Teaching for Mastery

Telford

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Teaching for Mastery

Why does it work?

How does it work?

Research evidence for Mastery

Is it for all schools?

Using materials to support teaching for mastery

What does it mean to master something?

- I know how to do it
- It becomes automatic and I don’t need to think about it- for example driving a car
- I’m really good at doing it – painting a room, or a picture
- I can show someone else how to do it.

Mastery of Mathematics is more…..

- Achievable for all
- **Deep** and sustainable learning
- The ability to build on something that has already been sufficiently mastered
- The ability to reason about a concept and make connections
- Conceptual and procedural fluency

Teaching for Mastery

- The belief that all pupils can achieve
- Keeping the class working together so that all can access and master mathematics
- Development **of deep** mathematical understanding
- Development of both factual/procedural and conceptual fluency
- Longer time on key topics, providing time to go deeper and embed learning

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A Mastery Lesson

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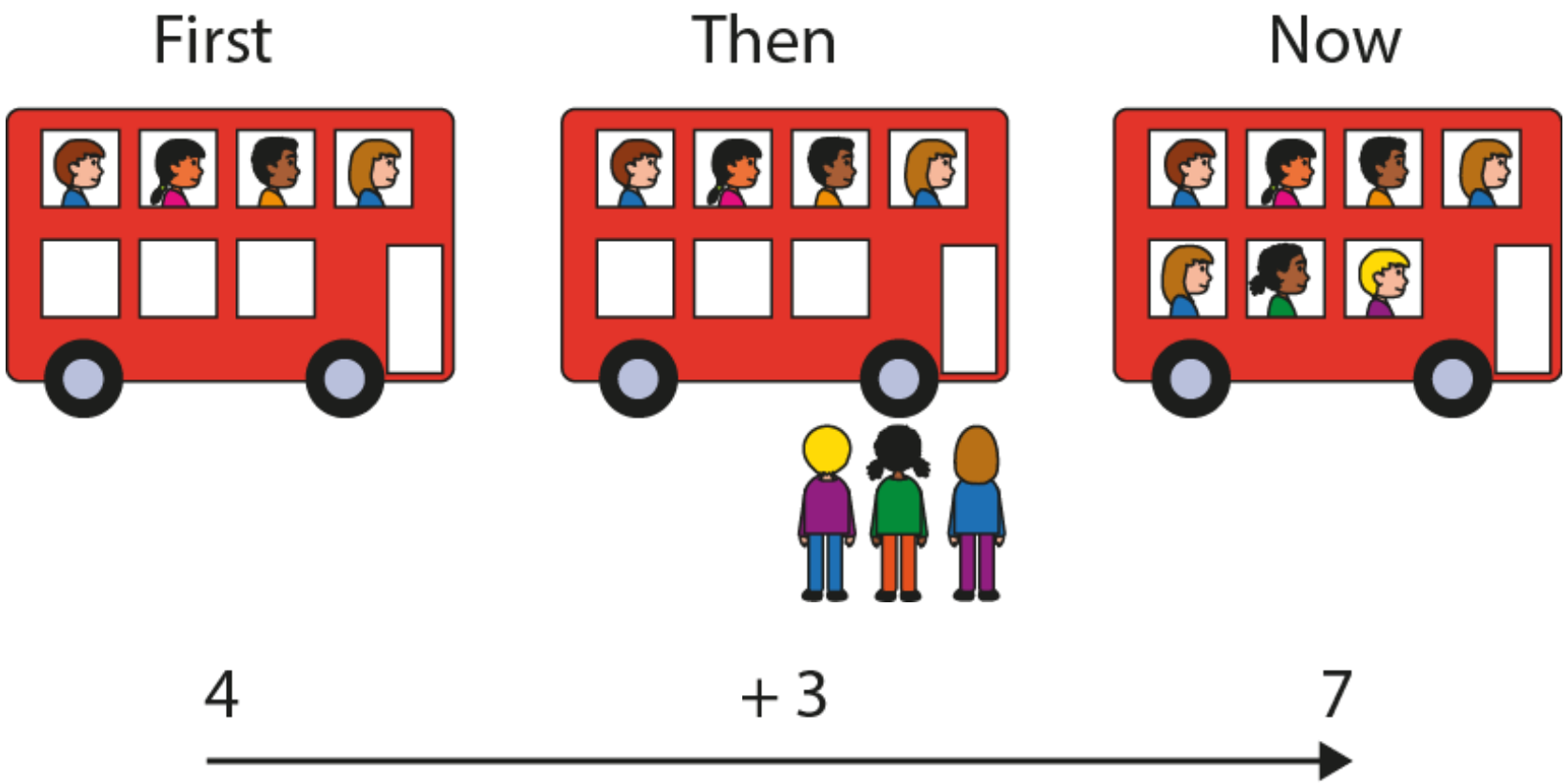
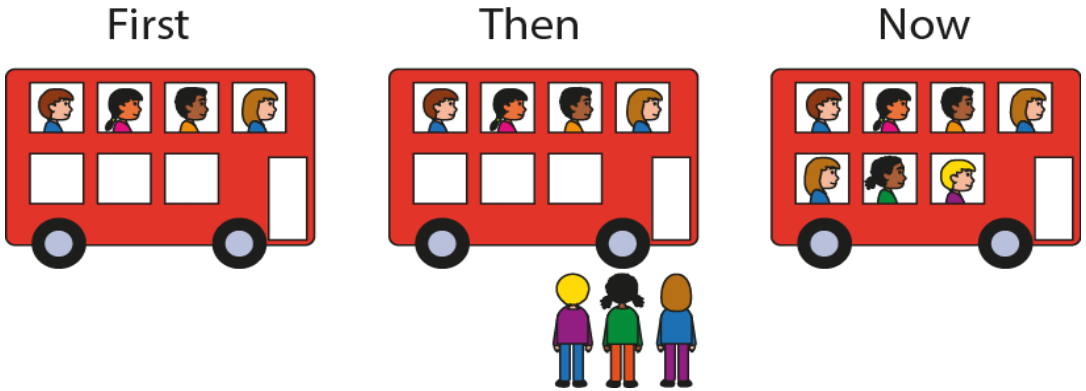
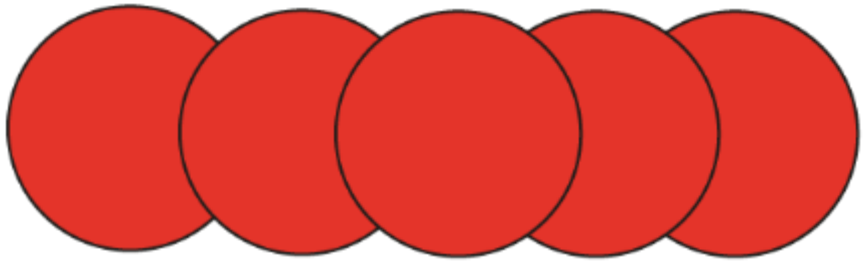
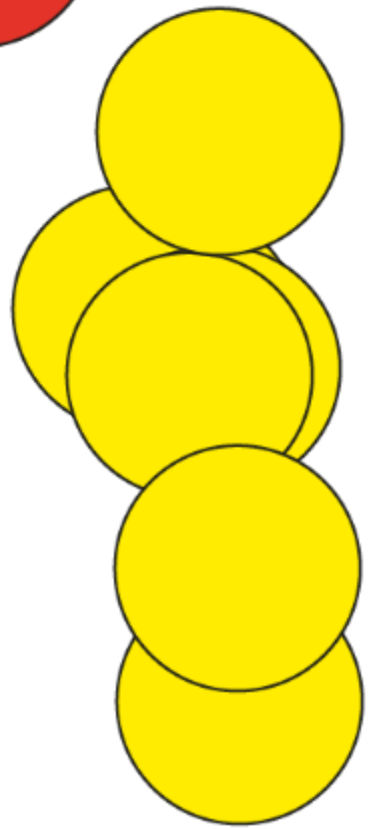
A Story



