Maths at Greenside

Elliot Foundation

GREENSIDE PRIMARY SCHOOL

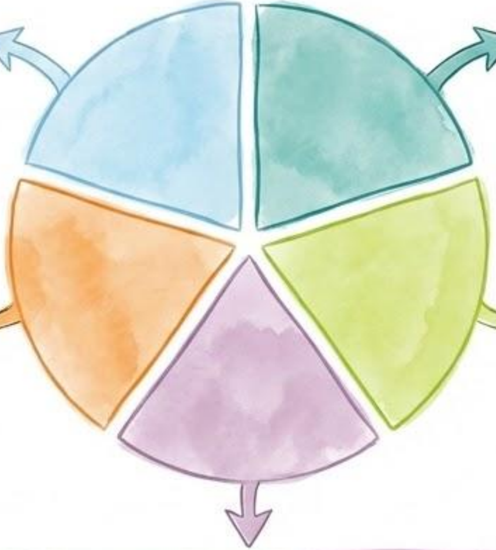
Approach and Vision

At Greenside, we value mathematics and are committed to nurturing, inspiring, and challenging our children.

We use a blend of White Rose and NCETM resources, delivered through the Maths Mastery approach.

5 Big Ideas in Mastery

1. Coherence
2. Representation and Structure
3. Mathematical Thinking
4. Fluency
5. Variation



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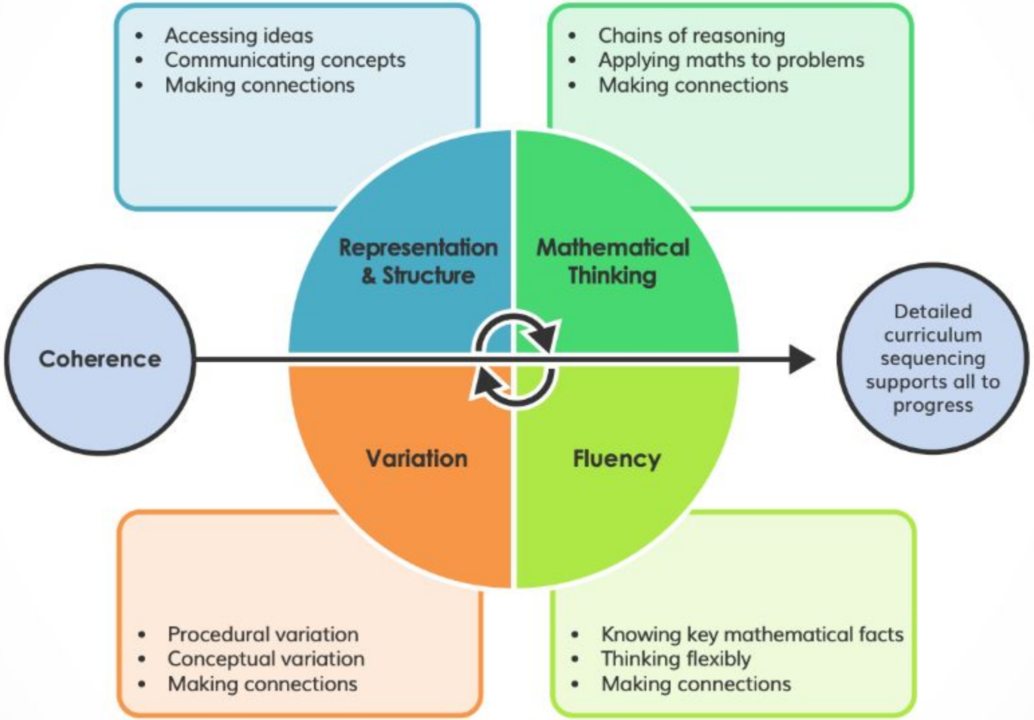
Teaching for Mastery
Five Big Ideas

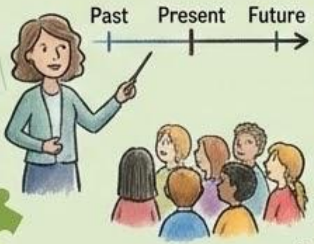


NCETM
NATIONAL CENTRE FOR EXCELLENCE IN THE TEACHING OF MATHEMATICS

Coherence in relation to Maths

Concept:
Coherence strongly links to variation, where learning is built in small but connected steps within a lesson, across lessons, and across years.

