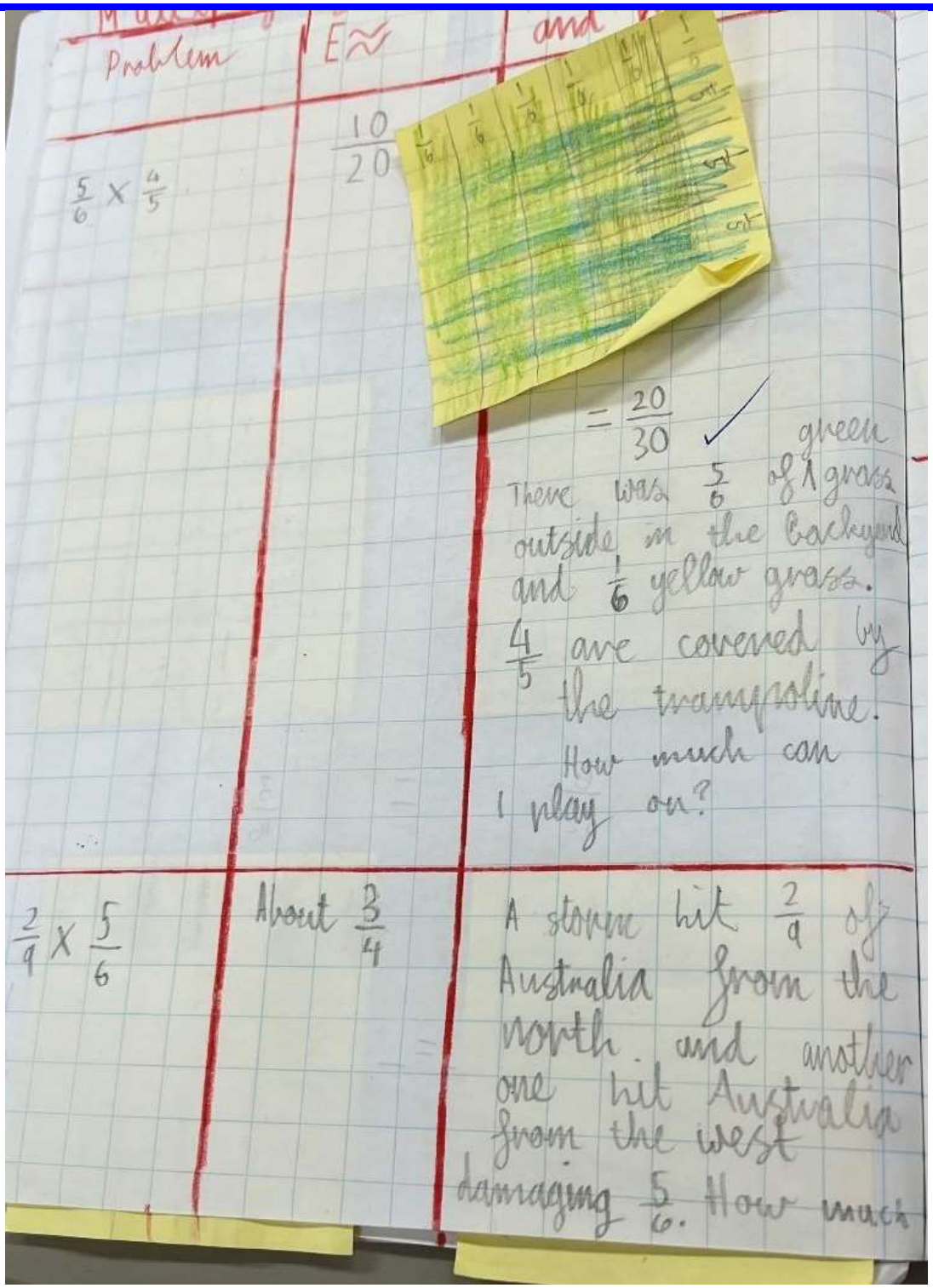
- someone eating a portion of food, then the next person at the table eating a portion of whatever is left
- crossovers of grass/bark in their backyard
- shared areas of paddocks between different farmed animals, or shared territories for wild animals
- shared dessert toppings
- cooking a recipe that calls for a certain fraction of a cup, but now you need to cook for more people
- reducing a decimal price by a fractional amount

Note that the student work above represents the answer in the simplest form possible (showing 3/15 as 1/5).

