The Primary Curriculum and the Implications for Key Stage 3

Debbie Morgan
National
Director for Primary
Mathematics
debbie.morgan@ncetm.org.uk

National Centre
for Excellence in the
Teaching of Mathematics

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National Curriculum Purpose of study

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Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary in most forms of employment. ***A high-quality mathematics education*** ***therefore provides a foundation for understanding the world, the ability to reason mathematically, and a sense of enjoyment and curiosity about the subject.*** **(P54)**

The Aims of The New Curriculum

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The latest draft National Curriculum for mathematics aims to ensure all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **reason** mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Primary Mathematics
What has changed?

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1. higher expectation overall - benchmarked against age-related expectations in other nations
2. progression shown year-by-year – but for teachers to set out their year-by-year approach in their school curriculum
3. conceptual development of number addressed in detail, especially in relation to arithmetic and proportionality
4. fewer things in more depth in primary so data is less prominent and probability not introduced till Key Stage 3
5. all pupils expected to build firm foundations and not be accelerated to content expected in secondary school

Primary Mathematics
What has changed?

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In detail (1) Higher Expectations

- Earlier and more challenging requirement for multiplication tables
- Clear expectations around written methods in addition to mental methods
- Earlier and more challenging requirement for fractions and decimals
- Increased requirement for pupils to use formulae for volume and to calculate the area of shapes other than squares and rectangles

Primary Mathematics
What has changed?

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In detail (2):

- Probability has been removed
- Increased requirement for understanding of proportional reasoning – for example through volume and calculations with fractions
- Financial education has been reinforced with a renewed emphasis on essential numeracy skills, using money and working with percentages
- A strong steer that the use of calculators should be restricted until the later years of primary.

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Secondary Mathematics

- higher expectation overall - benchmarked against age-related expectations in other nations
- less detailed than primary and set out by key stage – secondary school teachers will need to set out the detail in their school curriculum by year.
- **consolidating understanding - Key Stage 3 builds on Key Stage 2**
- probability and statistics treated separately
- mathematics set out in more detail than current National Curriculum – with less specification of generic skills

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Fluency

The government wishes to continue to emphasise fluency, but this should not be understood to mean *“rote learning without understanding”.....conceptual understanding is clearly important and ..any emphasis on practice needs to be a part of achieving that understanding.*