Sequence:
It's not about one task that will support children's learning, but considering the sequence of tasks and the links that are made over time.



Teaching Practice:
I often model a lesson... but I always urge them not to [just teach it]. We need to consider what comes before and have an eye on what is coming next.

Goal: Coherence is all about how the learning builds in ways that make sense to children.

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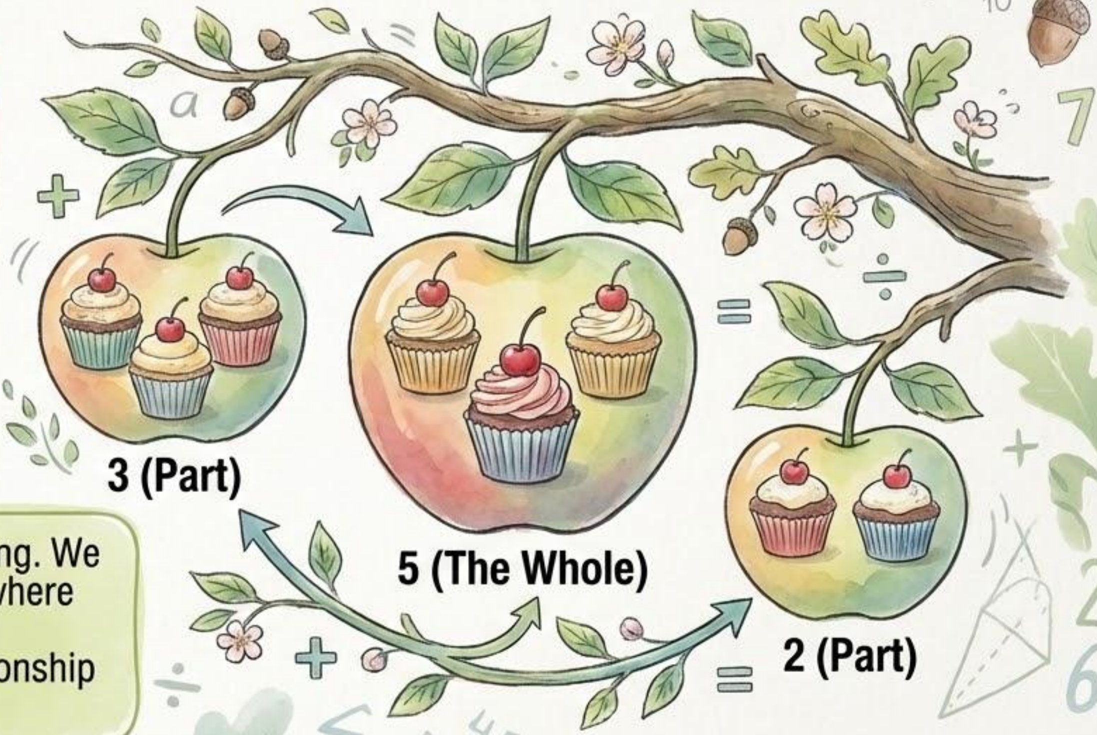
Representation and Structure

Revealing the Structure: The Additive Relationship (Part-Part-Whole)

When we represent, we reveal the structure – how and why the maths works. It's about relationships, like putting quantities together.

Example: 3 cakes + 2 cakes = a larger group of 5 cakes. This is an additive structure, often shown as a 'cherry model'.

The model shows partitioning. We don't show all cakes everywhere (not 3+2+5=10!). Dynamic movement shows the relationship between parts and whole.



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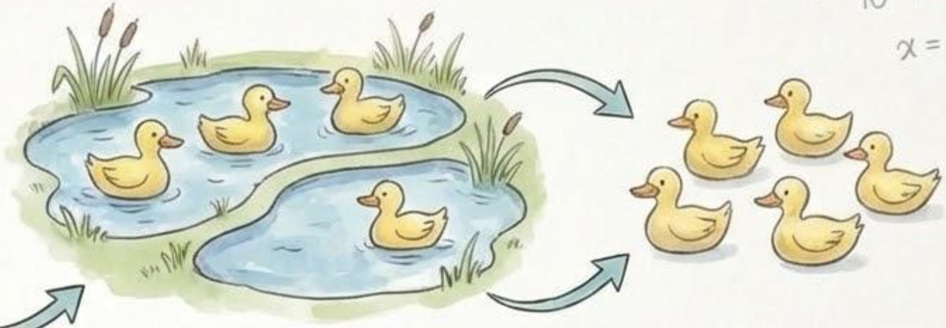
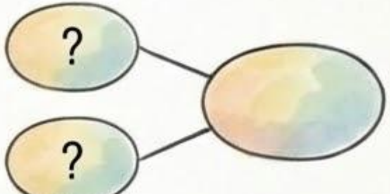
Alternative Part-Part-Whole Structures

