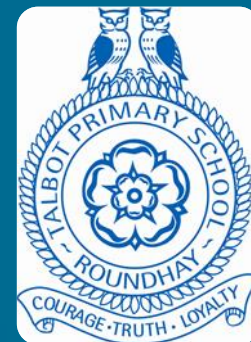


Maths at Talbot Primary



Isobel MacDonald
(Maths lead) and Parm
Gill

National Centre
for Excellence in the
Teaching of Mathematics

 **MathsHUBS**

Aims of the meeting

- Support your understanding of the Maths curriculum
- Explore the methodologies behind Maths, i.e. what we teach, how and why
- Enable you to support your child at home in developing their image as a ‘confident mathematician’

Aims of the National Curriculum

- Fluency
- Reasoning
- Problem Solving

To be good mathematicians children need to develop three forms of knowledge:

Factual – *I know that ...*

Procedural – *I know how ...*

Conceptual – *I know why ...*

A snapshot of our Maths Vision

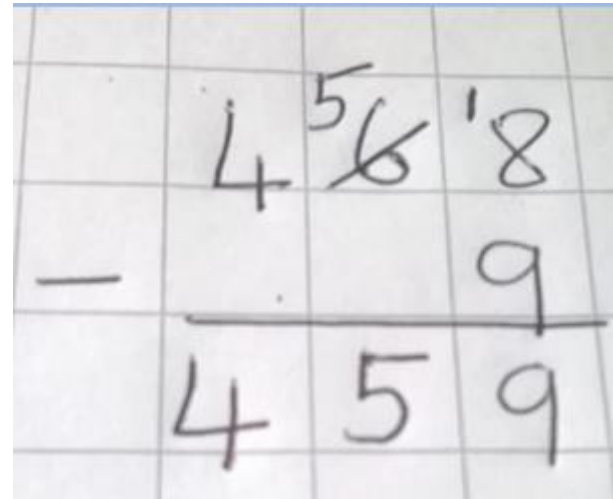


- Use of practical apparatus to support understanding of number and calculation is embedded across school
- Children move through concrete, pictorial and abstract representations to ensure they are able to show their learning in multiple ways

Mastery approach to Maths

Why?KS2 Arithmetic Paper

4	$468 - 9 =$						
	<table border="1" style="border-collapse: collapse; width: 100%; height: 40px;"> <tr> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> </tr> </table>						



Sally knows all her tables up to 12×12

When asked what is 12×13 she looks blank.

Does she have fluency and understanding?

What do you think it means to master something?