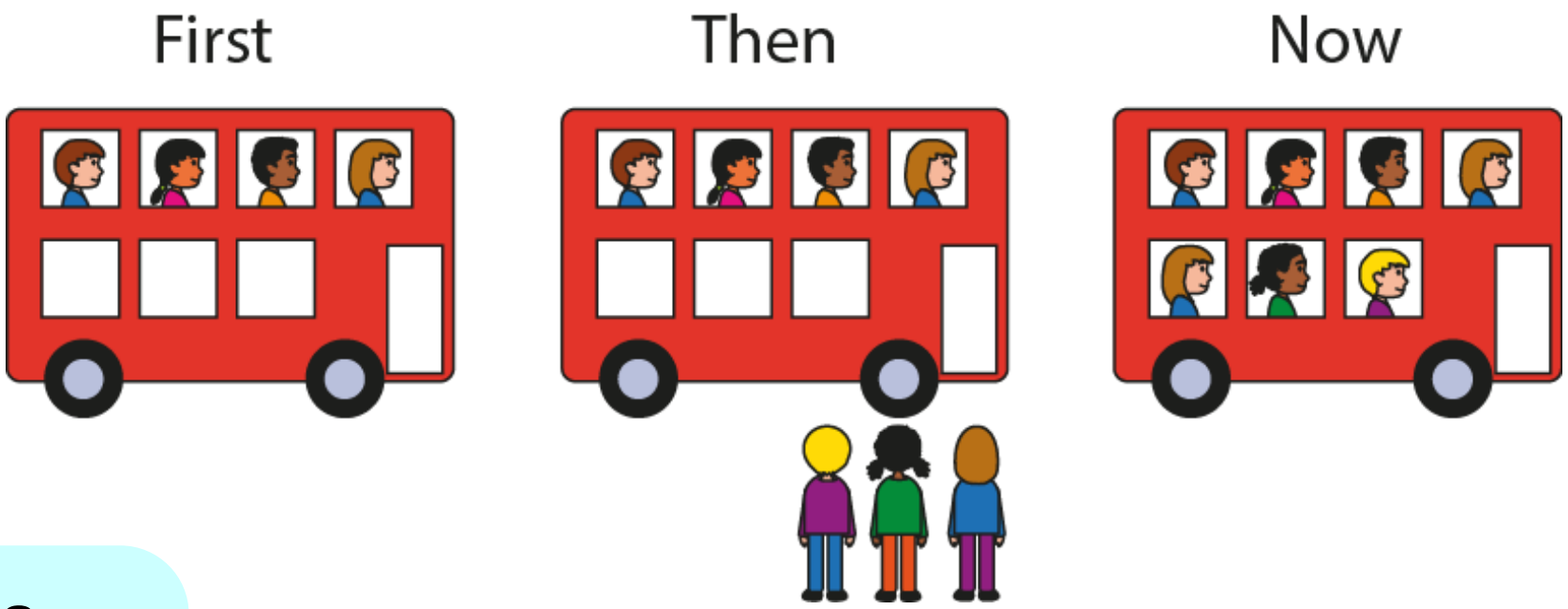




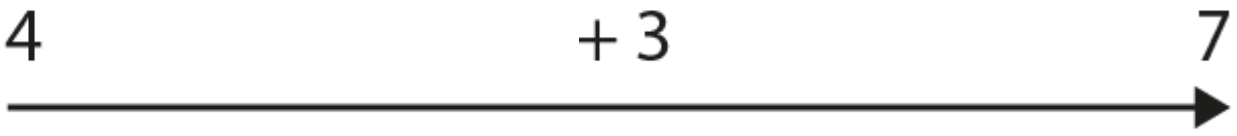


Thinking about how to write the equation

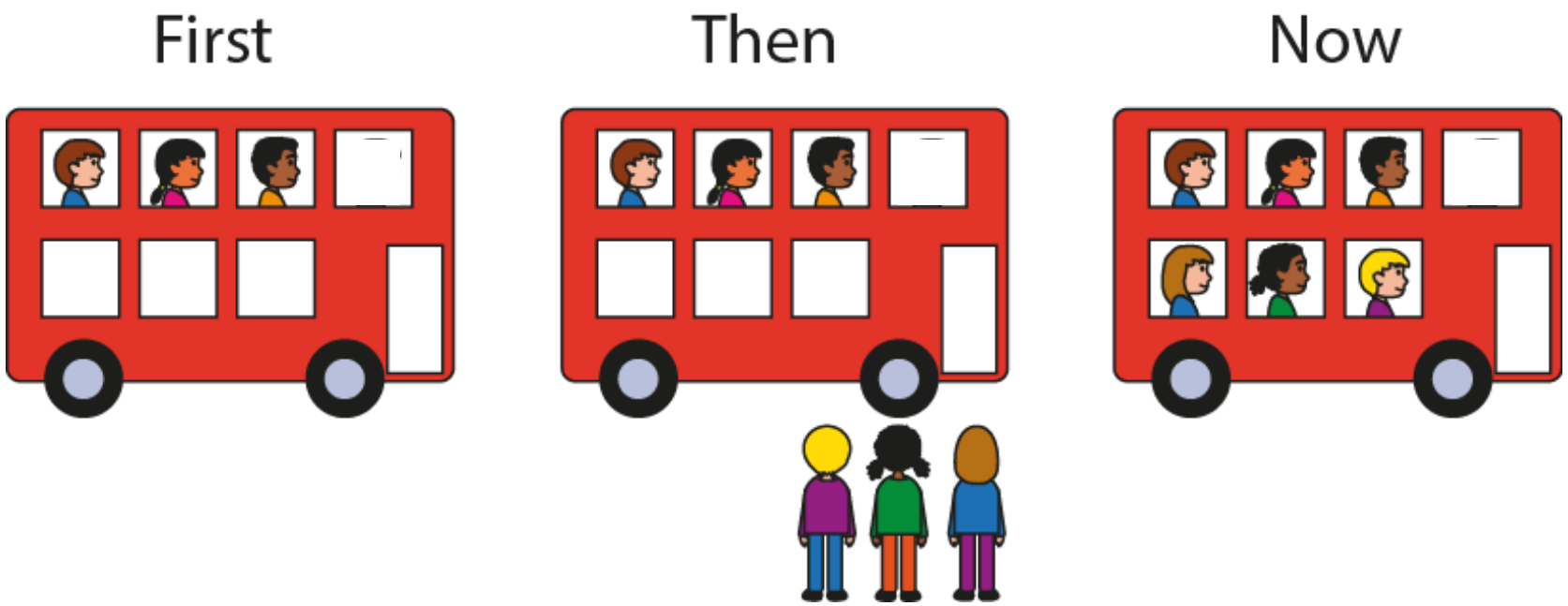
1.6 Augmentation and reduction – steps 1:2–1:3



What does each number represent ?



$$4 + 3 = 7$$



3 + 3 = 6

First

?

Now

3 +2 5

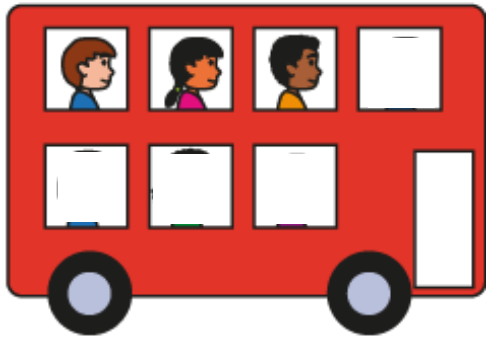
3 + ? = 5

Model with your tens frame

First

?