That's not the only structure we use to represent the part-part-whole relationship.

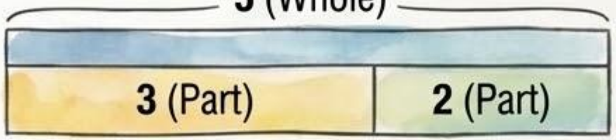
At early stages, we use real contexts, like five ducks deciding which of two ponds to swim in, before formalising it into an abstract cherry model.





Abstract Cherry Model
(Partitioning)

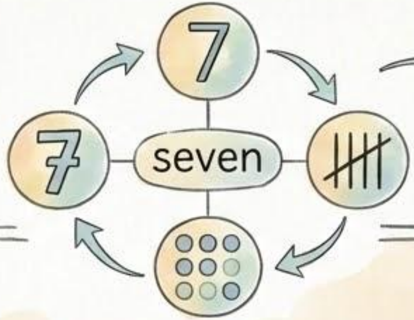
Bar models are another great tool to draw attention to the equivalence between the parts and the whole.
between the parts and the whole.
Teachers should select different models to draw out certain aspects of a concept.



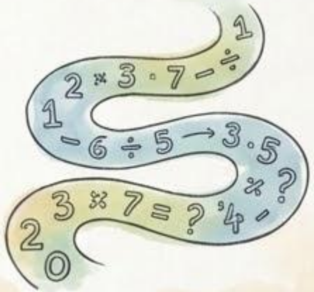
Bar Model (Equivalence)

Developing Mathematical Thinking through Variation

Stimulate Thinking & Reasoning:
The main aim is to stimulate children's mathematical thinking and reasoning.



Link to Variation:
Represent a concept in different ways to draw out essential structures. Carefully select and order representations to build concepts.



Develop Fluency:
Fluency develops in the movement between representations and the ability to see the structure of the maths in different ways.

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Mathematical Thinking

Mathematical thinking lies at the heart of learning mathematics. It is not a separate topic, but the foundation through which we understand and explore concepts. At its core, it is about **identifying relationships and reasoning about them**. Unlike rules to memorise, mathematical relationships are built on **patterns** and **structures** that we can teach pupils to make sense of.

Describing
articulating observations

Explaining
why an answer is incorrect?

Conjecturing
making predictions and exploring possibilities

Generalising
identifying patterns and forming broader rules

Justifying
providing logical reasoning to support an answer

Proving
demonstrating why the maths works through clear reasoning

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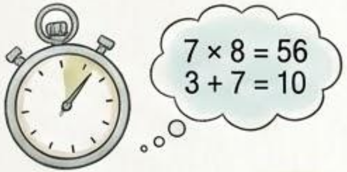
Fluency

Fluency in maths is often misunderstood as simply recalling facts quickly, but it encompasses much more. There are three key elements to fluency:

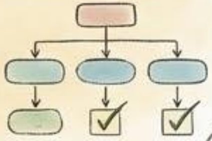


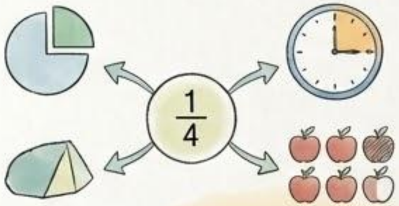
1. Recall and automaticity: the effortless recall of facts, such as number bonds within 10 and times tables facts, and understanding the relationship between these facts.

2. Procedural fluency: being confident and accurate with using procedures and being able to select the most appropriate method for the task at hand.

124 x 3 = ?

$$\begin{array}{r} 124 \\ \times \quad 3 \\ \hline 100 \end{array}$$





3. Flexibility and adaptability: the skill of moving between different contexts and recognising connections between them. For example, understanding the concept of ¼ in various situations, whether it's a fraction of a shape, a portion of time or a proportion of set of objects.