Stefano Pozzi Mathematics in School May 2013 p2

BALANCE

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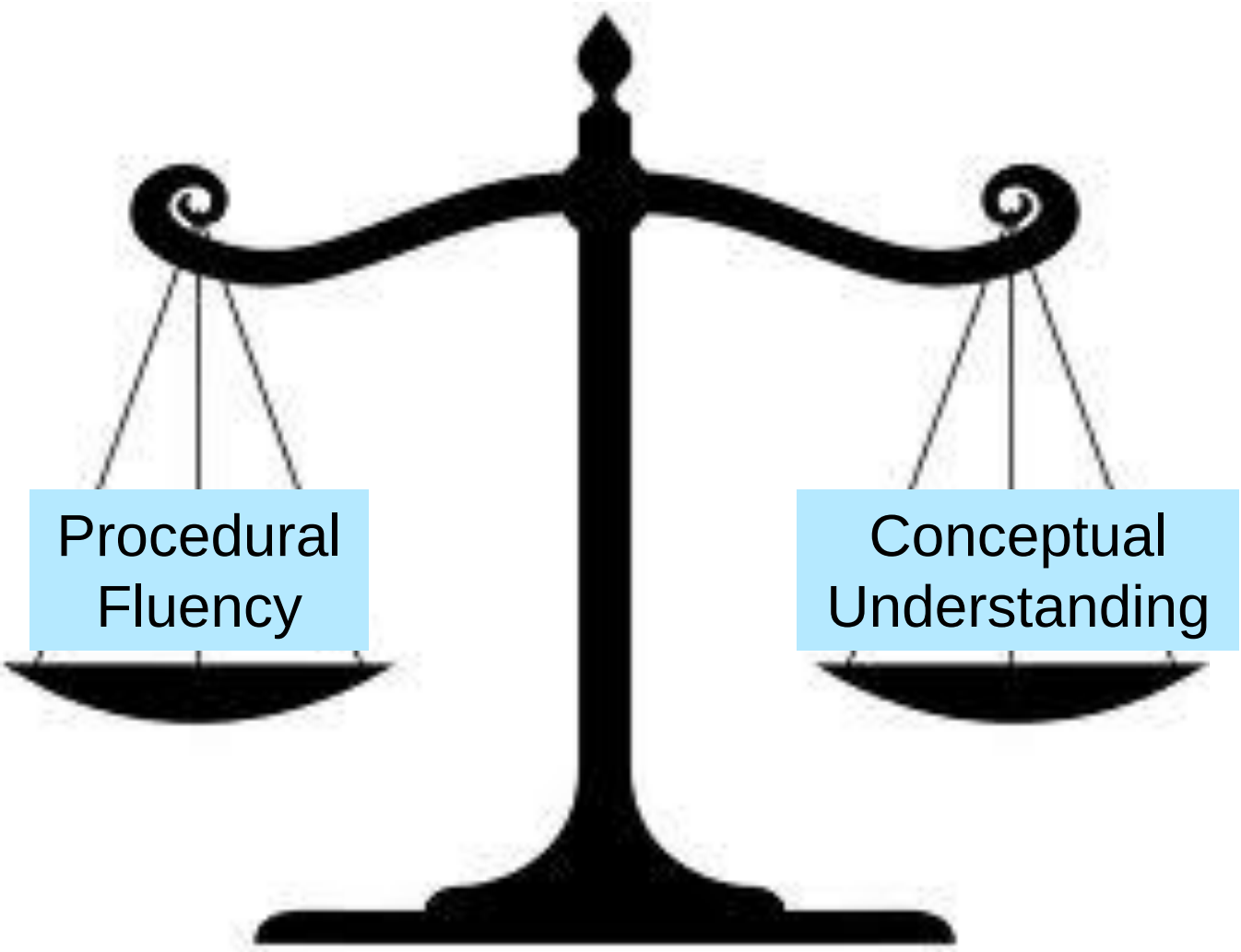

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Ofsted

Resources to help build concepts

1000	2000	3000	4000	5000	6000	7000	8000	9000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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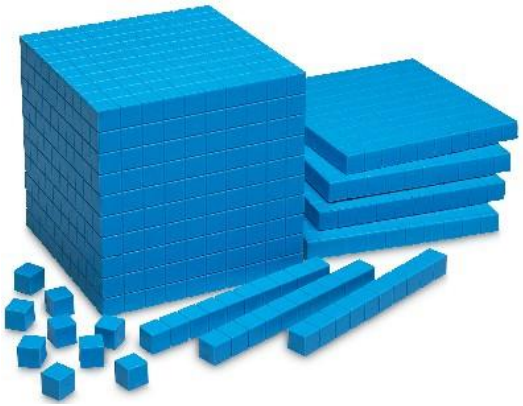

