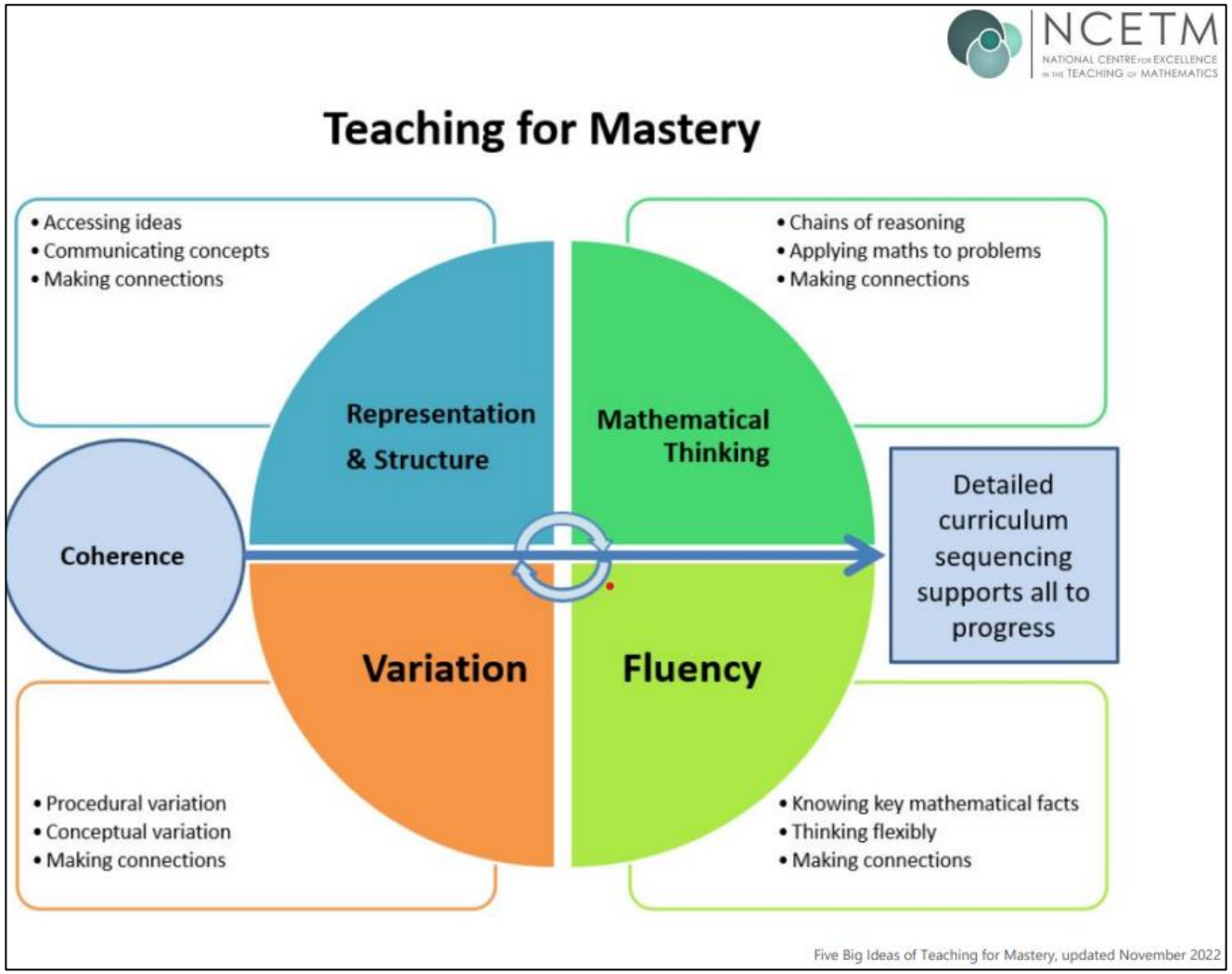
Providing equity to learners within teaching for mastery in mathematics

Aims

- To elicit how teachers can be guided towards using aspects of teaching for mastery to enhance pupils' mathematics learning in Early Years, Key Stage 1 and Key Stage 2, so that all learners are able to access provision whilst being provided with appropriate deep thinking and support.
- To determine how pupils can be supported with developing fluency alongside flexibility with links to reasoning and problem solving … whilst being presented with ideas that can be shared in school.