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Here is a question from the 2024 Year 6 SATs paper:

It is likely that some pupils went straight to dividing both numbers by 2, 3, 4, 8 and 9, which would take a very long time. However, if pupils have developed factual fluency, it becomes a very easy question.

Applying Factual Fluency & Divisibility Rules:

- (2) **Tick 2:** Both numbers are even (54, 72).
- (3) 5+4 = 9, 7+2 = 9 — **Tick 3:** Digits add to a multiple of 3.
- (4) $\frac{72}{2} = 36$ (even) — **Tick 4:** Half of an even number is even, so it is a multiple of 4.
- 8 & 9 — **Tick 8 & 9:** Within times tables facts, learned to automaticity (8x9=72, 6x9=54).

Tick the numbers that are factors of both 54 **and** 72

2	✓
3	✓
4	✓
8	✓
9	✓

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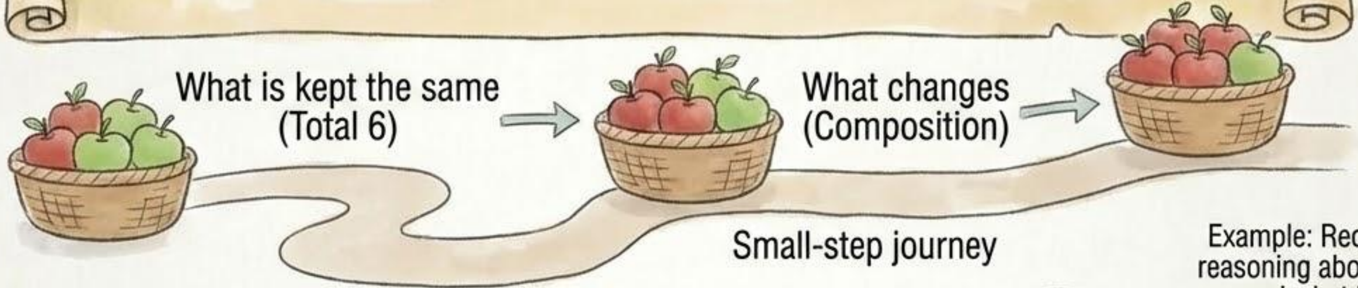
Variation

Variation draws attention to essential structures and relationships.
It is a carefully constructed small-step journey, considering what is kept the same and what changes.



Example: Reception class reasoning about what is six and what is not six.

Variation includes considering what the concept is, and what it is not. This contrast deepens learning.

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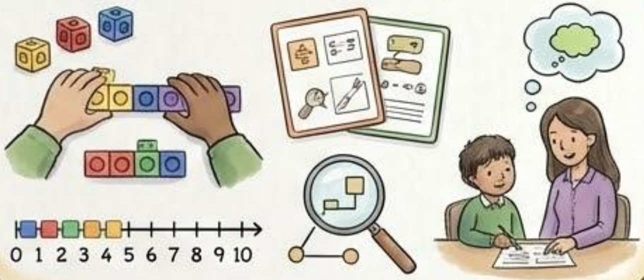
Supporting students with SEN and Higher Attainers

SEN Support: Small steps, visual aids, and guided practice



Higher Attainers: Deeper reasoning, problem-solving, and exploration

Concepts are broken down, allowing for extended time and personalized guidance to build confidence.

At Greenside, we ensure every child can thrive in maths.

Opportunities to explore concepts in greater depth, so all students can progress and succeed at their own level.

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EYFS at Greenside

Reception & Nursery Inputs

Reception — **DAILY** Maths Inputs

Nursery — **3-4 TIMES/WEEK** Maths Inputs

Daily teacher-led maths inputs in Reception; 3-4 times per week in Nursery.

Maths Provision & Outdoor Learning

Dedicated maths areas indoors, with targeted opportunities outdoors.

Continuous Provision: Environment planned for independent exploration, practice, and application of skills.

Nursery Focus: Consolidating Learning

DAILY REVIEW

Daily review and nursery rhymes support number, pattern, and language.

Adult-Directed Activities

2x WEEK Maths/Phonics

DAILY Art Activity

Two adult-directed maths/phonics activities weekly, plus daily art activity.