Now

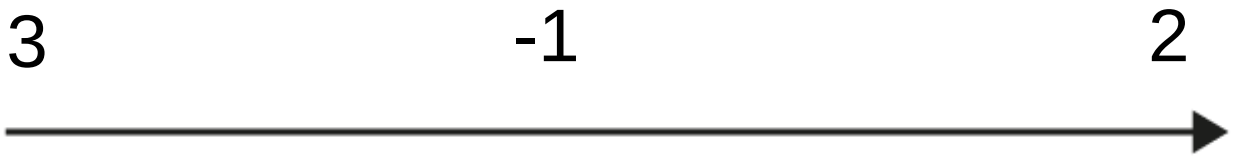


3 +0 3

3 + ? = 3

Model with your tens frame

At First Then Now



$3 - 1 = 2$

What does each number represent ?

3 – 4 = -1

Data Collection Table

First	Then	Now – (What has been the change – increase or decrease?)
+3		

Ping Pong

Provides a clear and coherent journey through the mathematics

Provides detail

Provides scaffolding for all to achieve

Provides the small steps

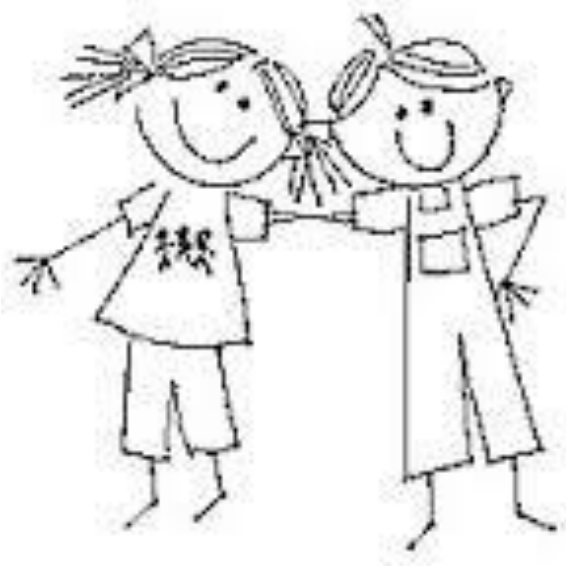
Providing a Pudian

By putting blocks or stones together as a Pudian, a person can pick fruit from a tree which cannot be reached without the Pudian (Gu 2014 p. 340).

The teacher provides the steps but the child takes and connects the steps, reasoning along the way

The smaller the distance from the existing knowledge and the new learning,
the greater the success
Gu, L. (1994).

Meeting the needs of all pupils - The road to differentiation



Inclusion is important, but maybe we need to think about it in a different way

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Meeting the Needs of Higher Attaining Pupils

- Breaking down the curriculum into smaller steps results in greater rigour and depth of understanding.
- Moving more slowly means there is greater time to think, make connections and apply mathematics.
- There are higher expectations in terms of language and explanations.
- The concepts children need to learn are the same for all pupils.
- The teaching of the concepts should be the same for all but the outcomes in terms of application may be different

Two Stories of High Attaining Pupils

Bethany Year 1

Lesson on difference

Liam Year 3

Lesson on Fractions

The Mastery Glasses

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True or False?

$$\frac{3}{8} + \frac{2}{8} = \frac{5}{16}$$

$$\frac{3}{9} - \frac{2}{9} = \frac{1}{9}$$

$$\frac{2}{14} - \frac{1}{7} = \frac{1}{7}$$

Repetition of key phrases to develop fluency of thought

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1.4

I say 1.4 but I read it as one and four tenths……..

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A lesson on decimals

1.6

I say _____ but I read it as ……..

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A lesson on decimals

3.4

I say _____ but I read it as ……..