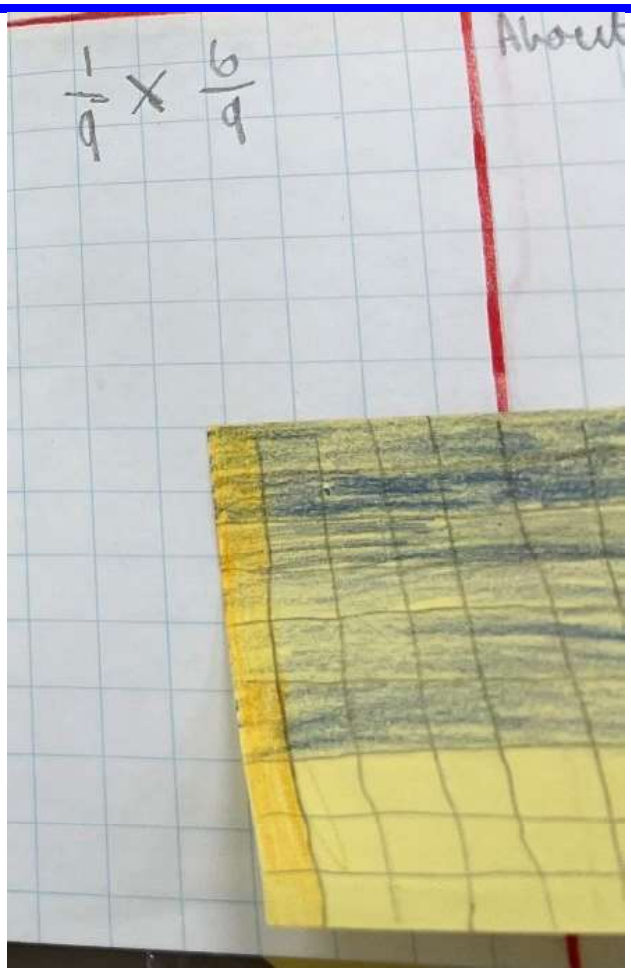
Critical tip: Simplify fractions before working out the answer in the area model, which often makes it easier to solve and provides a more simplified answer as well.