Five big ideas in teaching for mastery

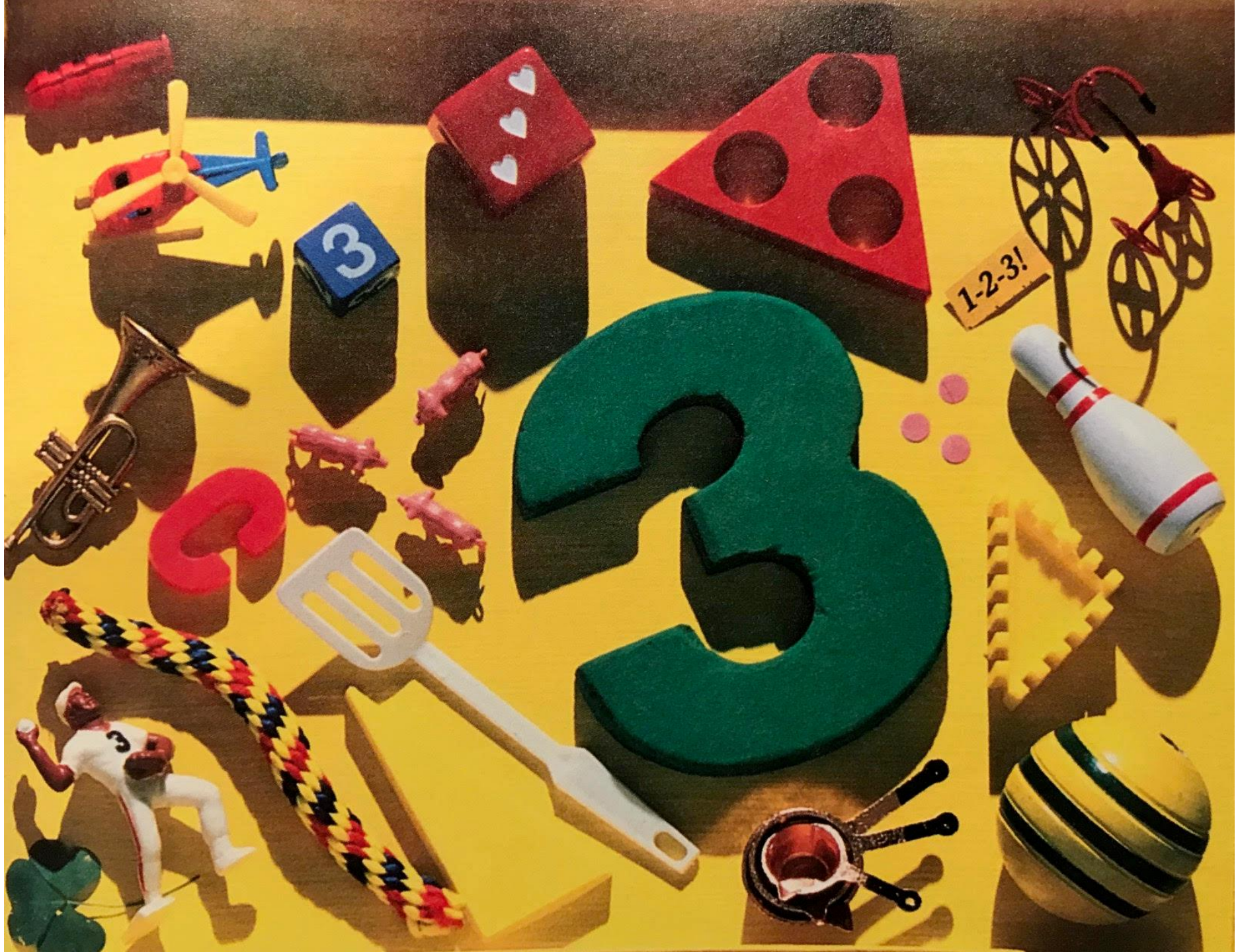


See further details here.

Mathematical representations

Developing children's number sense alongside understanding of numerals

See 'I Spy Numbers' by Jean Marzollo here.



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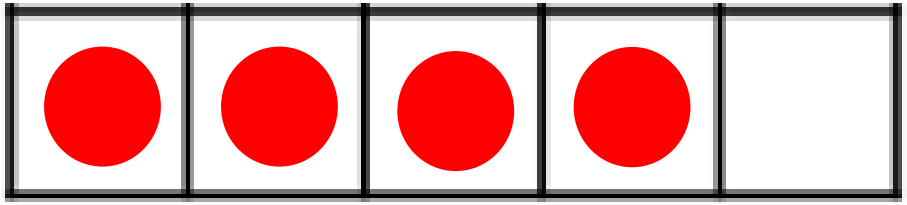
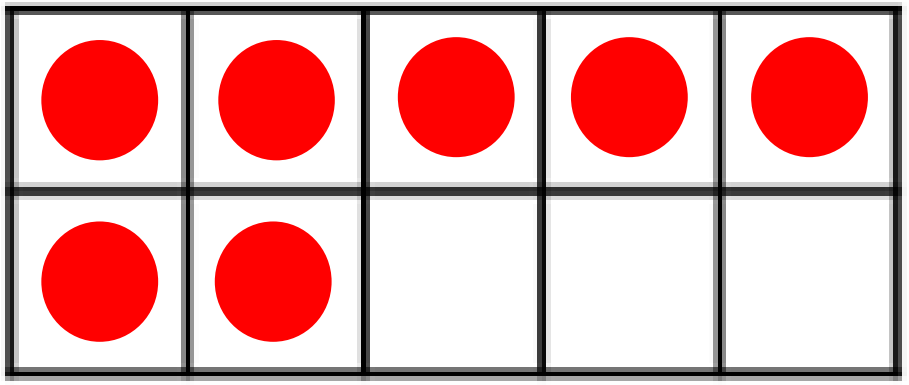
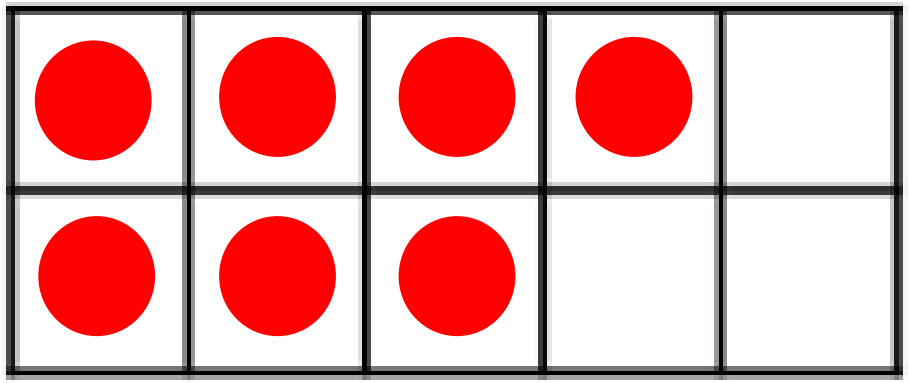
Mathematical structures