NCETM Video Fluency and Understanding

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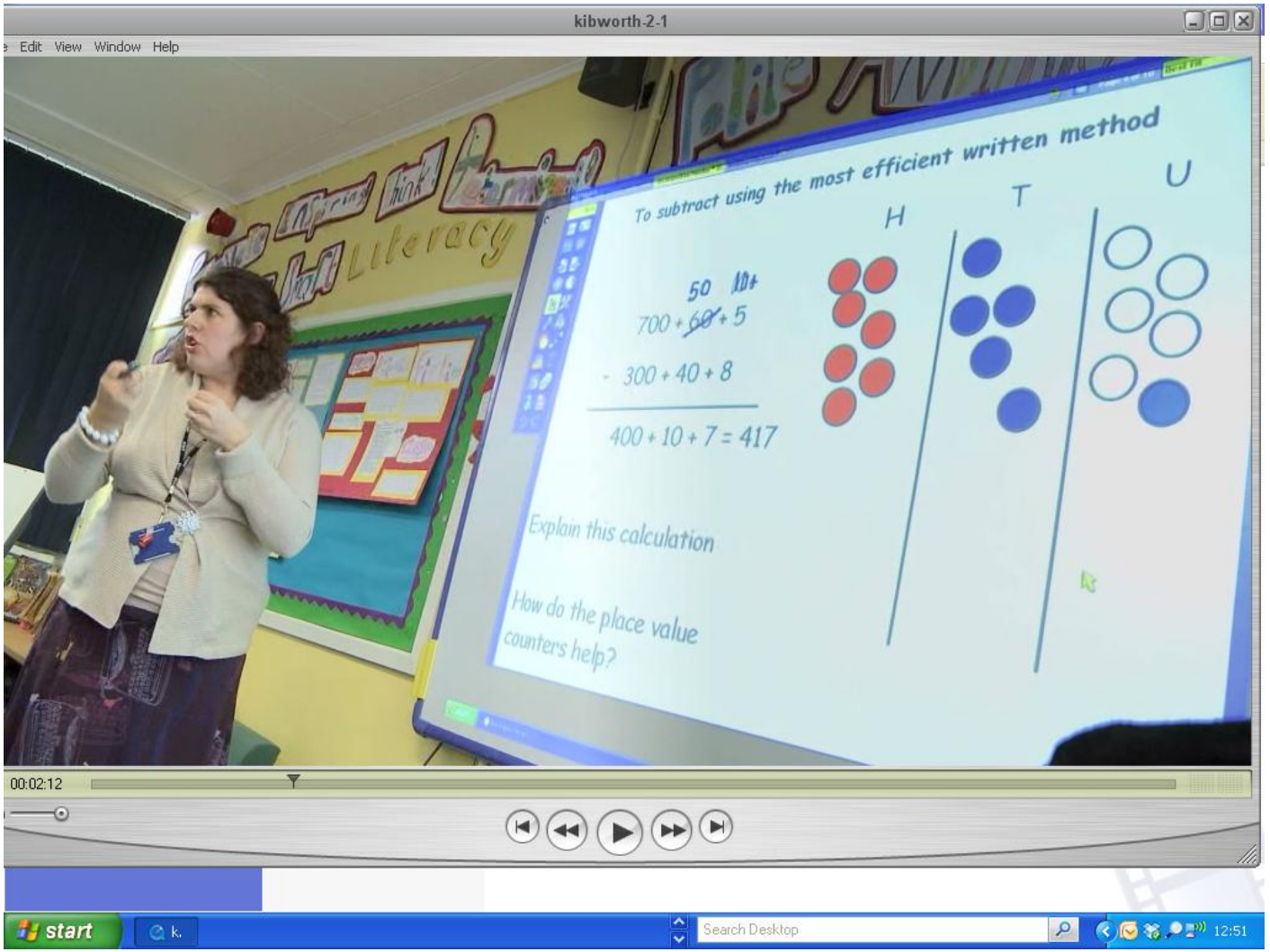

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Representation

Goldin and Shteingold (2001) suggest that representational systems are important to the learning of mathematics because of the inherent structure contained within each representation.

This structure can shape or constrain learning. Further, different representations emphasise different aspects of a concept and so the development of an understanding of a particular concept comes from having a range of representations and being able to move between them.

The Bar Model for Problem Solving

Laura had $240. She spent 5/8 of it. How much money did she have left?

Overall percent correct, Singapore: 78%, United States: 25%).

Why were Singapore so successful?
They used a particular representation which enabled pupils to access the structure of the mathematics

How would you solve this?

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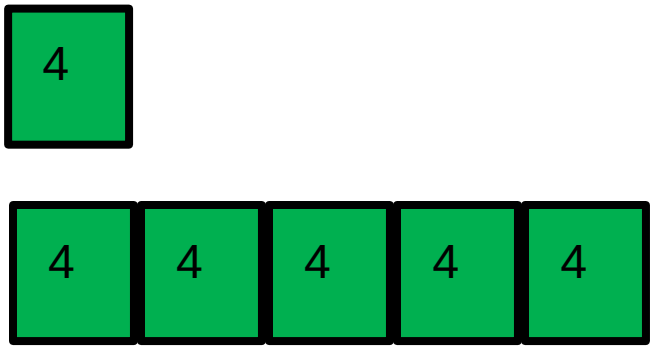
24 In a class, 18 of the children are girls.