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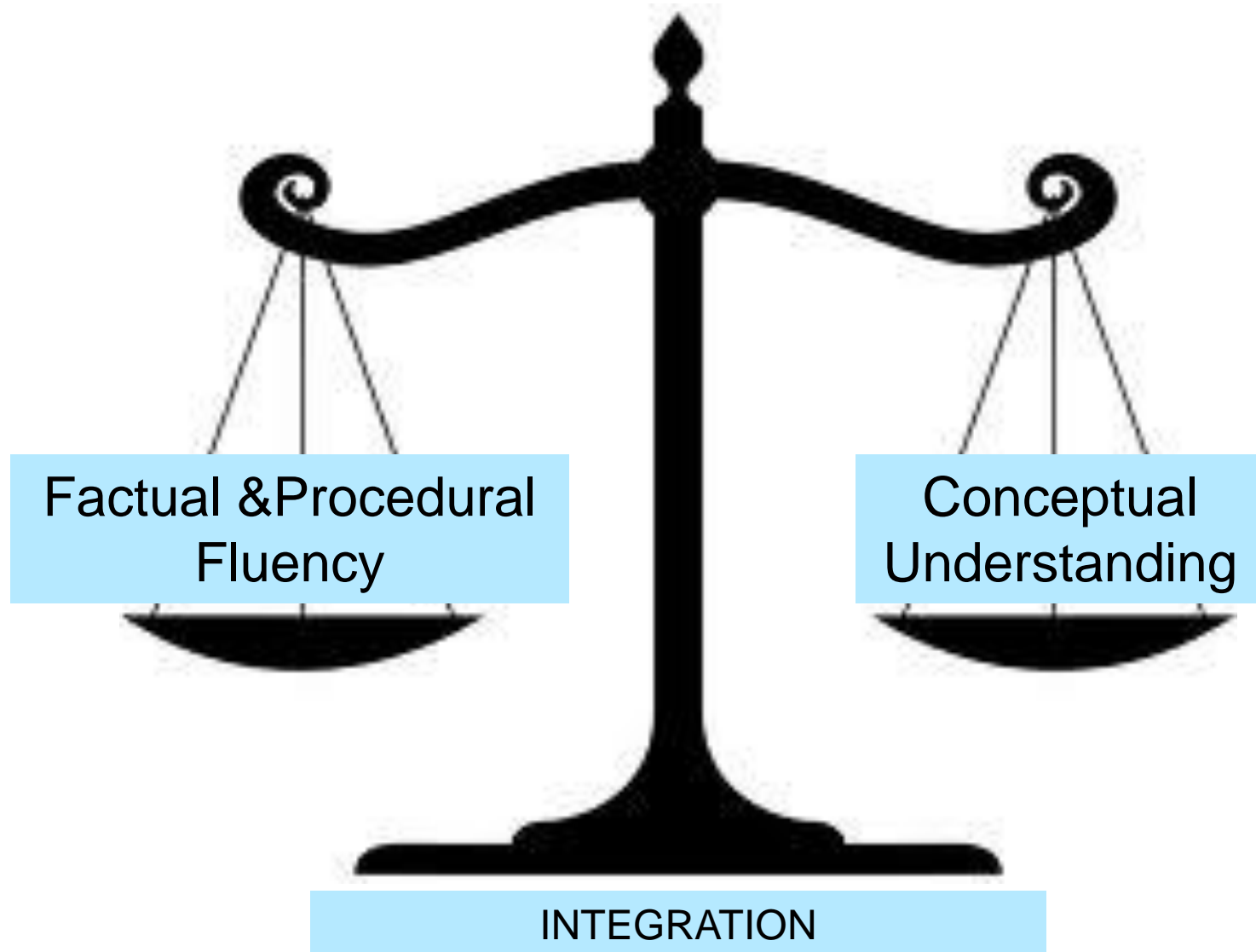


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What does it mean to master something?

- 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.

The Curriculum

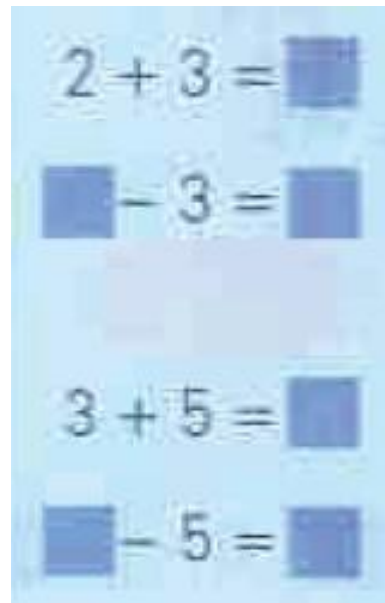


Procedural variation

Progression through a variety of problems/calculations to form an understanding of a concept, stage by stage

Examples are carefully chosen to highlight a particular concept. This allows children to spot links and connections between numbers.

$$\begin{array}{l} 18 - \square = 8 \\ 18 - \square = 10 \\ 18 - \square = 12 \\ 18 - \square = 14 \\ 18 - \square = 16 \end{array}$$



A vertical sequence of four math problems, each followed by a blue square representing a missing number:

$$\begin{array}{l} 2 + 3 = \square \\ \square - 3 = \square \\ 3 + 5 = \square \\ \square - 5 = \square \end{array}$$

$$\begin{array}{l} 180 \div 2 = \\ 180 \div 20 = \\ 270 \div 30 = \\ 270 \div 90 = \end{array}$$