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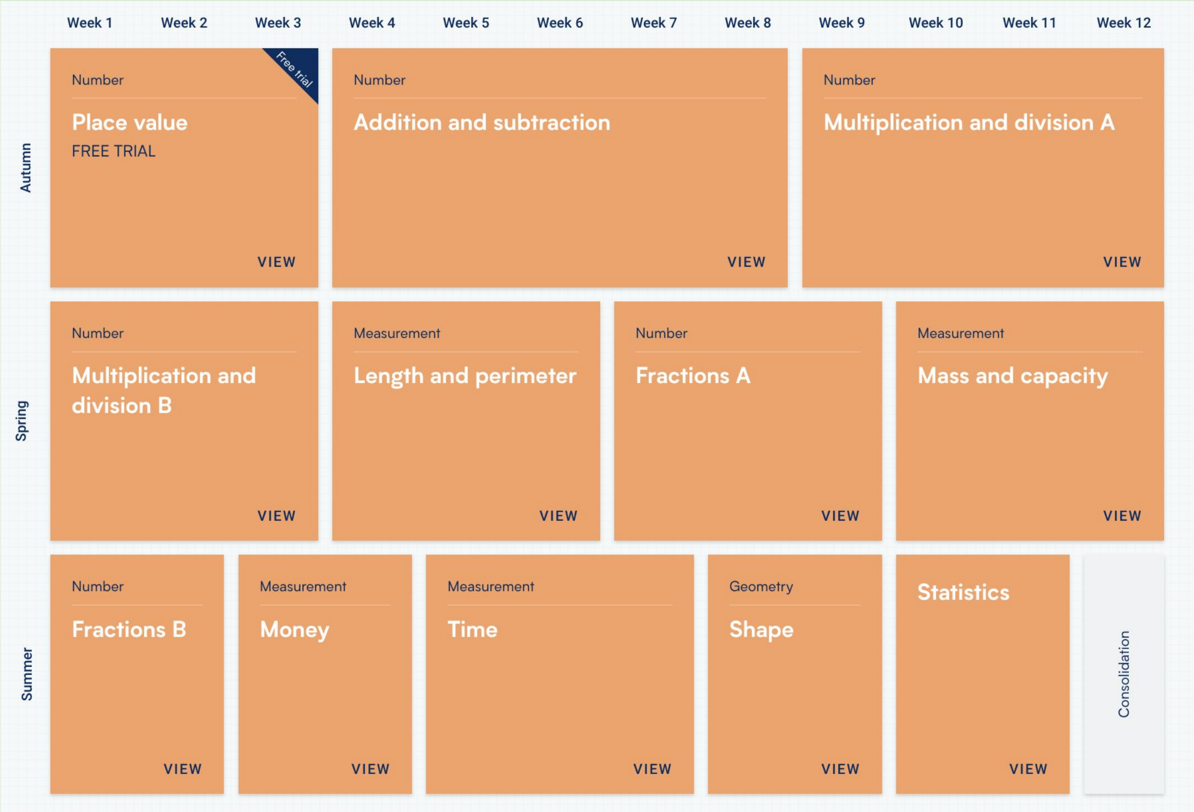
Medium Term Planning/White Rose Overviews:

This is a year 3 example:



KS1 and KS2 Planning and Implementation

For KS1 and KS2, teachers plan lessons according to a structured format that reflects the stages of mathematical progression. These stages may take different forms: some are practical, while others focus on written work in groups or individually.

Stage 1 – Practise (Fluency)

The intention is to support students in learning and practising a skill or concept.

Example: 6 × 7 = ?

Stage 2 – Apply

The intention is for students to apply the skill in new but familiar contexts.

Example: How many wheels are there on 6 bicycles?

Stage 3 – Reasoning / Problem Solving

The intention is for students to explain, justify, and explore mathematical relationships. Students are encouraged to show reasoning about why a method works, not just how.

Example: "Convince me..." or "Which is the odd one out?"

Stage 4 – Deepening Understanding (Mastery with Greater Depth)

The intention is to extend learning beyond the expected level through deep, connected thinking. Students aim to demonstrate rich conceptual understanding that can be applied flexlbly in unfamiliar contexts.

Example: Create your own problem; explore "what if..."