A quarter of the children in the class are boys.

Altogether, how many children are there in the class?

Peter has 4 books

Harry has five times as many books as Peter. How many books has Harry?



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Multiplication

Henry ate 10 meatballs at the Christmas party. Shane ate 3 times as many meatballs as Henry . How many meatballs did they eat altogether?

Helen has 9 times as many football cards as Sam. Together they have 150 cards. How many more cards does Helen have than Sam?

The sum of 2 numbers is 60. One number is 9 times as big as the other. What is the bigger number?

The sum of 2 numbers is 64. One number is 7 times as big as the other. What is the smaller number?

How Can the Bar Model be used to solve this problem?

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Sam had 5 times as many marbles as Tom. If Sam gives 26 marbles to Tom, the two friends will have exactly the same amount. How many marbles do they have altogether?

Developing Proportional Reasoning

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Your Strip Represents £5

- Show me £3
- Show me £4
- Show me £3.50
- Show me £3.59
- What would the half way mark represent?

Laura's Shoes and Tom's Trainers

Laura has £16

She spends 5/8 of it on a pair of shoes.

How much money does she have left?

Tom spent 2/5 of his money on a pair of Trainers. The trainers cost £24.

How much money did he have at the start?

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Solving Proportional Problems

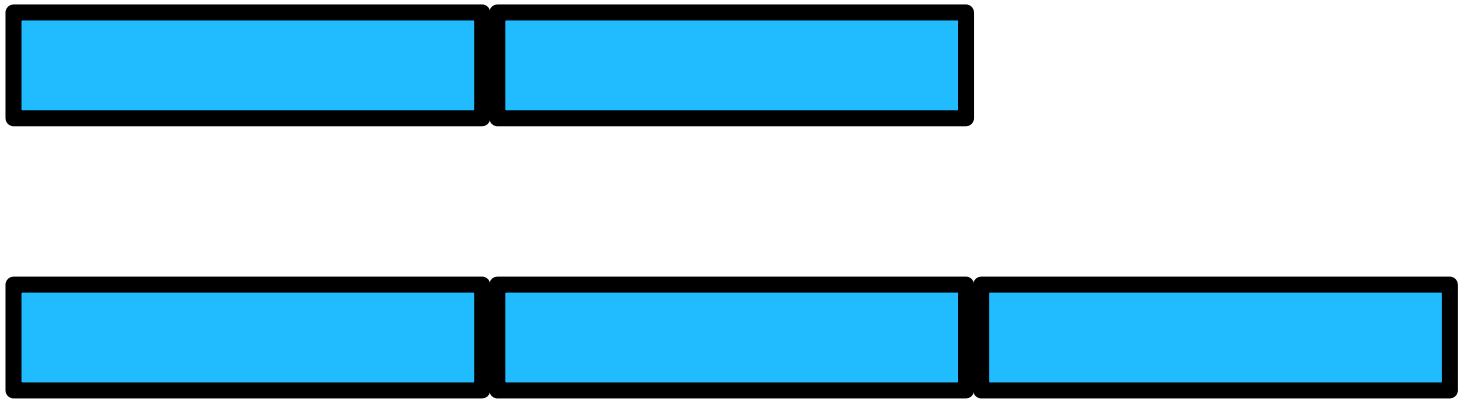
A Super Mario Game costs £45, it is reduced in price by 25%, how much does it cost now?

A computer game was reduced in a sale by 20%, it now costs £40, what was the original price

A computer game was reduced in a sale by 40%, it now costs £60, what was the original cost?

Laura had £240. She spent 5/8 of it. How much money did she have left?

Ratio



Tim and Sally share marbles in the ratio of 2:3
If Sally has 36 marbles, how many are there altogether?

Try these using the bar model

In an election for class rep 5 out of 8 pupils voted for Sam. If 30 pupils voted for Sam, did Sam win? If he did, how many more votes did he receive?

A purse contains10p, 20p and 50p coins
These are in the ratio 6:3:2
If there are 4 x 50p coins, how much money is in the purse?