



KS2 Maths workshop

Aims of the Workshop

- Understanding what underpins maths teaching & the aims of the National Curriculum.
- Teaching the concrete, pictorial, abstract approach.
- Teaching the four operations.
- Fluency, reasoning, problem solving- the Mastery Approach.
- To appreciate the need for mastery in KS2.

Year 3

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn term	Number Place value FREE TRIAL VIEW		Number Addition and subtraction VIEW				Number Multiplication and division A VIEW					
Spring term	Number Multiplication and division B VIEW		Measurement Length and perimeter VIEW		Number Fractions A VIEW		Measurement Mass and capacity VIEW					
Summer term	Number Fractions B VIEW	Measurement Money VIEW	Measurement Time VIEW		Geometry Shape VIEW	Statistics Statistics VIEW		Consolidation				

Year 4

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn term	Number Place value FREE TRIAL VIEW			Number Addition and subtraction VIEW			Measurement Area VIEW	Number Multiplication and division A VIEW			Consolidation	
Spring term	Number Multiplication and division B VIEW		Measurement Length and perimeter VIEW	Number Fractions VIEW			Number Decimals A VIEW					
Summer term	Number Decimals B VIEW	Measurement Money VIEW	Measurement Time VIEW	Consolidation	Geometry Shape VIEW	Statistics VIEW	Geometry Position and direction VIEW					

Year 5

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn term	Number Place value FREE TRIAL VIEW	Number Addition and subtraction VIEW	Number Multiplication and division A VIEW	Number Fractions A VIEW								
Spring term	Number Multiplication and division B VIEW	Number Fractions B VIEW	Number Decimals and percentages VIEW	Measurement Perimeter and area VIEW	Statistics VIEW							
Summer term	Geometry Shape VIEW	Geometry Position and direction VIEW	Number Decimals VIEW	Number Negative numbers VIEW	Measurement Converting units VIEW	Measurement Volume VIEW						

Year 6

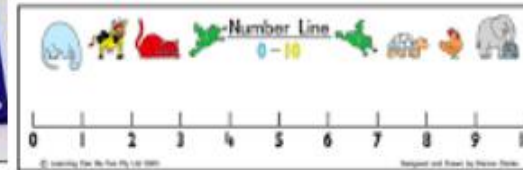
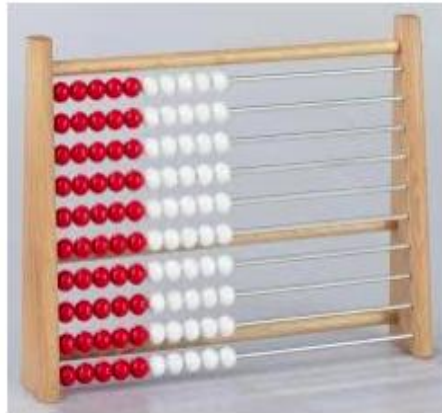
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn term	Number Place value FREE TRIAL VIEW	Number Addition, subtraction, multiplication and division VIEW					Number Fractions A VIEW	Number Fractions B VIEW	Measurement Converting units VIEW			
Spring term	Number Ratio VIEW	Number Algebra VIEW	Number Decimals VIEW	Number Fractions, decimals and percentages VIEW	Measurement Area, perimeter and volume VIEW	Statistics VIEW						
Summer term	Geometry Shape VIEW	Geometry Position and direction VIEW	Themed projects, consolidation and problem solving VIEW									

The CPA approach

- All four operations are taught using this approach throughout the school.
- Concrete
- Pictorial
- Abstract

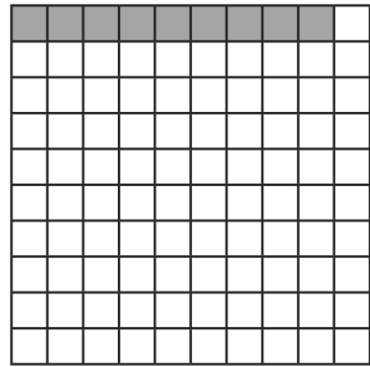
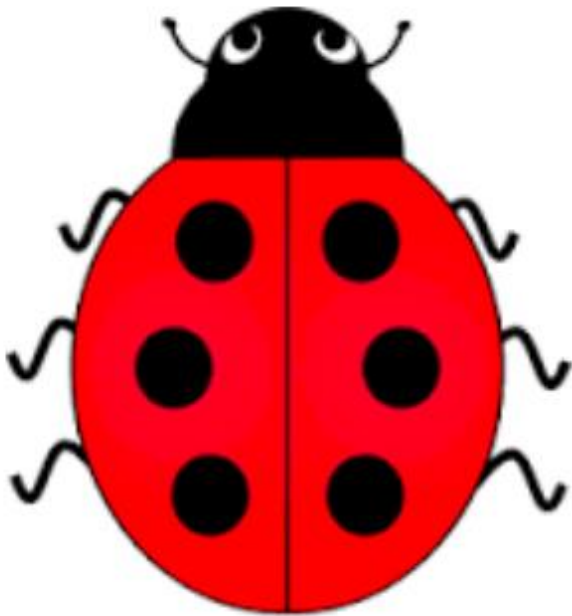
Concrete Resources