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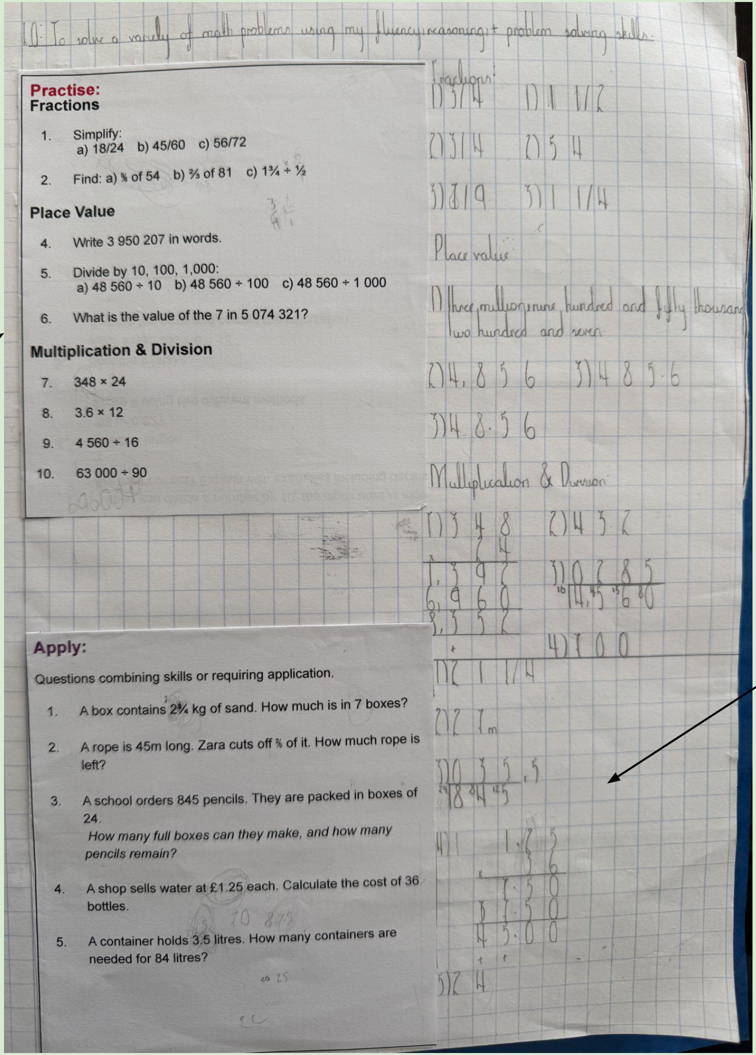
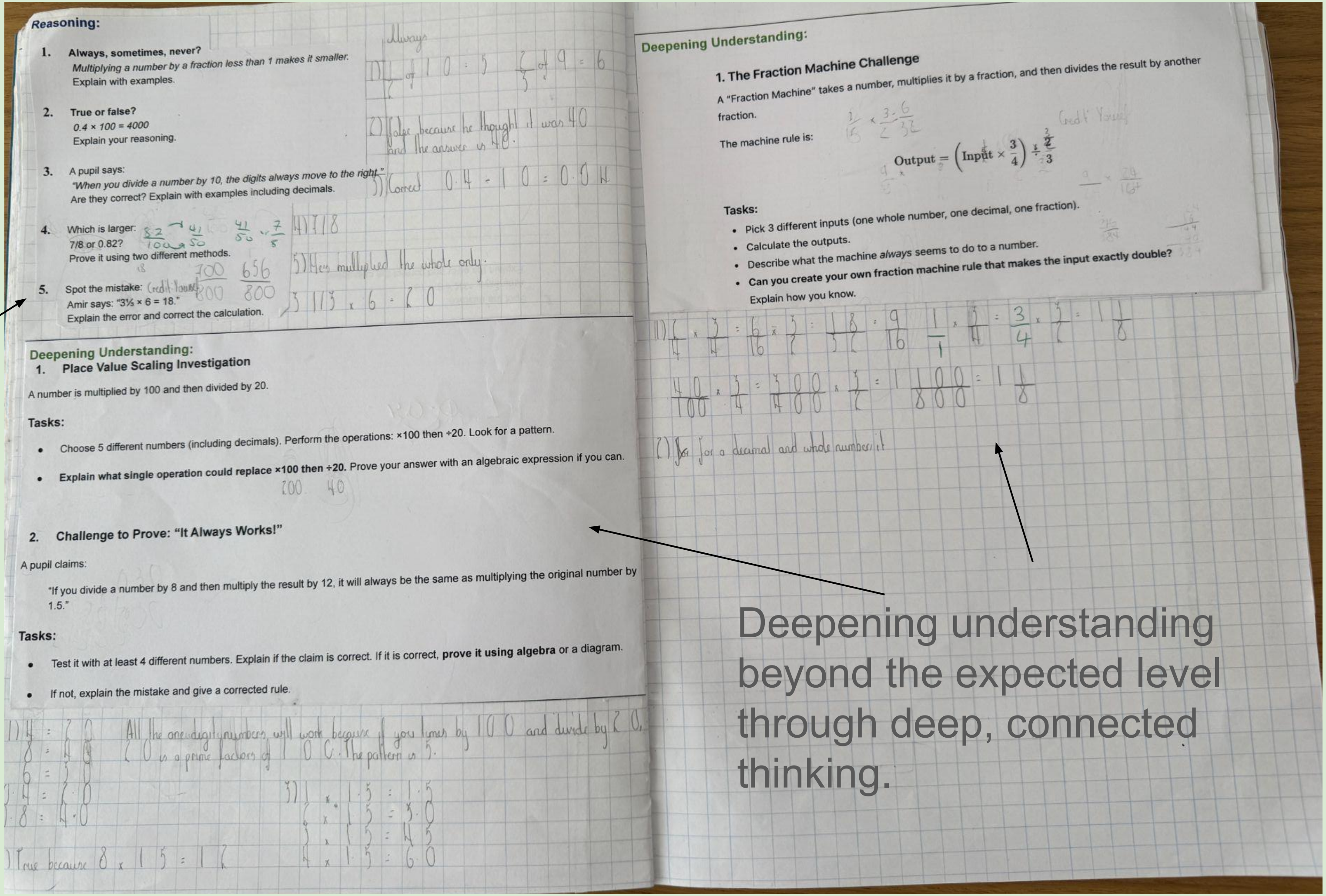
Here is an example from students' workbooks, showcasing Year 6 evidence of their learning.