Using structured representations to support learning of number bonds





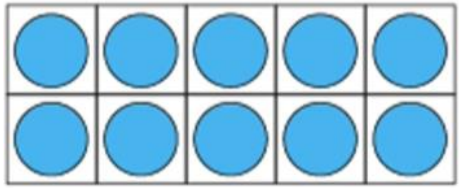


Progression in use of the ten frame structure

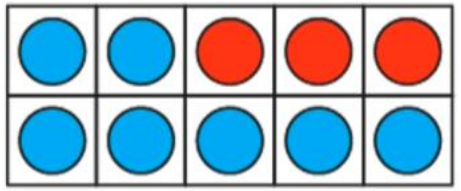
A core set of representations can be used to expose important mathematical structures and ideas, and make them accessible to pupils. Consistent use of the same representations across year groups helps to connect prior learning to new learning.

eg the tens frame:

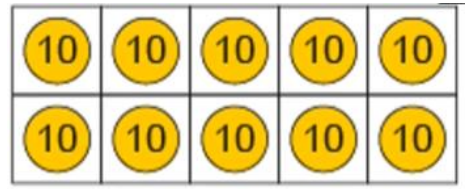
Year 1



Year 2



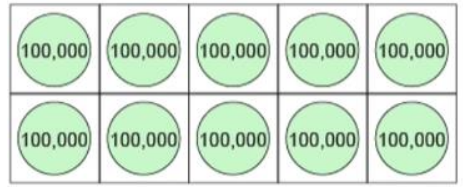
Year 3



Year 4

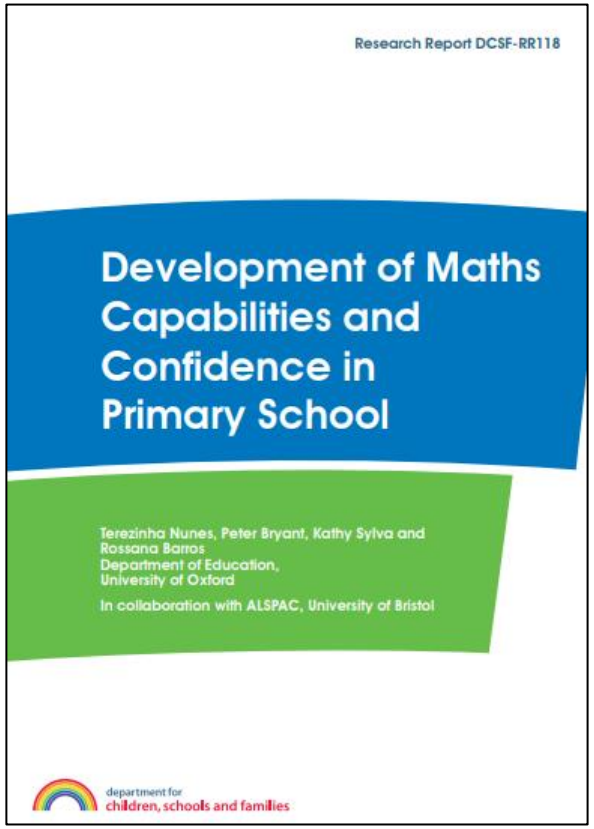