Children should use concrete manipulative resources to help them understand what they are doing.

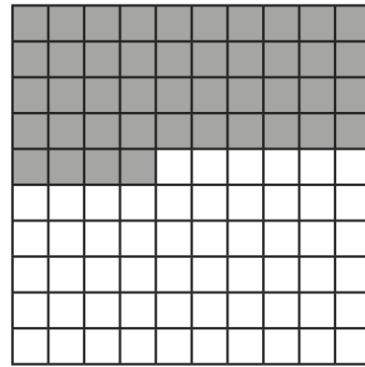


Pictorial

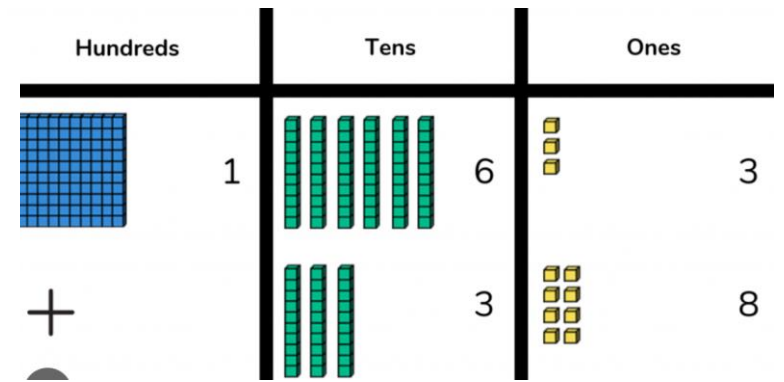
Children should build on the concrete approach by using pictorial representations. These can be used to reason and problem solve.



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Abstract

With the foundations firmly laid, children should then be able to move on to an abstract approach using number and key concepts with confidence.

1 a. $10 \times 85 = \underline{\hspace{2cm}}$

1 b. $1000 \times 7 = \underline{\hspace{2cm}}$

2 a. $1000 \times 104 = \underline{\hspace{2cm}}$

2 b. $10 \times 48 = \underline{\hspace{2cm}}$

3 a. $246 \times 1000 = \underline{\hspace{2cm}}$

3 b. $374 \times 1000 = \underline{\hspace{2cm}}$

4 a. $639 \times 1000 = \underline{\hspace{2cm}}$

4 b. $1000 \times 289 = \underline{\hspace{2cm}}$

5 a. $504 \times 100 = \underline{\hspace{2cm}}$

5 b. $10 \times 555 = \underline{\hspace{2cm}}$

6 a. $436 \times 100 = \underline{\hspace{2cm}}$

6 b. $219 \times 10 = \underline{\hspace{2cm}}$

7 a. $1000 \times 340 = \underline{\hspace{2cm}}$

7 b. $1000 \times 636 = \underline{\hspace{2cm}}$

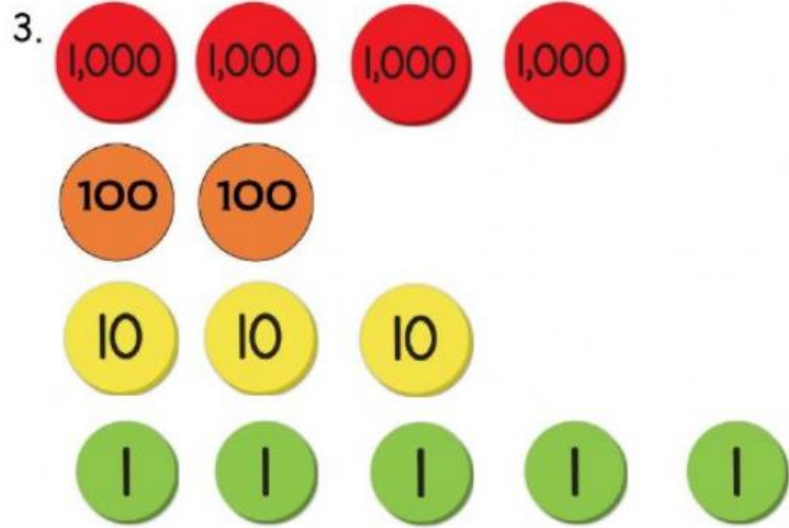
8 a. $1000 \times 415 = \underline{\hspace{2cm}}$

8 b. $10 \times 181 = \underline{\hspace{2cm}}$

Use of well known mental calculation strategies.