Practising the skill/concept.



Apply the skill in a new but familiar concept.



Reasoning:

1. **Always, sometimes, never?**
   Multiplying a number by a fraction less than 1 makes it smaller.
   Explain with examples.

2. **True or false?**
   0.4 × 100 = 4000
   Explain your reasoning.

3. A pupil says:
   "When you divide a number by 10, the digits always move to the right."
   Are they correct? Explain with examples including decimals.

4. Which is larger:
   7/8 or 0.82?
   Prove it using two different methods.

5. Spot the mistake:
   Amir says: "3⅓ × 6 = 18."
   Explain the error and correct the calculation.

Deepening Understanding:

1. **Place Value Scaling Investigation**

A number is multiplied by 100 and then divided by 20.

Tasks:

- Choose 5 different numbers (including decimals). Perform the operations: ×100 then ÷20. Look for a pattern.
- **Explain what single operation could replace ×100 then ÷20.** Prove your answer with an algebraic expression if you can.

2. **Challenge to Prove: "It Always Works!"**

A pupil claims:

"If you divide a number by 8 and then multiply the result by 12, it will always be the same as multiplying the original number by 1.5."

Tasks:

- Test it with at least 4 different numbers. Explain if the claim is correct. If it is correct, **prove it using algebra** or a diagram.
- If not, explain the mistake and give a corrected rule.

Deepening Understanding:

1. The Fraction Machine Challenge

A "Fraction Machine" takes a number, multiplies it by a fraction, and then divides the result by another fraction.

The machine rule is:

$$\text{Output} = \left(\text{Input} \times \frac{3}{4}\right) \div \frac{2}{3}$$

Tasks:

- Pick 3 different inputs (one whole number, one decimal, one fraction).
- Calculate the outputs.
- Describe what the machine *always* seems to do to a number.
- **Can you create your own fraction machine rule that makes the input exactly double?** Explain how you know.

Justification and method

Deepening understanding beyond the expected level through deep, connected thinking.

Timetabling

All classes have daily maths lessons, with KS1 and KS2 also participating in additional daily fluency and arithmetic sessions.