Year 5

Year 6



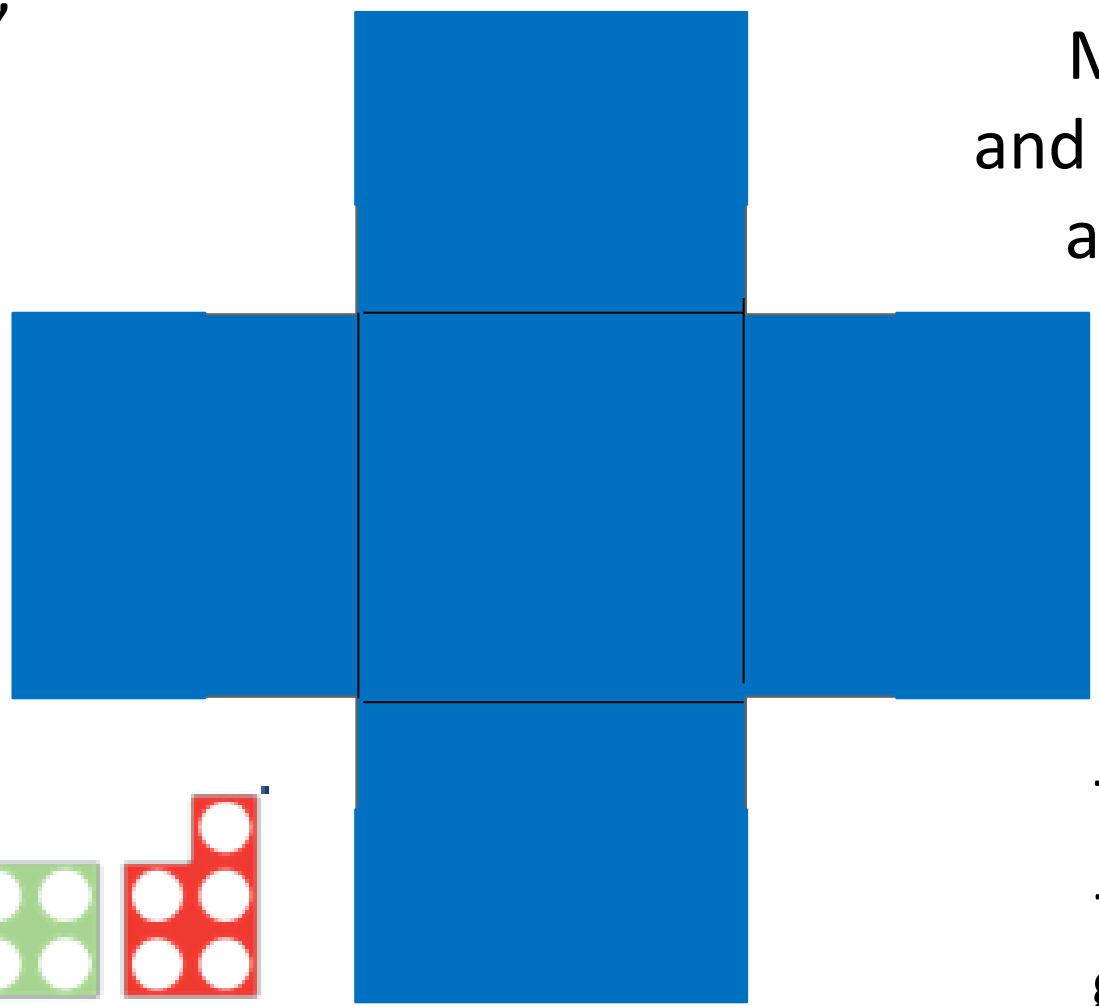
Mathematical thinking linked with reasoning

‘Mathematical reasoning, even more so than children’s knowledge of arithmetic, is important for children’s later achievement in mathematics.’ (Nunes et al., 2009)



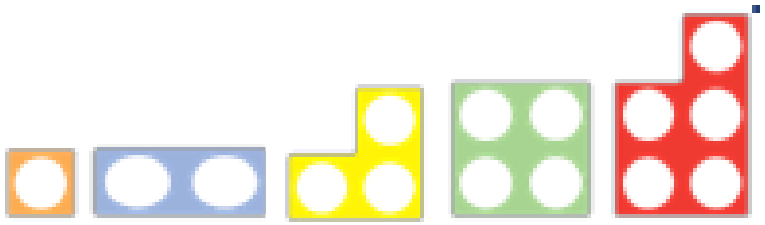
Developing chains of reasoning

‘Balance the lines’



Make the column and row both add up to an equal amount.

Use the 1-5 Numicon shapes



Test your ideas – trying to find generalisations

Applying maths to problems

Inductive reasoning involves, ‘generating examples’ and ‘sniffing out’ patterns.