- Partitioning and recombine
- Doubles and near doubles
- Use number pairs to 10, 20, 100
- Adding near multiples of ten and adjusting
- Using patterns of similar calculations
- Using known number facts
- Counting on
- Round to check answers
- Estimate and using the inverse.

Build it and draw it.

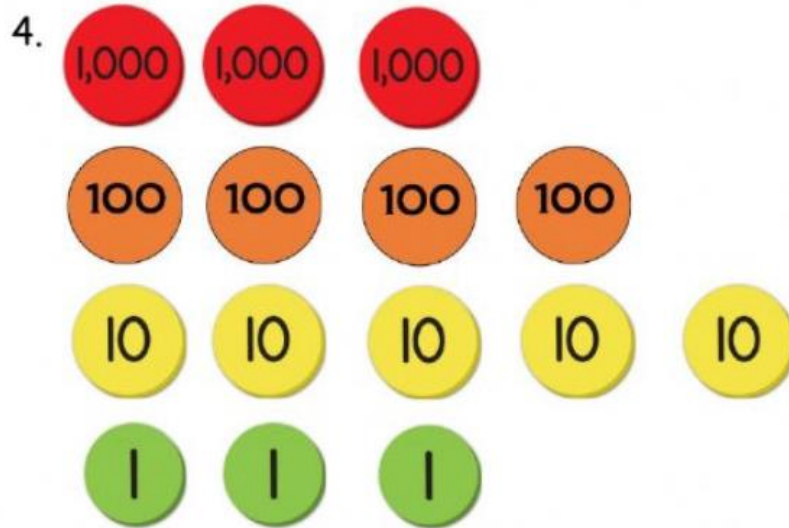


..... thousands

..... hundreds

..... tens

..... ones



..... thousands

..... hundreds

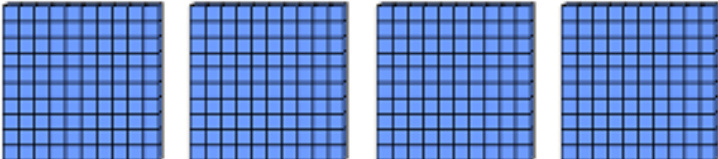
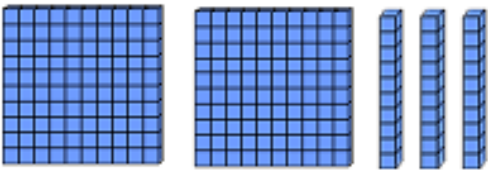
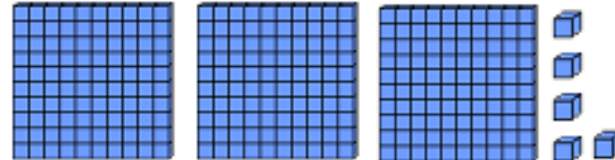
..... tens

..... ones

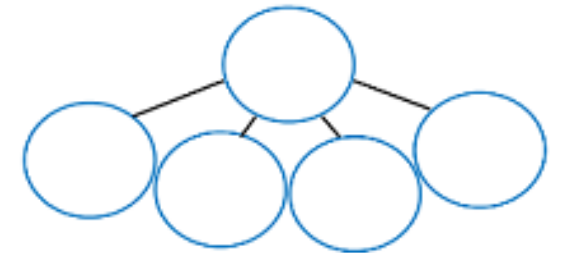
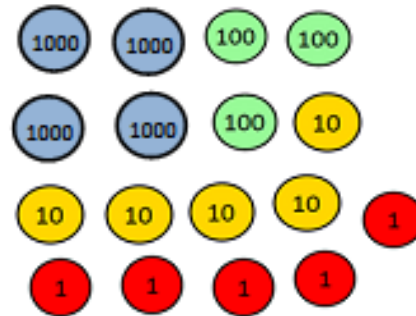
Number and The Four Operations

- ▶ Place Value and Number
- ▶ Addition
- ▶ Subtraction
- ▶ Multiplication
- ▶ Division

Place Value

Representation	Number
	
	
	

Complete the part-whole model for the number represented.