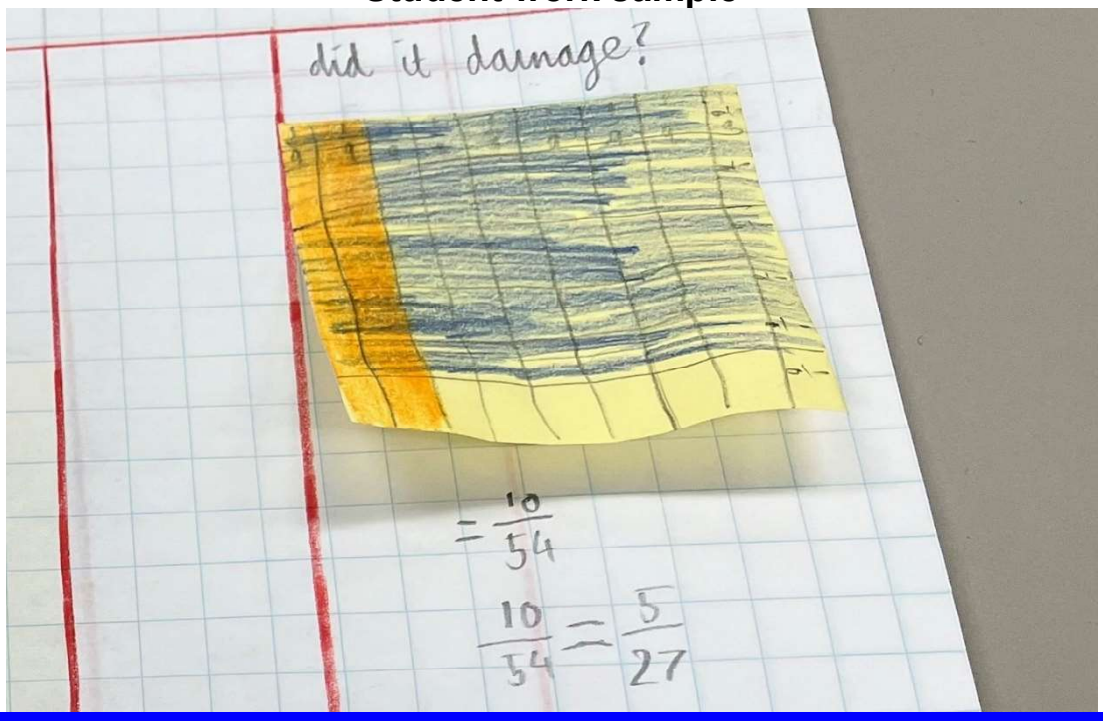
Students own created scenario

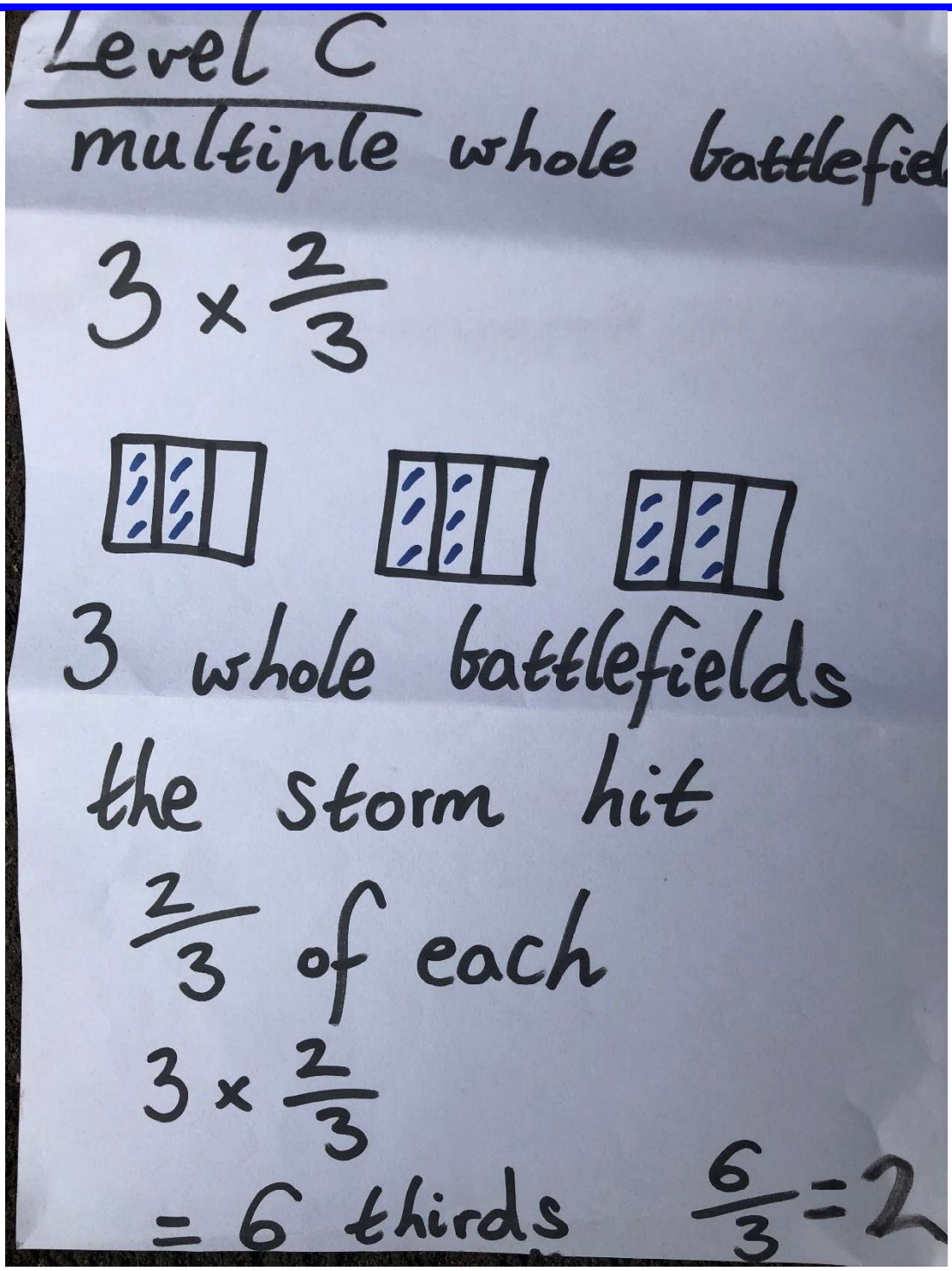


Note the estimation element and worded problem element in this work sample to ensure the equation was linked to something real for the student (the storm analogy or similar).