More procedural variation

Calculate



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

=

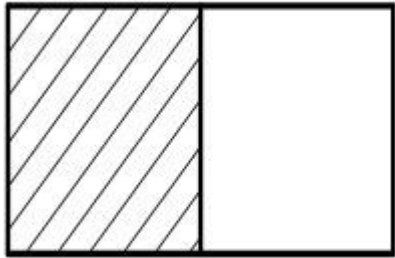
$$4/5 + 1/6 + 5/6 + 1/7 + 6/7 + 1/8 + 7/8 + 1/9 + 8/9 + 2/10 = 5$$

Conceptual variation

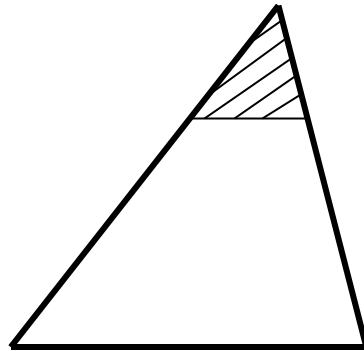
Experiencing a concept in lots of different contexts

Commutative Property	Repeated Addition
$5 \times 3 = 15$	$3 + 3 + 3 + 3 + 3 = 15$
$3 \times 5 = 15$	
Groups of:	An Array
	
3 groups of 5	

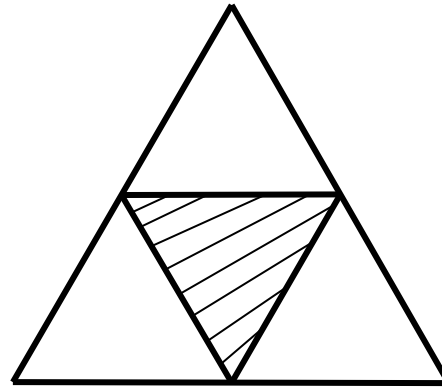
This includes thinking about what it is not...



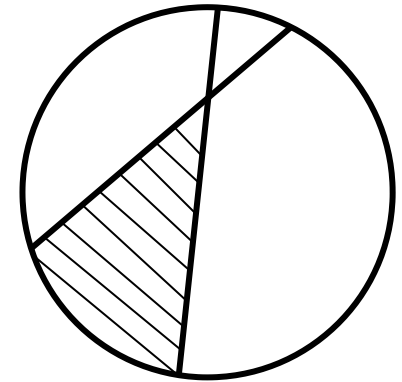
$$\frac{1}{2} \checkmark$$



$$\frac{1}{2} \times$$



$$\frac{1}{3} \times$$



$$\frac{1}{4} \times$$

Why? Explain.

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
- One way, two ways, three ways...clever day