Understanding Equivalence

*Understanding the
equals sign*

the same as

equivalent

=

*Not the answer
to a calculation!*

equal

balance

Addition

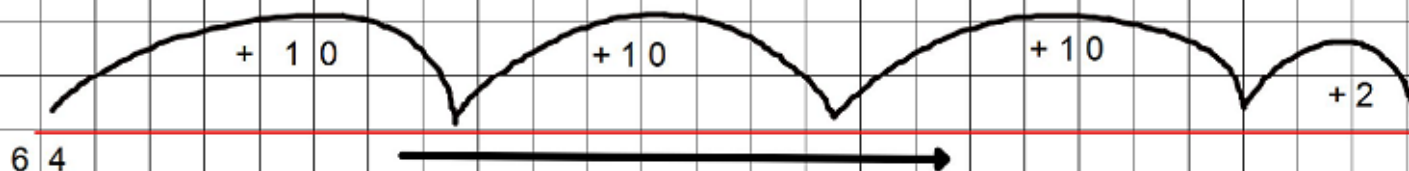
- add, addition, more, plus, increase
- sum, total, altogether
- score
- how many more to make...?
- one more, two more... ten more
- how many more to make...?
- how many more is... than...?
- how much more is...?

Stages of teaching addition

ADDITION - Year 3

$$64 + 32 =$$

Empty number line



ADDITION - Year 4

Partitioning

	64 = 60 + 4		74		32		74	
+	32 = 30 + 2	+	25		+	64	+	25
	<u>96 = 90 + 6</u>					<u>6</u>		<u>6</u>
						90		

$\begin{array}{r} + 323 \\ 518 \\ \hline \end{array}$	$\begin{array}{r} + 607 \\ 228 \\ \hline \end{array}$
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$$\begin{array}{r} 6246 \\ + 5564 \\ \hline \\ \hline \end{array}$$

ADDITION - Year 5

Partitioning

$$\begin{array}{r} + \quad 2 \quad 3 \quad 4 \\ 1 \quad 4 \quad 7 \\ \hline 3 \quad 8 \quad 1 \\ \hline \end{array} = \begin{array}{r} 2 \quad 0 \quad 0 \\ 1 \quad 0 \quad 0 \\ 3 \quad 0 \quad 0 \\ \hline \end{array} + \begin{array}{r} 3 \quad 0 \\ 4 \quad 0 \\ 8 \quad 0 \\ \hline 1 \quad 0 \end{array} + \begin{array}{r} 4 \\ 7 \\ 1 \end{array}$$

$$\begin{array}{r} 2 \quad 3 \quad 4 \\ 1 \quad 4 \quad 7 \\ \hline 1 \quad 1 \\ 7 \quad 0 \\ \hline 3 \quad 0 \quad 0 \\ \hline 3 \quad 8 \quad 1 \end{array}$$

ADDITION - Year 6

Conventional

$$\begin{array}{r} + \quad 2 \quad 3 \quad 4 \\ 1 \quad 4 \quad 7 \\ \hline 3 \quad 8 \quad 1 \\ \hline 1 \end{array}$$

Decimals

$$\begin{array}{r} 2 \quad . \quad 3 \quad 4 \\ 1 \quad . \quad 4 \quad 7 \\ \hline \hline \end{array}$$



$$\begin{array}{r} 3 \quad 6 \quad . \quad 2 \\ 7 \quad . \quad 0 \quad 8 \\ \hline 1 \quad 6 \quad . \quad . \\ \hline \end{array}$$