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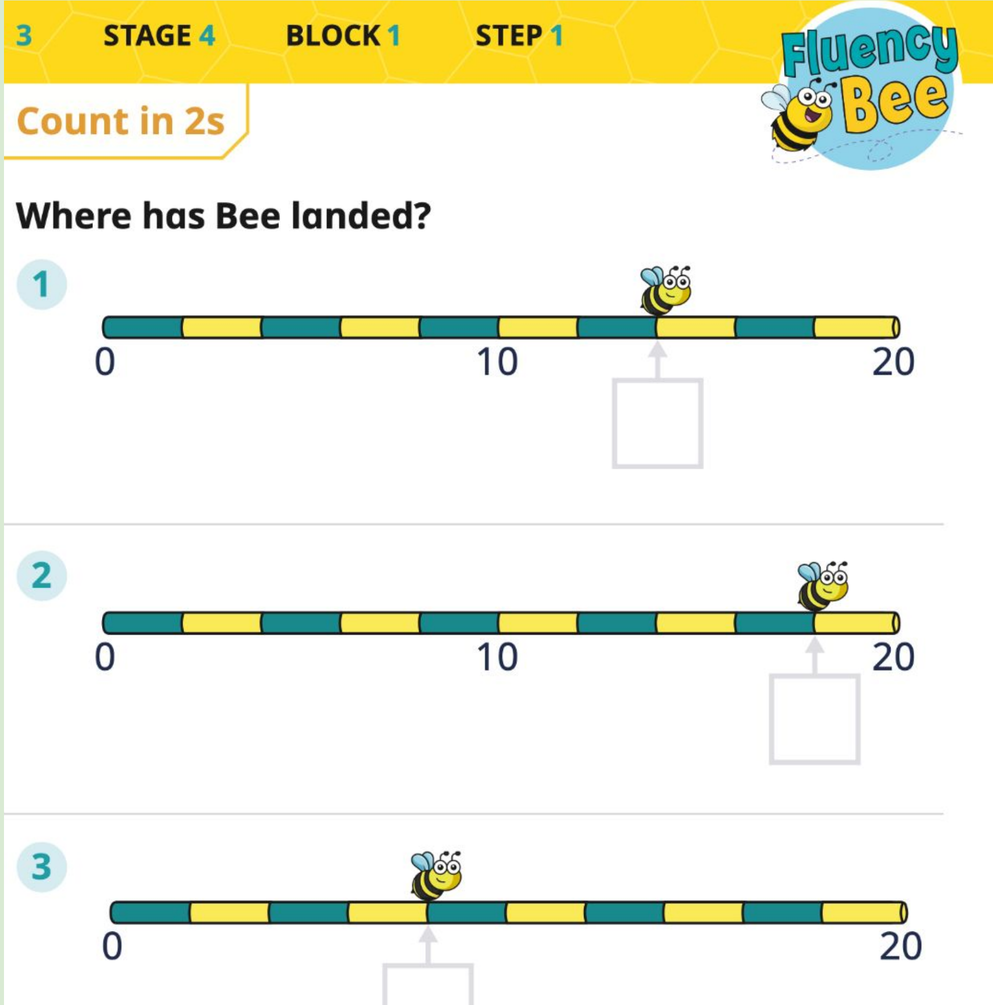
Fluency Bee Example

Year 1 example



To end on a beautiful note, here are some comments:

"I like maths because we learn about shapes. We have written numbers all the way to 10! I find maths both hard and easy because sometimes we reach high numbers I have never heard of, and other times I know them. We use ten frames to help us" - EYFS

"I don't worry about making mistakes; I don't have to rub it out. I can make an answer that's closer, and then I can estimate. The teacher helps us by giving clues, and in terms of the class, I like maths a lot. I wouldn't change anything" - KS1

"I wouldn't change any of the maths teaching this year -please keep it the same, and ensure everyone is included like it is at the moment... I love the 4 parts of practise, apply, reasoning, and deepening understanding, as this helps everyone... The combination of this phase learning, and the marking makes me feel I can do anything." - Lower Ks2

"Maths is harder this year, but in a good way, as it has multi-step problems that make us delve deeper into the world of maths. I can now answer and explain work with percentages that I couldn't before... I love opening my book and diving into it... It is my favourite part of the day" - Upper KS2

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