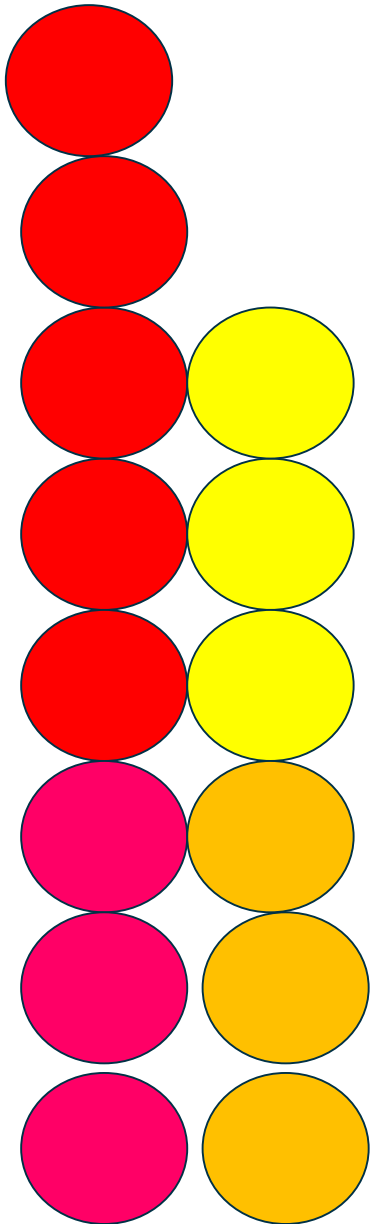
Solve the following

$$4 + 5 + 6 = \square$$

$$\square + 17 = 15 + 24$$

$$99 - \square = 90 - 59$$

Representing Mathematical Relationships



Same Difference

$$5 - 3 = 2$$

$$6 - 4 = 2$$

$$7 - 5 = 2$$

$$8 - 6 = 2$$

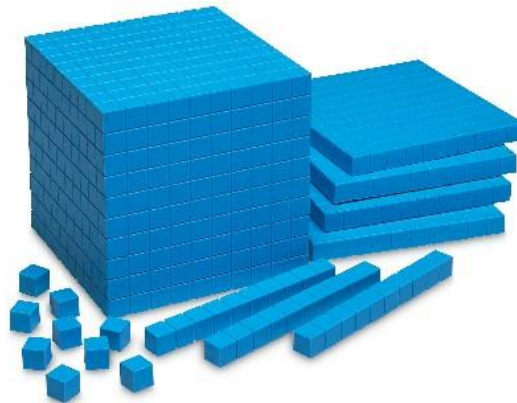
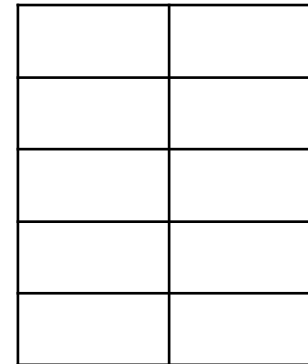
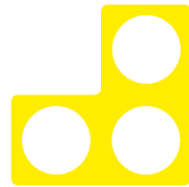
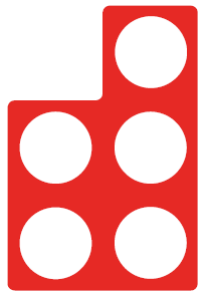
Concrete, Pictorial and Abstract approach to Maths

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Concrete Resources in Maths

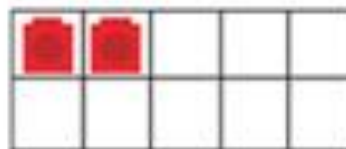
Resources to help build concepts



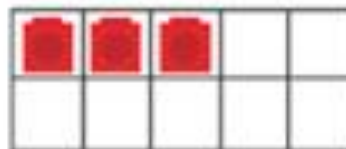
Concrete Pictorial (iconic) Abstract



1



2



3



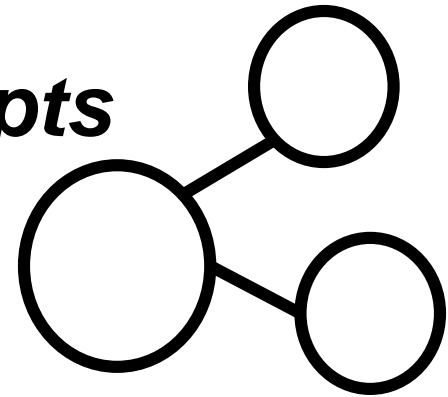
4

Examples of concrete problems

- ‘Find all the ways of making numbers to 20, e.g. 8 and 17 using numicon and place value.’ This knowledge needs to be deep and embedded. Children are exposed to key language and encouraged to find multiple solutions to embed their understanding, e.g. 15: 10 and 5, 11 and 4
- Use of base ten equipment to show exchanging e.g. $54 + 78$