$$3 \quad 6 \quad . \quad 2 + 7 \quad . \quad 0 \quad 8 + 1 \quad 6$$

Subtraction

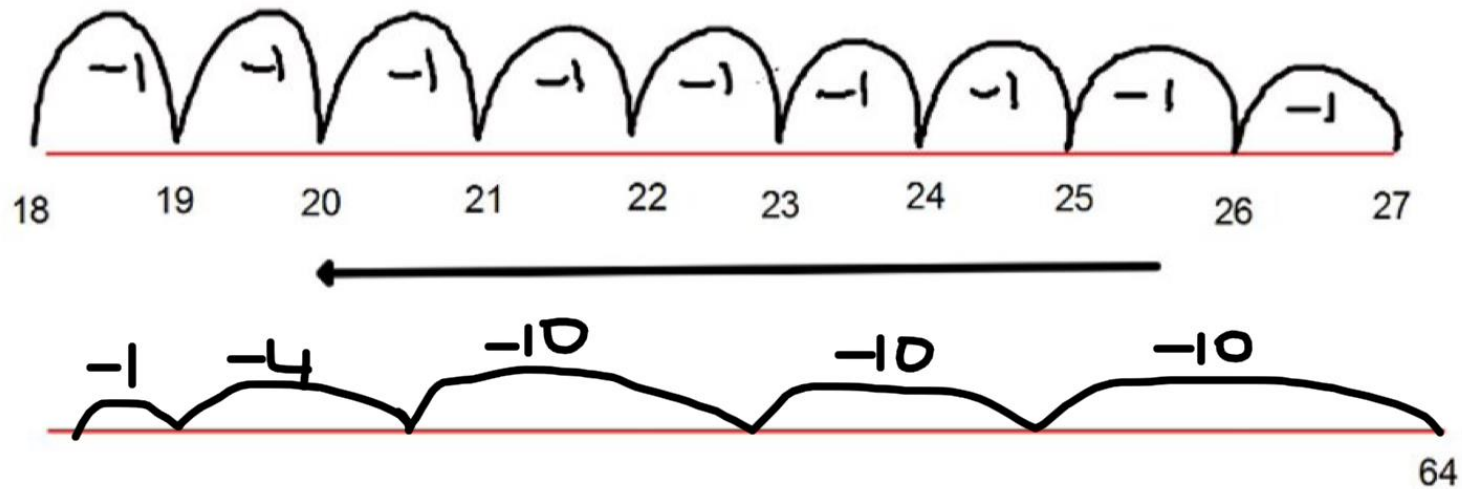
- subtract, subtraction, take (away), minus, decrease
- leave, how many are left/left over?
- difference between
- half, halve
- how many more/fewer is... than...?
- how much more/less is...?
- equals, sign, is the same as
- tens boundary, hundreds boundary

Stages for teaching subtraction

$$27 - 9 =$$

SUBTRACTION

Year 3 - Empty Number Line



$$64 - 35 =$$

Year 4 SUBTRACTION -Partitioning

	3	6	7	=	3	0	0	6	0	7	4	5	9	=	4	0	0	5	0	9
-	1	4	4	=	1	0	0	4	0	4	2	3	5	=	2	0	0	3	0	5
	2	2	3	=	2	0	0	2	0	3				=						