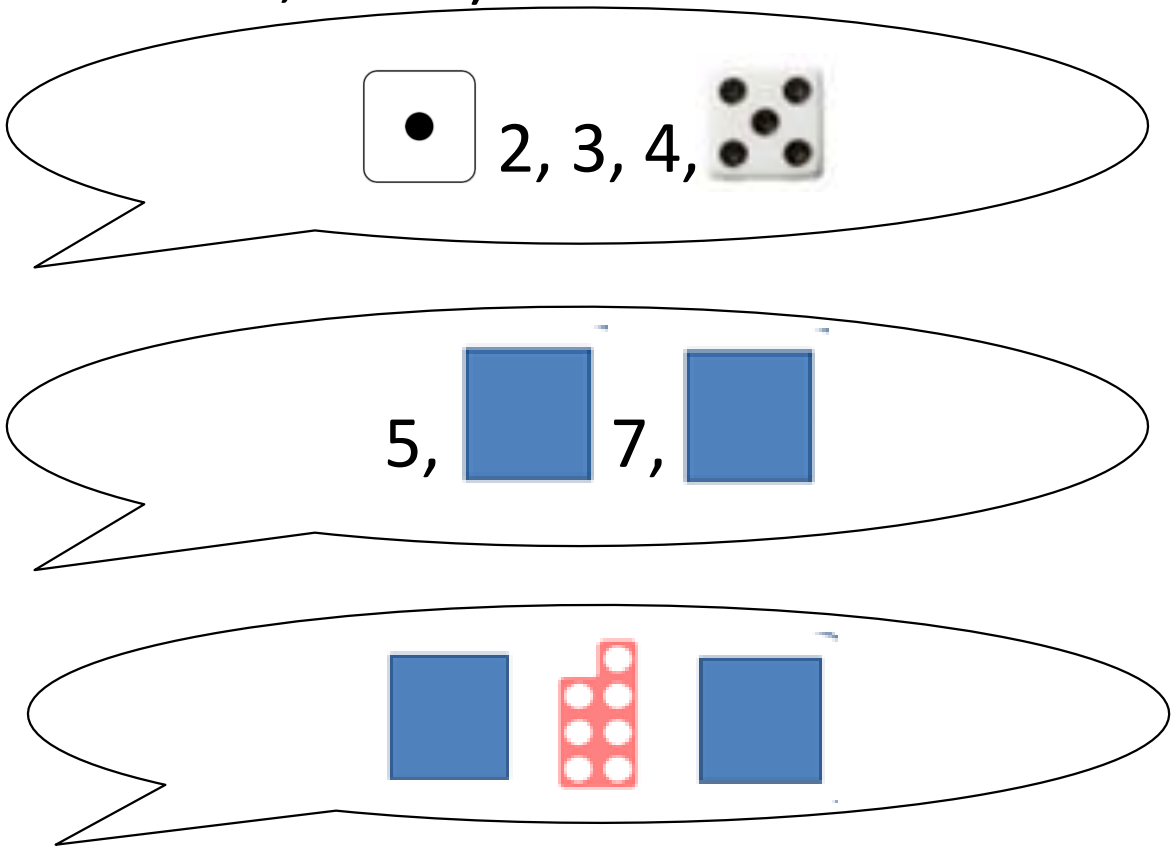
Year 2
Always, sometimes, never Is it always, sometimes or never true that if you add three numbers less than 10 the answer will be an odd number

Variation:
Conceptual vs. Procedural

- Conceptual variation: representing the same concepts in different ways to draw out essential features and form a fluent/deep understanding of the concept.
- Procedural variation: calculations are connected and pupils use the relationships to find easy ways of calculating.

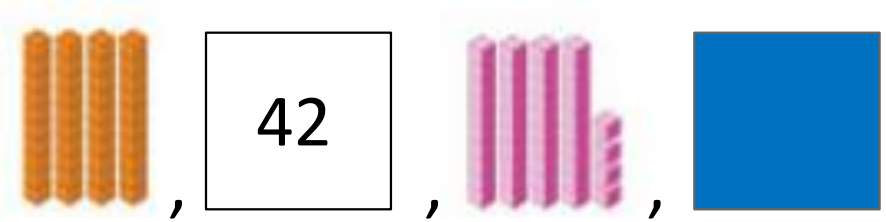
Conceptual variation with counting

‘Variation highlights the essential features of the concepts through varying the non-essential features.’
(Gu, Huang and Marton, 2004)