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SATS questions

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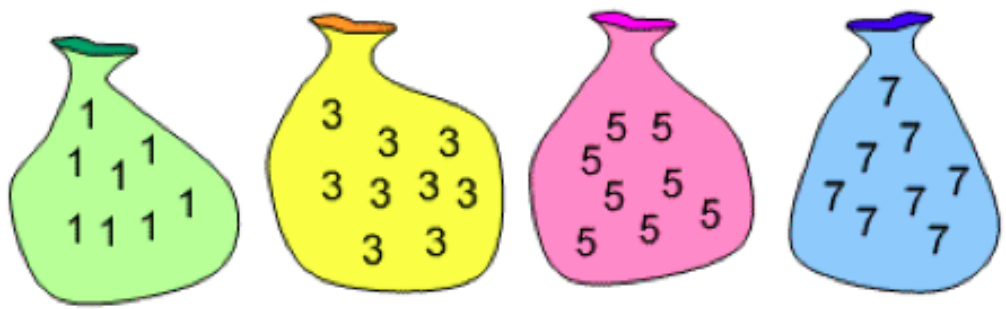
Make 37

www.nrich.maths.org/1885

Four bags contain a large number of 1s, 3s, 5s and 7s.



Pick any ten numbers from the bags above so that their total is 37.

Intelligent Practice

5 x	1	=	
	3		
	5		
	7		
	9		

	0	x 5 =	
	2		
	4		
	6		
	8		

5	6	9

She makes a 2-digit number and a 1-digit number.

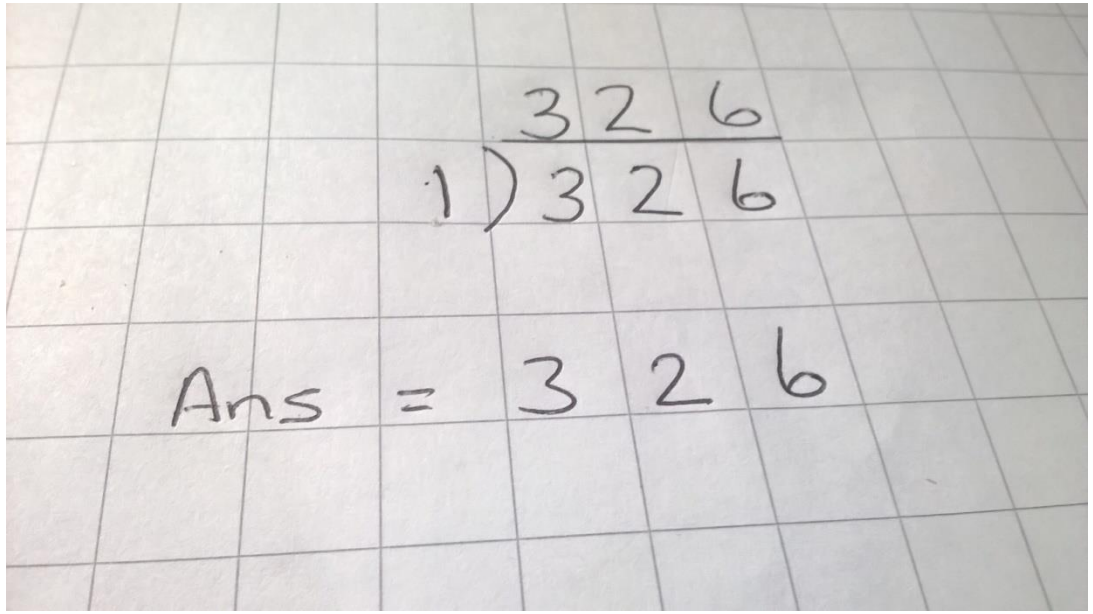
She multiplies them together.

Her answer is a **multiple of 10**

What could Chen's multiplication be?

Is this Mastery?

$$326 \div 1 =$$



What Mastery isn't

Thinking about relationships

21 $5{,}542 \div 17 = 326$

Explain how you can use this fact to find the answer to **18 × 326**

17 x 326 = 5,542
18 x 326 = 5,542 + 326

How might children respond to this question?
What is the best response?

Calculate

(4/5 + 1/6) + (5/6 + 1/7) + (6/7 + 1/8) +
(7/8 + 1/9) + (8/9 +2/10) =

4/5 + **1/6 + 5/6** + **1/7 + 6/7** + **1/8 + 7/8** +
1/9 + 8/9 + **2/10** = 5

Table A has 5 children

Table B has 6 children

Each child requires 3 pencils

$3 \times 5 + 6 = 21$

$3 \times (5 + 6) = 21$

Ofsted

- Produce a clear outline of:
- What you are doing?
- Why you are doing it?
- What it looks like in practice?