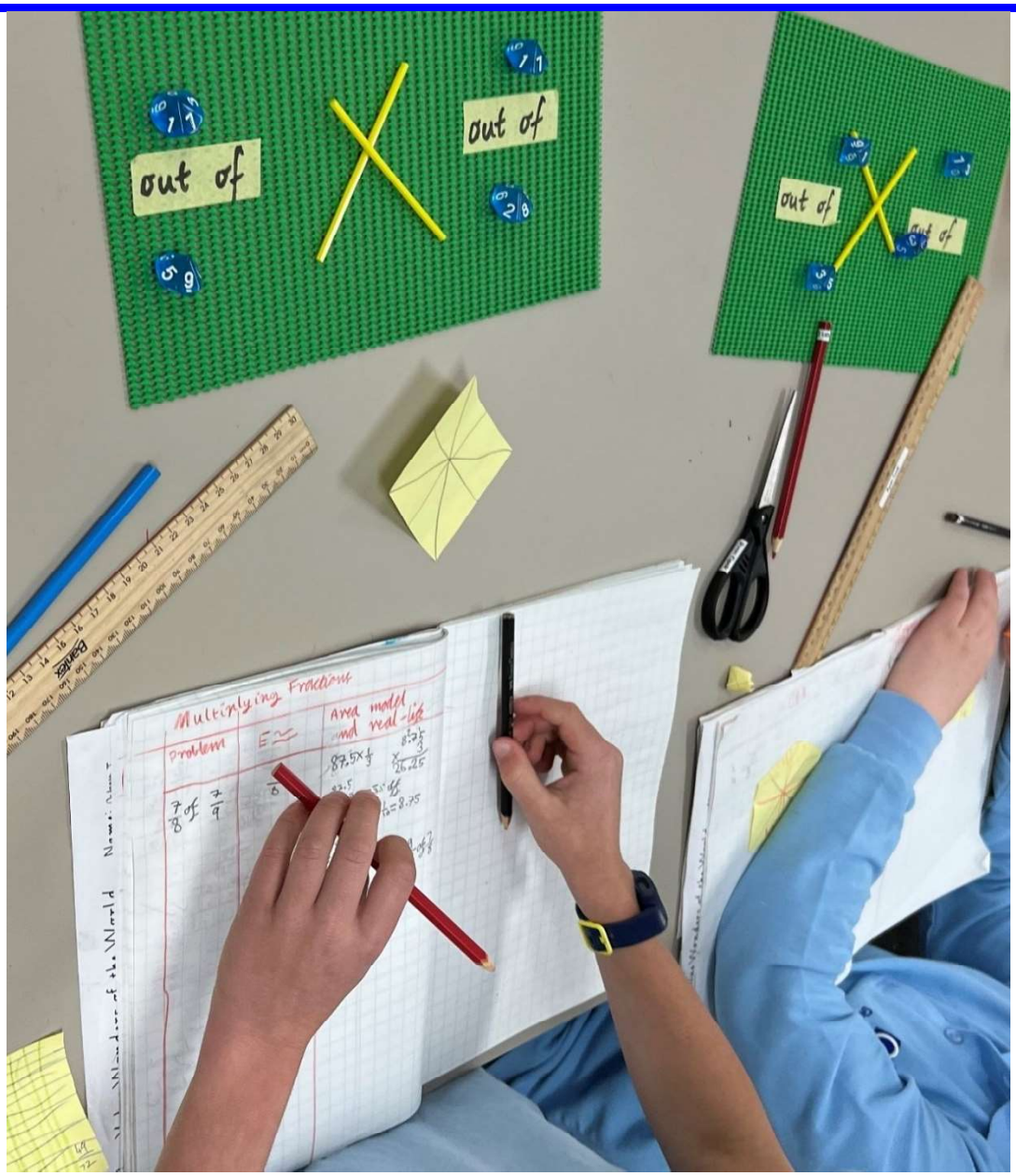


Student work sample





Extension level challenges:
Fraction by a whole number, or even a mixed number.



Questioning prompts:

- Did the area that both storms hit increase or decrease in size compared to the area that one storm hit? Why?
- What do you expect multiplication to do? What does multiplication by a fraction do?
- What if it is multiplication by a whole number, or an improper fraction?

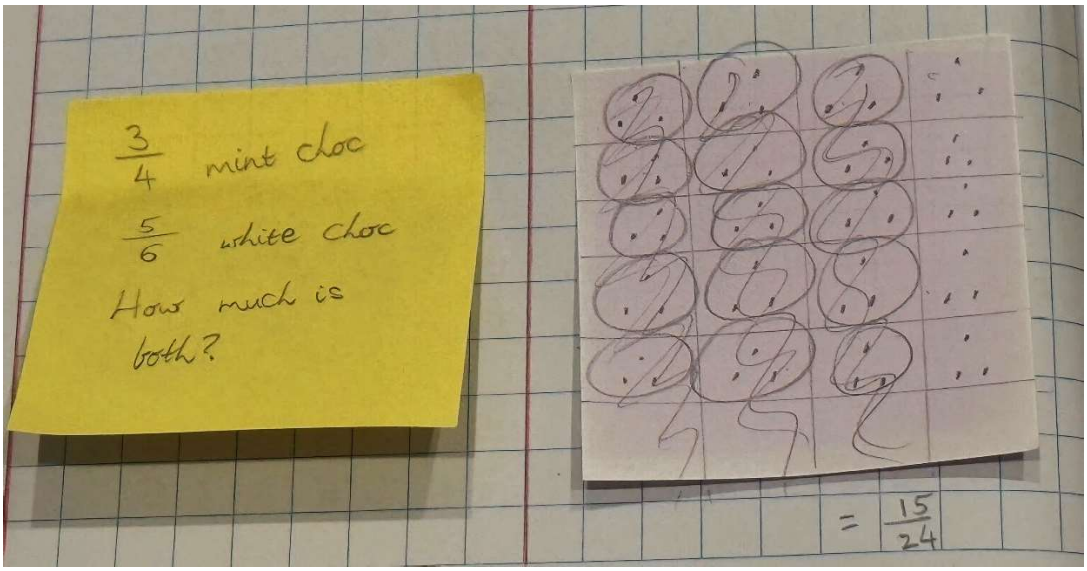
Alternative hook: Imagine the area model as a block of chocolate – where you have created it yourself using your favourite two types of toppings: https://www.nationalgeographic.com/travel/article/worlds-best-chocolate-shops

Part 2: Custom chocolate block shop

Belgium is considered the home of chocolate. In Belgium, you can design your own chocolate block with different decorations and toppings on each fraction of the block: link.

Brainstorm two toppings and the fraction of the block that you would like each topping to cover. The fractions can add up to more than one whole, as the toppings can overlap (double toppings) in parts.