Pictorial Resources in Maths

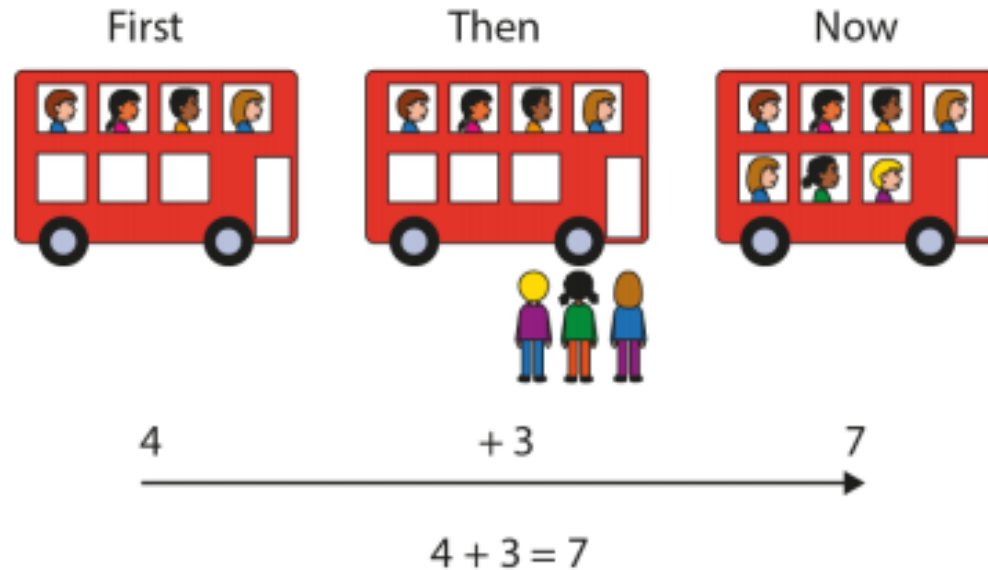
Resources to help build concepts



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
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009

Draw the problem	Show the problem using a model
Calculate	Explain

Examples of pictorial problems



This concept can first be demonstrated using children sitting on chairs.

It could then be shown as a picture.

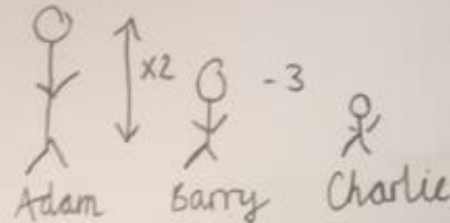
When the children securely understand the concept, a ten frame and counters can be used.

Examples of pictorial problems

LO: To complete a multi-step problem using a reasoning square

Adam is twice as old as Barry.
 Charlie is 3 years younger than Barry.
 The sum of all their ages is 53.
 How old is Barry?

Draw the problem



Represent the problem using a model



Calculate

$$A = 26 \quad 26 + 13 + 10 = 49$$

$$B = 13$$

$$C = 10$$

$$A = 28 \quad 28 + 14 + 11 = 53$$

$$B = 14$$

$$C = 11$$

Explain

We knew that Adam's age must be an even number. We could see that Barry's age was around half of the total.



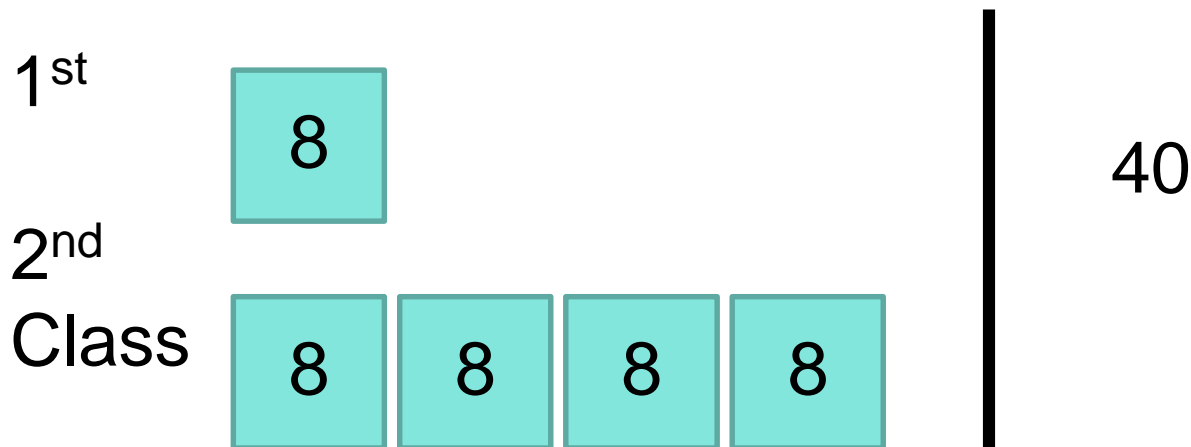
Ralph posts 40 letters, some of which are first class, and some are second.