Acknowledge that you are developing and demonstrate that you understand the weaknesses and have strategies in place to address.

Language in the Early Years

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Numberblocks and Language Development

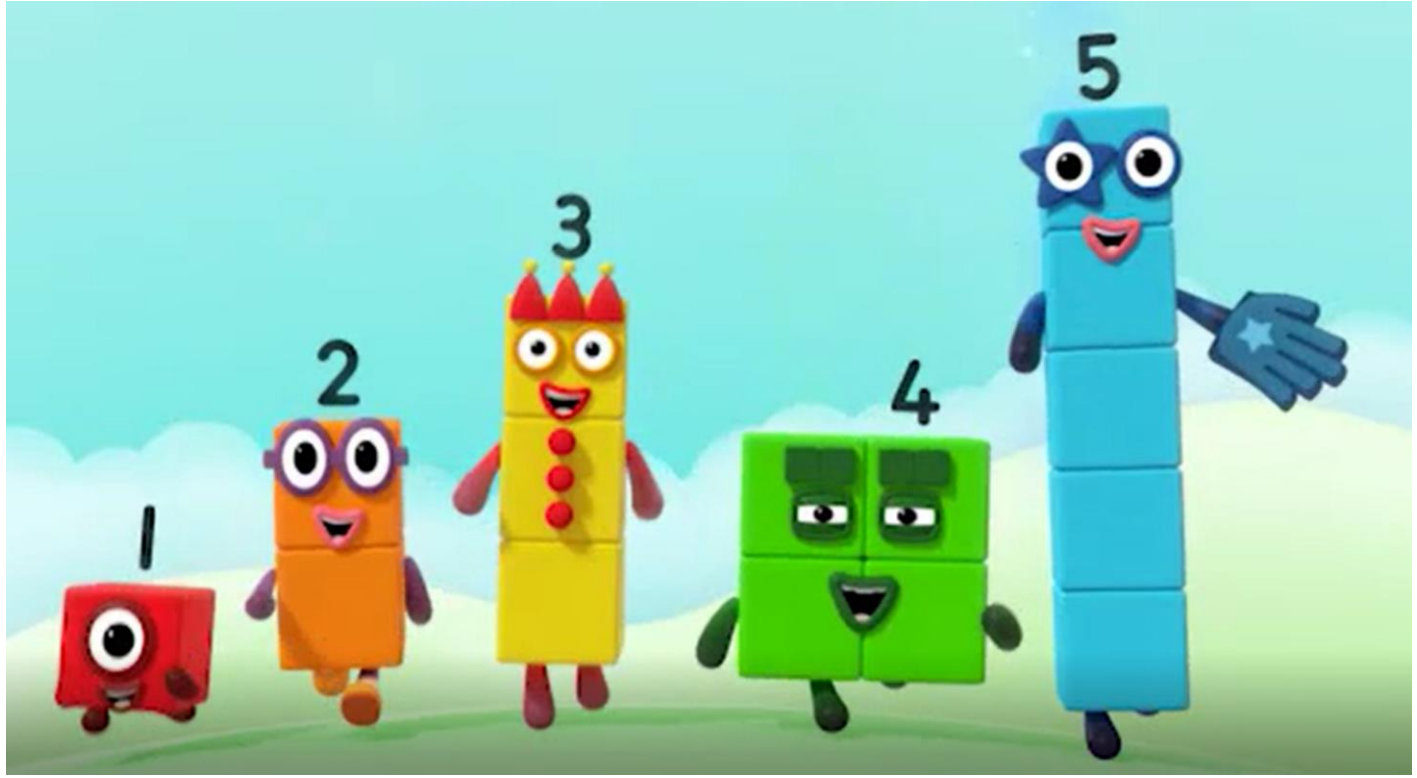
Counting

Cardinality

Composition

Comparison

Change



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Series 1 Overview

stories and mathematics

Numbers to 5

Episode	Name	Storyline	Mathematics
1	One	A little block falls out of the sky, meets her numberling and discovers one wonderful world, singing and counting to one.	• Meet *One* • Counting to 1
2	Another One	*One* discovers it's tricky to play tennis when you're the only block in the world. She bumps into a magic mirror and meets *Another One* – and they join	• Meet *Two* • 2 is one more than 1