Now use the area model to solve where the toppings overlap, so you get a mix of both toppings in the same bite, like so:

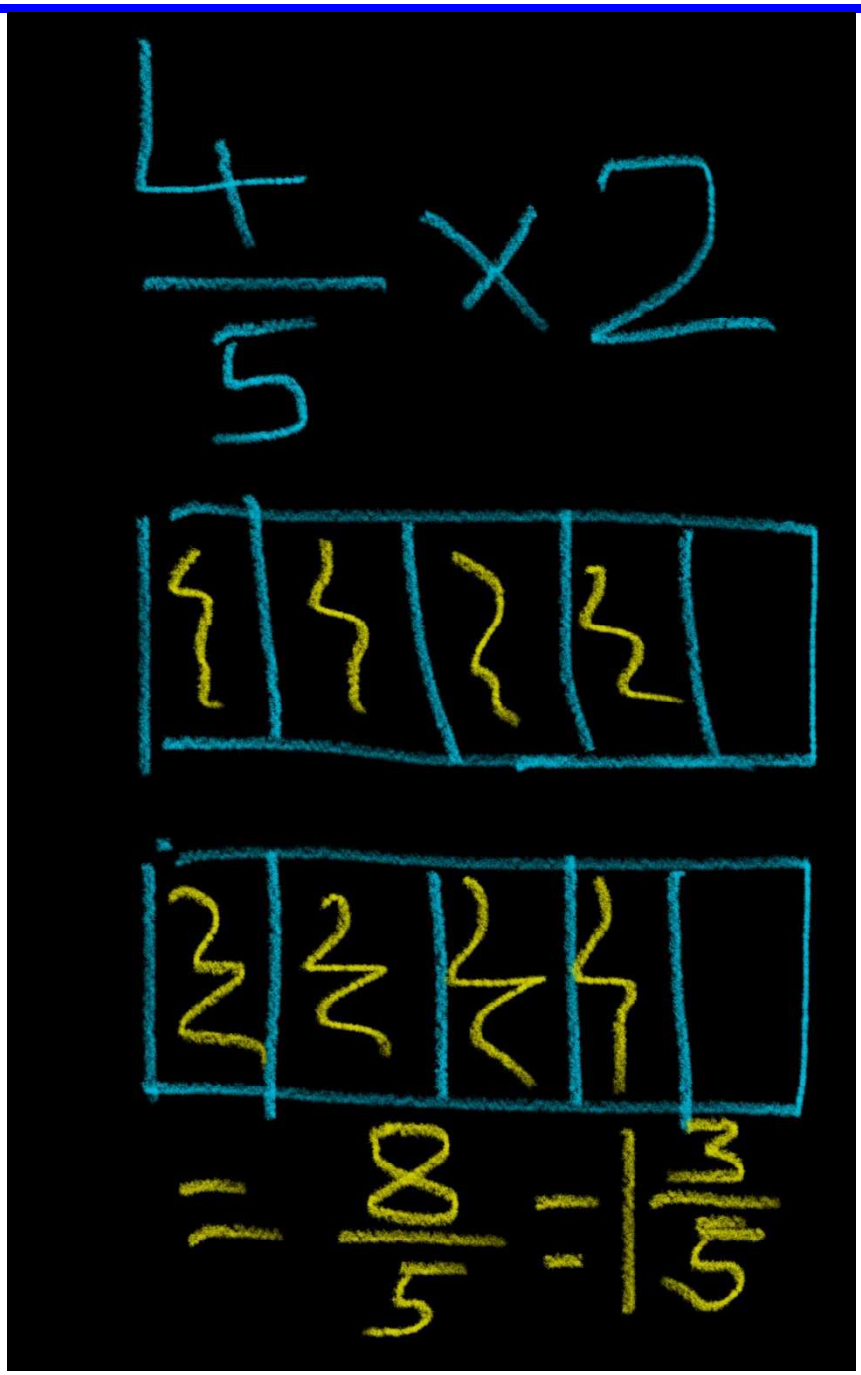


Part 3: Produce multiples of the same block (chocolate factory)

Your custom-made chocolate block becomes super popular!

Brainstorm one topping to cover a fraction of the block, then multiply it by a whole number, putting it into factory production to make duplicates of it.