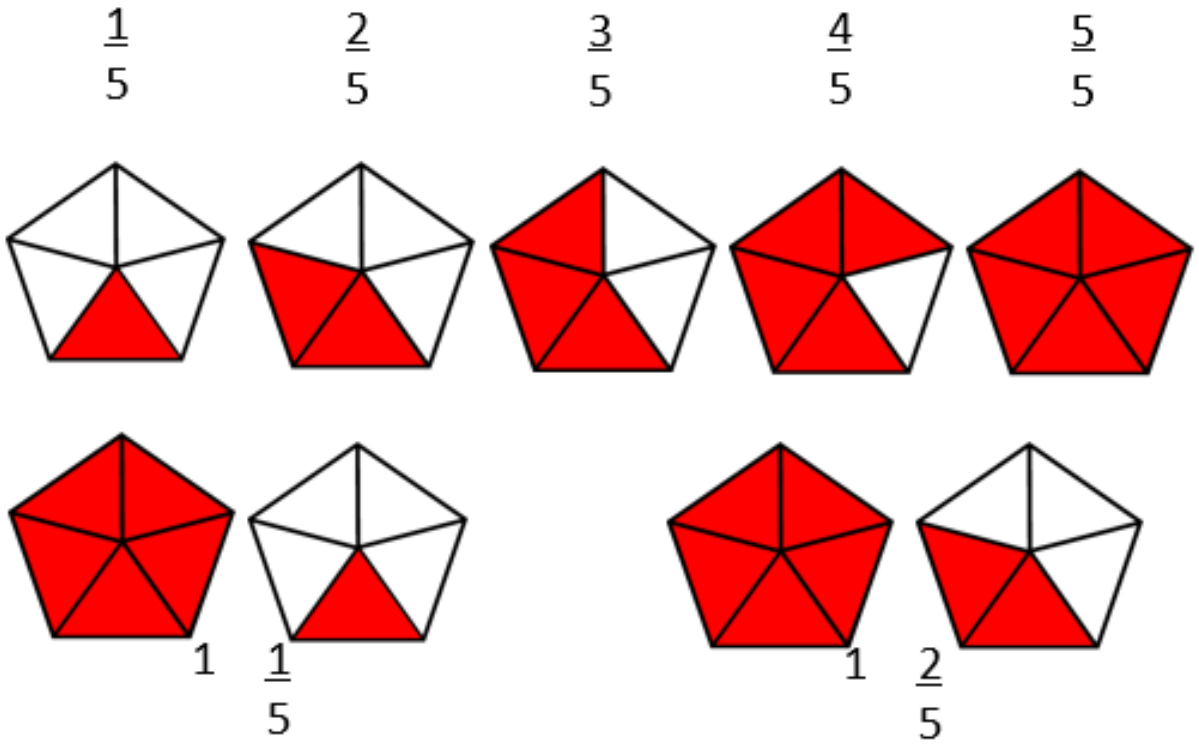


Conceptual variation with counting

Two-digit integers:

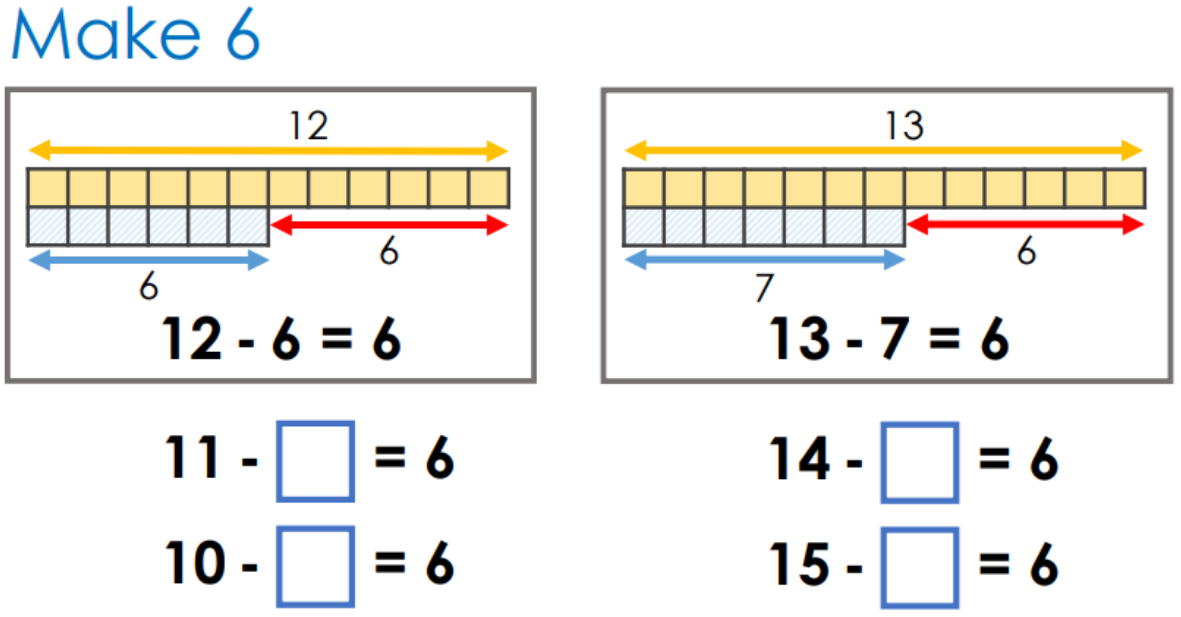


Fractions:



Procedural variation when calculating the difference

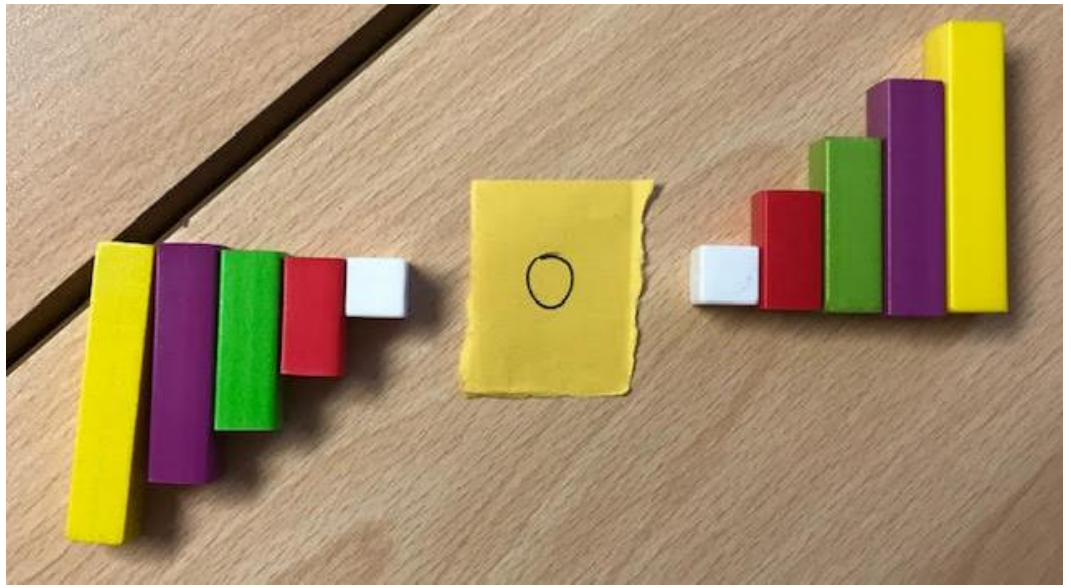
Encouraging children to understand and interpret mathematical structures such as bar models will, in this instance, help them develop conceptual understanding, plus fluency with flexibility.