He posts four times as many second class letters as first.

How many of each class of letter does he post?

He posts four times as many second class letters as first.

How many of each class of letter does he post?



$$40 \div 5 = 8$$

$$8 \times 4 = 32$$

1st Class 8 letters

2nd Class 32 letters



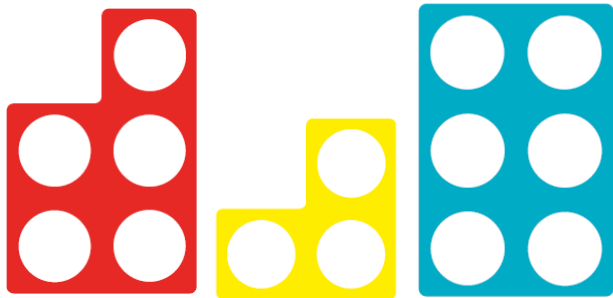
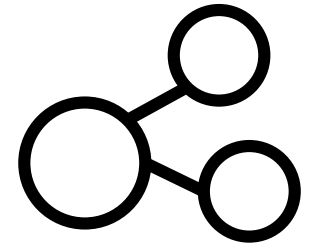
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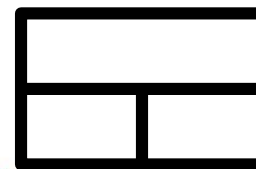
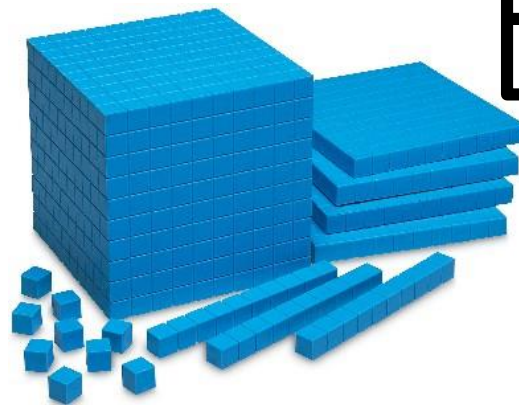
How many of each class of letter does he post?