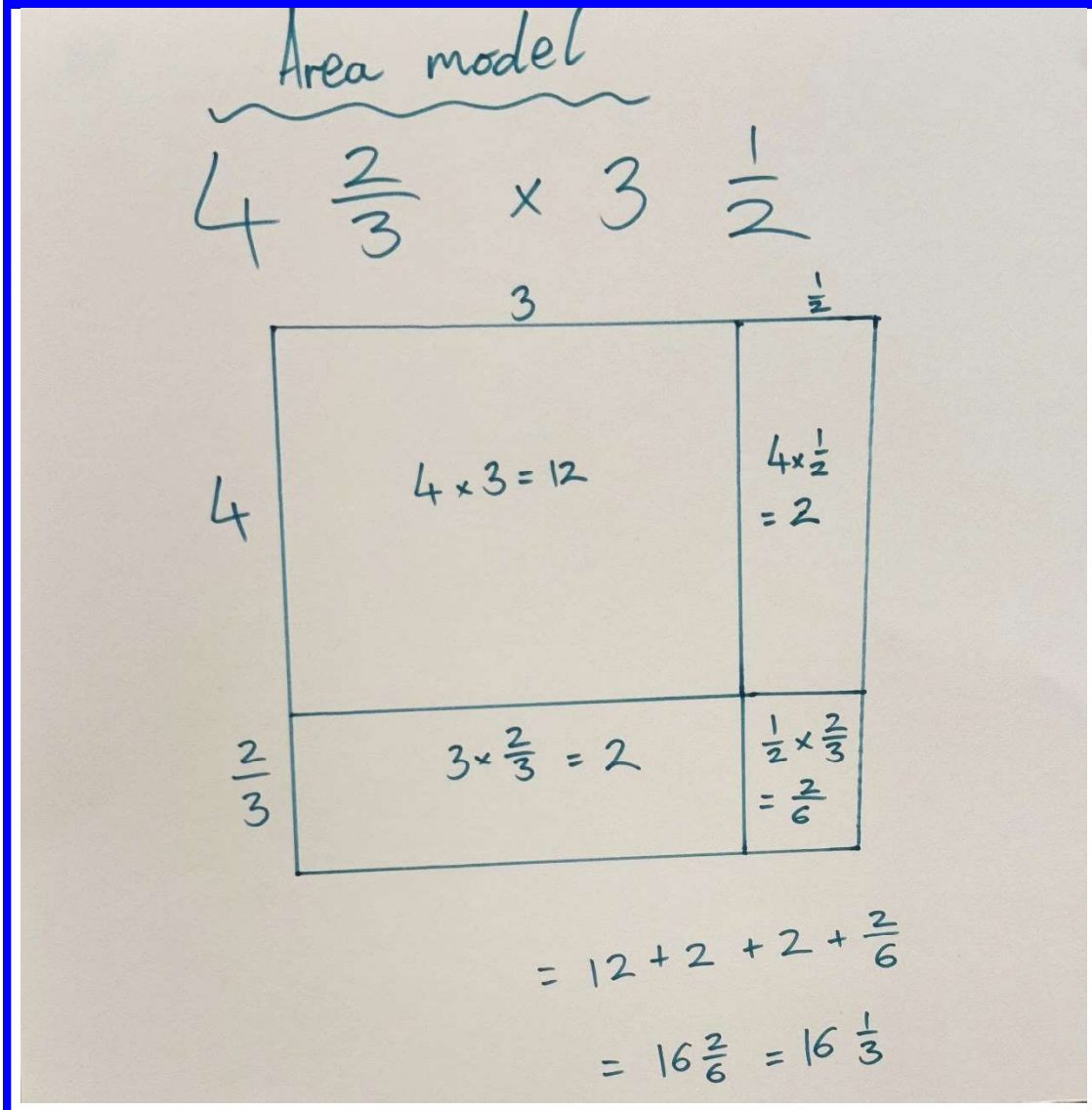
iPad style recording with sketches and colours.