Credit: 'I See Reasoning' – 'Tasks for enriching mathematical talk' – Key Stage 1. Access the resource here.

Procedural variation when calculating the difference

‘In designing exercises, the teacher is advised to avoid mechanical repetition and to create an appropriate path for practising the thinking process with increasing creativity.’
(Gu, 1991)



Find the difference between -1 and +3
Find the difference between -2 and +2
Find the difference between -3 and +1
Find the difference between -5 and +1

What is the same?
What is different?

Fluency

‘Understanding is … an essential part of fluency – in particular, understanding of relationships between numbers and operations, and understanding of the number system (see Russell, 2000). Fluency involves using this understanding to:

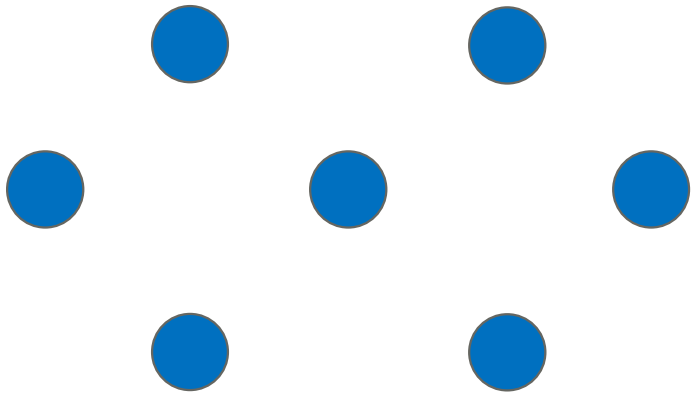
- notice things;
- make connections between what is known and what is unknown; and
- make decisions.’

(‘No Nonsense Number Facts,’ 2017)

Developing fluency alongside mathematical reasoning

‘Number Talk’

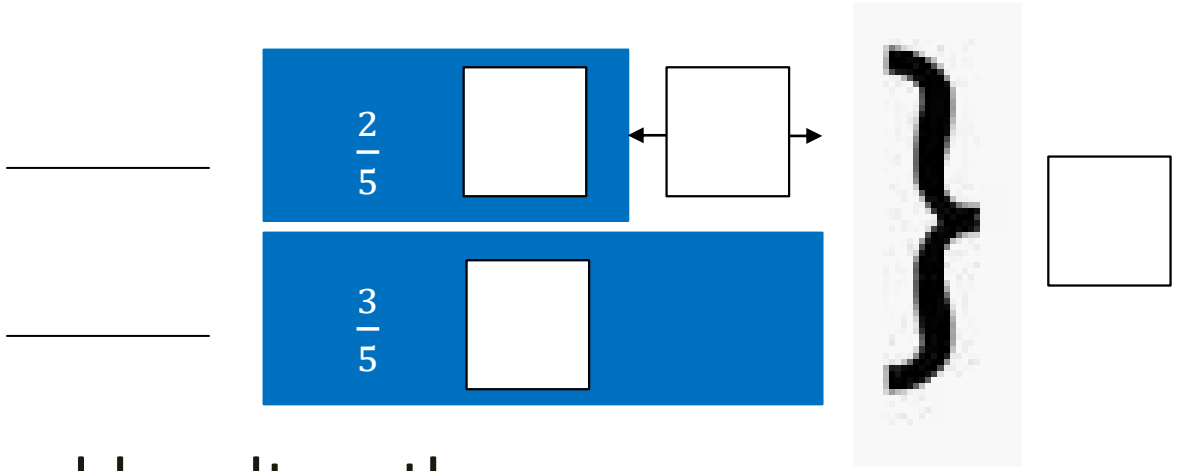
Say the total number of dots you can see…and how you know…



Credit: ‘Number Talk’ – Jo Boaler via. youcubed here.

Developing fluency alongside mathematical reasoning

Sam and Tom share 45 marbles in the ratio 2:3.
Complete the bar model annotations before advancing to work mathematically so that the prompt sentences below can be completed.



With thanks to Jan Parry

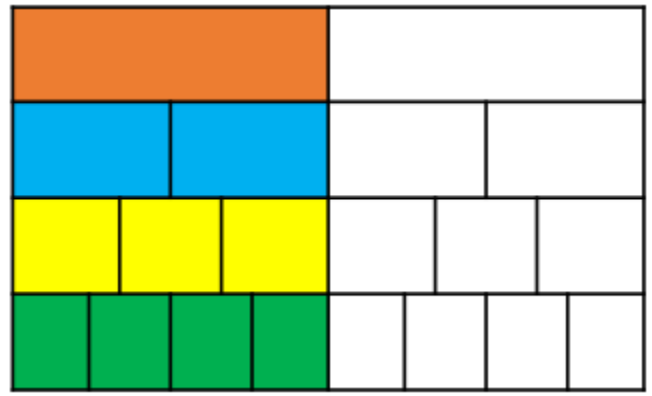
There are ___ marbles altogether.
Sam has ___ marbles.
Tom has ___ marbles.
The difference between Sam and Tom's quantities of marbles is ___.