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Maths in the Episode

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Subitising numbers 1 to 5

Subitising is where we recognise a small quantity without counting. Often the shape of an arrangement will help children's number recognition. E.g. dice patterns. Subitising is an important skill that supports the development of children's number sense.

Different ways of arranging blocks to 5

Children need to develop a flexibility with number and recognise five items arranged in different ways. Over time they will learn to work systematically and justify that they have found all the ways to arrange a small number of items.

Conservation of number

Children need to recognise that the number of objects remains the same however they are rearranged.

Using Mathematical Language

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Encourage children to use full sentences to explain their thinking.

I know it is Four because there are four blocks.

I can see four blocks without counting.

Four is more than three because it has more blocks.

Three is less than four because it has fewer blocks.

Three is more than two because it has one more block.

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Mastery Professional Development

Number, Addition and Subtraction

1.5 Additive structures: introduction to aggregation and partitioning

Teacher guide | Year 1

Teaching point 1:

Combining two or more parts to make a whole is called aggregation; the addition symbol, +, can be used to represent aggregation.

Teaching point 2:

The equals symbol, =, can be used to show equivalence between the whole and the sum of the parts.

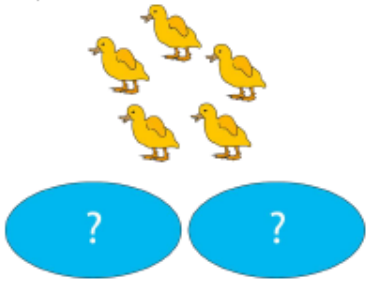
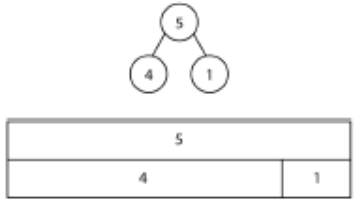
Teaching point 3:

Each addend represents a part, and these are combined to form the whole/sum; we can find the value of the whole by adding the parts. We can represent problems with missing parts using an addition equation with a missing addend.

Teaching point 4:

Breaking a whole down into two or more parts is called partitioning; the subtraction symbol, –, can be used to represent partitioning.

Autumn 2017 pilot

	outcomes, and describe how the model represents the outcome • write all four equations to represent each of the different outcomes, and describe how the equations represent the outcome. By this point, children should be confidently using the following stem sentences: • ***'___ is equal to ___ plus ___.'*** • ***'___ plus ___ is equal to ___.'*** • ***'___ and ___ are the addends.'*** • ***'___ is the sum.'***	*'Mother duck is in the park with her five ducklings. There are two ponds. How many ducklings could be playing in each pond?'*  Example outcome:  5 = 4 + 1 5 = 4 + 1 5 = 1 + 4 5 = 1 + 4
2:4	As with step 1:4, you can use generalised representations, such as double-sided counters, without a story context. Children could explore different partitioning and number sentences, then create their own stories to go with each. They should explain how the manipulatives, part–part–whole model, and equations represent their story.	 • *'There are seven animals; three are cats and four are dogs.'* • *'The seven counters represent the seven animals; the three blue counters represent the three cats; the four red counters represent the four dogs.'*

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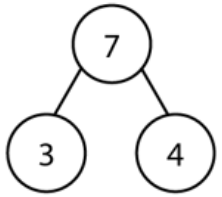
1.5 Aggregation and partitioning – step 2:4



Examples from the Materials

Thankyou for Listening