Questioning:

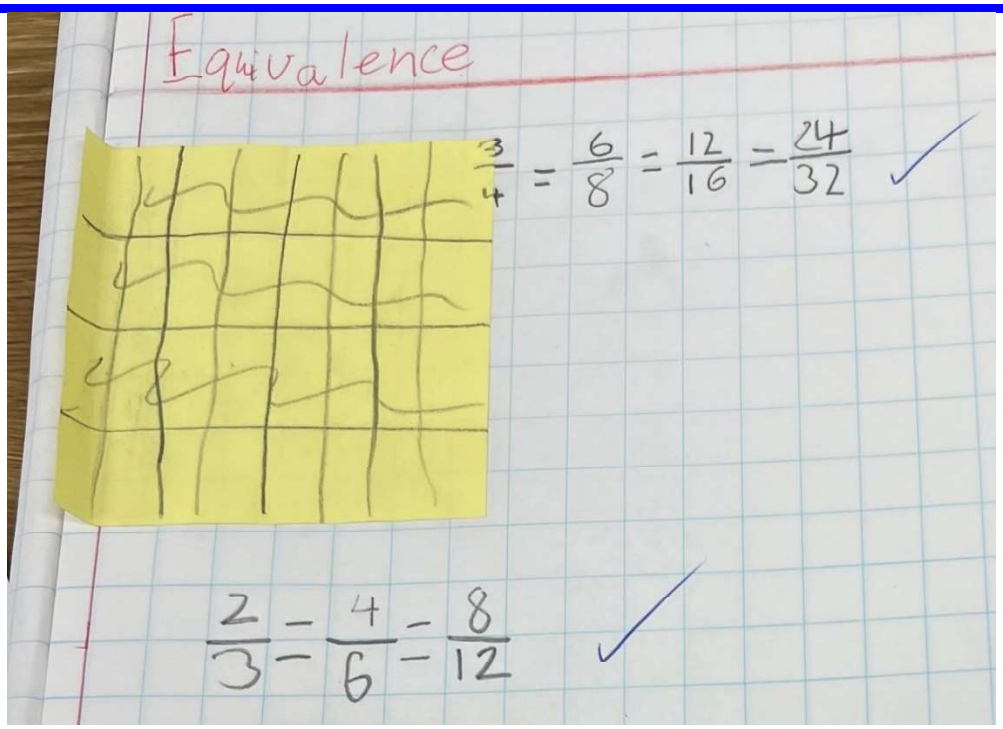
- What is the effect of multiplying a fraction by a whole number?
- How is this different to multiplying a fraction by a fraction?

Part 4: Using the area model for mixed numbers



This functions the exact same way as the area model first introduced during the Multiplication Units, particularly *Multiplication Unit 6*.

Support 1: Use 3-dot dice to focus on halves and thirds at first, then 6-sided dice.



Support 2: Use repeated folding to discover equivalence to half, then other fractions. This is shown above with ¾, starting with ¾ shaded, then folding the paper continually in half and seeing other fractions that appear to be the same size (equivalent or equal in size).

Extreme support: Focus on just representing a fraction using the post-it note, such as rolling 2/3 and shading in 2/3 (one storm only, without any multiplication of fractions involved).

Extension 1: Use 20-sided dice to generate the fractions involved in the storms and chocolate block toppings. If needed, use A4 paper for their area models, if the post-it note is too small to represent these fractions.

Extension 2: Record all equations as percentages, decimals and negative powers as well.

For example, for $\frac{2}{3} \times \frac{3}{4} = \frac{6}{12}$

Also record this as:

66.66% of 75% = 50%

0.66 x 0.75 = 0.5

66.66% of 0.75 = $\frac{1}{2}$

Aim to record at least three different equations that incorporate decimals, percentages, or both, to match the fractions problem that was solved.

Extension 3: What if one of the storms/toppings is an improper fraction? What then would be the answer? Does the area get larger or smaller?

Can you create a scenario where this would make sense (*for example – teacher guide only:* the storm hits twice, or is double as strong from one direction, or two sprinkles of the same topping)?

Extension 4: Three fractions (three storms/toppings) or more.

Extension 5: Division by a fraction as the inverse of multiplying.

Extreme spice (fourth level of the challenge):