Abstract Resources in Maths

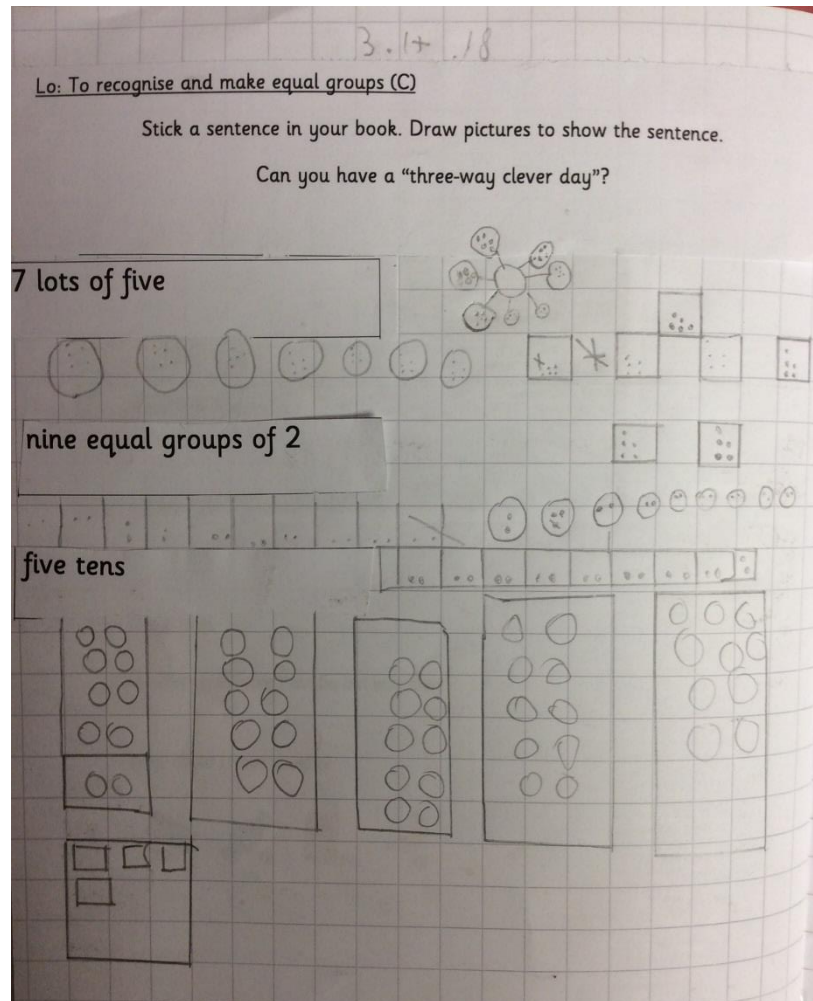
Using and applying all available resources to explain learning



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
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009



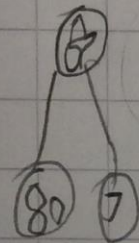
Examples of abstract problems



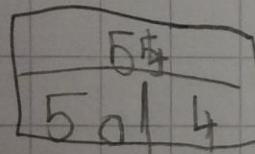
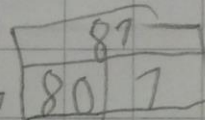
Lo: To represent numbers

Super Challenge:

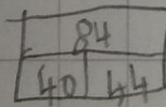
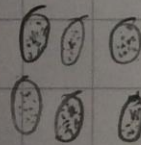
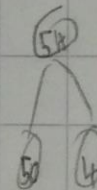
Choose a number card. Write the number in your book. Show me three ways to represent it. [money/numicon/base 10/ten frames] ✓✓



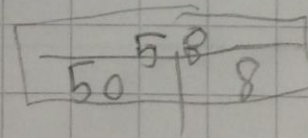
$$80 + 7 = 87$$



$$50 + 4 = 54$$



$$50 + 8 = 58$$



Key stage 2 example

$$\begin{array}{r}
 13,728 + 6541 \\
 \hline
 20,269
 \end{array}$$

LO: To add two 4-digit numbers

13,728 + 6,541

T	H	T	U
1	3	7	2
0	6	5	4
2	0	2	6
1	1		

13,728 + 6,541

T	H	T	U
1	3	7	2
0	6	5	4
2	0	2	6
1	1		

How you can help

- Talk about Maths. Make it real, use language
- Ask your child to explain their thinking. Ask if they could have solved the problem in a different way: 'One way, two ways, three ways...clever day.'
- If your child gets stuck encourage them to draw the problem
- Avoid the 'we're no good at maths in this house' feeling.....we are all good at maths, i.e. avoid the procedural mathematician syndrome

Websites that can help

- Reception and Key Stage one:
 - Conker Maths –
<http://www.conkermaths.org/cmweb.nsf/pages/kirfs.html>
 - Education City
 - Top marks www.topmarks.co.uk
- Key Stage two:
 - Education City
 - Hit the button
 - iXL
- Ideas also provided in the leaflet available today

What's next?

- New revised maths calculation policy incorporating our approach to concrete, pictorial and abstract approaches will be available on the website shortly
- A glossary explaining Maths terms and language will also be available. In the interim refer to the booklet provided for guidance.