Curriculum sequencing

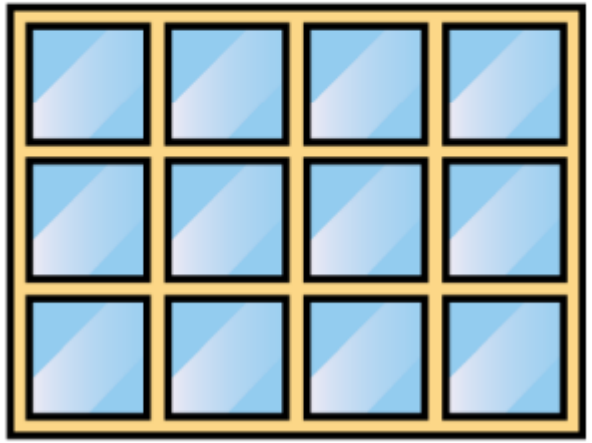
Progressing children's learning linked with equivalent fractions – Adapted stages from White Rose planning resources: Year 4

1 Use two strips of equal sized paper. Fold one strip into quarters and the other into eighths. Place the quarters on top of the eighths and lift up one quarter, how many eighths can you see? How many eighths are equivalent to one quarter? Which other equivalent fractions can you find?

2 How many fractions that are equivalent to one half can you see on the fraction wall? Can you draw any extra rows to show other equivalent fractions?

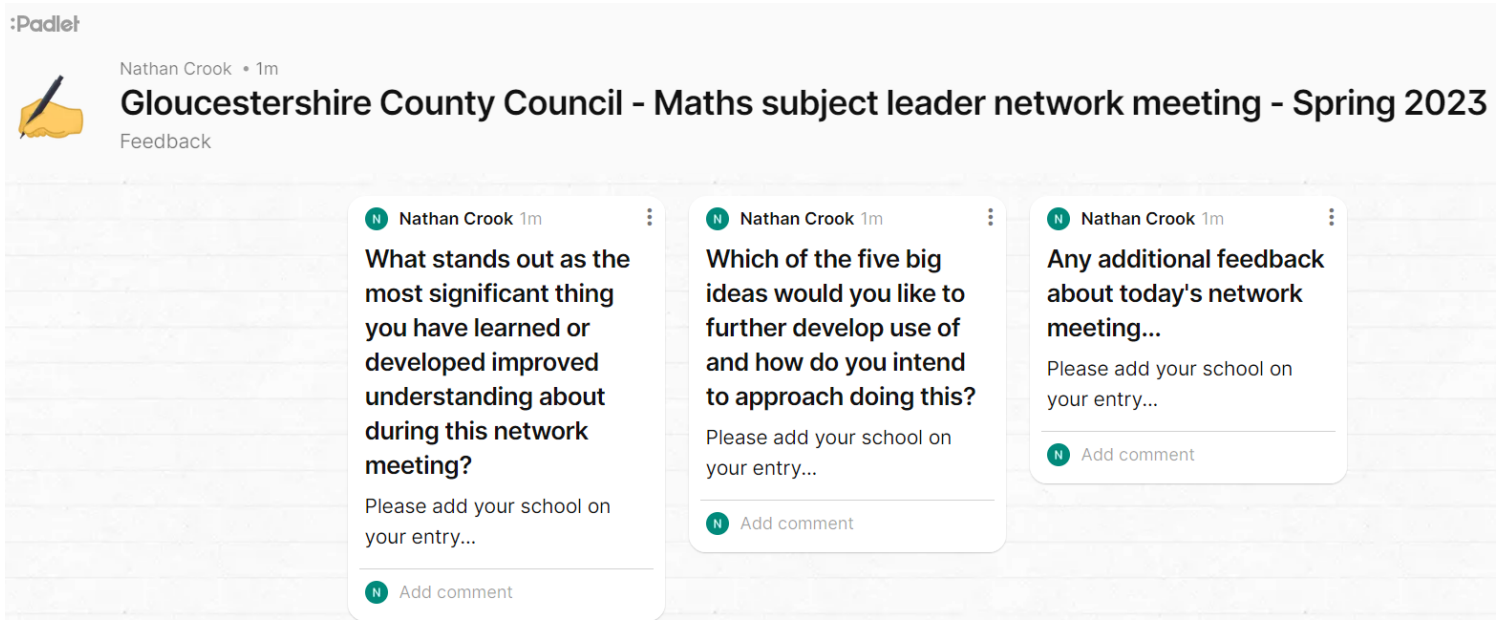


3 How many equivalent fractions can you see in this picture?



Feedback

Please add feedback on the session Padlet.
Click here.



Slides and any new supporting materials will be made available following this meeting.

NJC Education Consultancy

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