Year 5&6 SUBTRACTION -

	5	3	2	=	5	0	0	3	0	2	5	3	2	5	0	3		
-	3	2	7	=	3	0	0	2	0	7	-	3	2	7	-	2	1	6

$$\begin{array}{r} 451 \\ - 218 \\ \hline \hline \end{array}$$

$$\begin{array}{r} 7517 \\ - 3819 \\ \hline \hline \end{array}$$

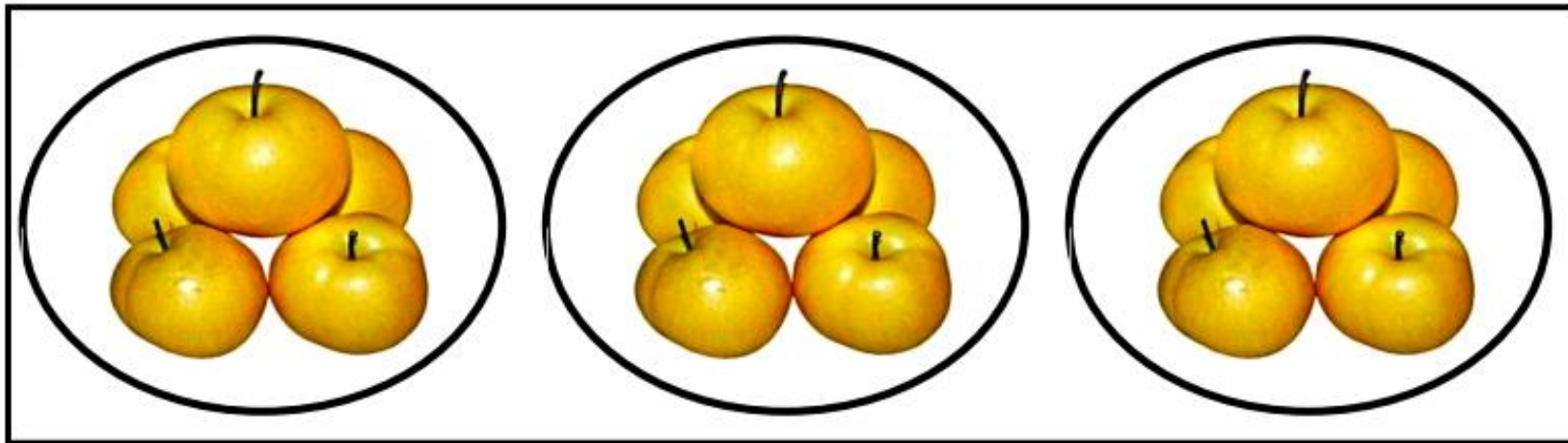
Multiplication

Lots of
Times
Multiply
Groups of
Product
Multiply by
Multiple of
Repeated Addition
Array

Repeated addition

$$5+5+5 = 15$$

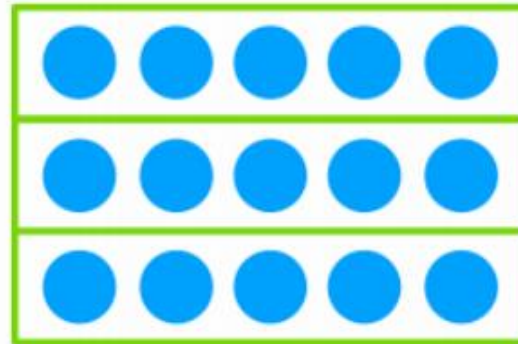
1.



Introduce the multiplication sign \times
 $5+5+5 = 15$ is the same as $3 \times 5 = 15$

Array

Rows and columns
with an equal amount in each.



$$3 \times 5 = 15$$

Helping children see links

MULTIPLICATION - Year 3

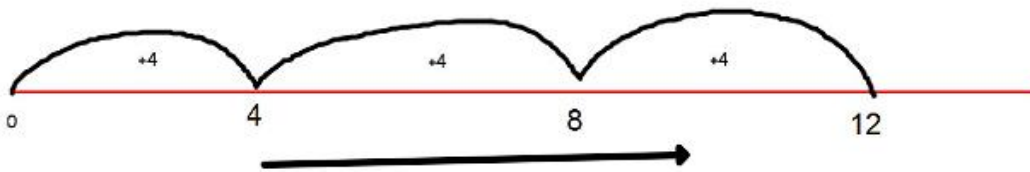
REPEATED ADDITION.

3 x 4

ARRAY (relate to division)



Empty Number Line



$$12 \times 3 = 36$$

x	10	2
3	30	6

= 36

$$\begin{array}{r} 1. \quad 24 \\ \quad \times 4 \\ \hline \\ \hline \end{array}$$

MULTIPLICATION - Year 4

Multiply any 2 digit number by 10 & 100 (DONT 'ADD' 0's!!!!)

$$24 \times 10$$

$$35 \times 10$$

$$63 \times 100$$

Grid Method

$$23 \times 4$$

$$24 \times 5$$

$$20 \quad 4$$

$$5 \quad 100 + 20$$

$$= 120$$

Must learn all times table up to 12 x 12

$$\begin{array}{r} 725 \\ \times \quad 3 \\ \hline \end{array}$$

MULTIPLICATION - Year 5 & 6

GRID HTO x O

$$\begin{array}{r}
 234 \times 3 = \\
 \hline
 200 \quad 30 \quad 4 \\
 3600 \quad 90 \quad 12 \\
 \hline
 = 702
 \end{array}$$

$$\begin{array}{r}
 234 \\
 \times \quad 3 \\
 \hline
 12 \\
 90 \\
 600 \\
 \hline
 702
 \end{array}$$

TO x TO

$$\begin{array}{r}
 23 \\
 \times 15 \\
 \hline
 15 \quad (3 \times 5) \\
 100 \quad (5 \times 20) \\
 30 \quad (10 \times 3) \\
 200 \quad (10 \times 20) \\
 \hline
 345
 \end{array}$$

TO x TO

$$\begin{array}{r}
 23 \\
 15 \\
 \hline
 115 \\
 230 \\
 \hline
 345
 \end{array}$$

Th HTU x TU

Decimals

Division

- share, share equally
- one each, two each, three each...
- group in pairs, threes... tens
- equal groups of
- divide, division, divided by, divided into
- remainder

Division is about sharing and grouping equally.

DIVISION - Year 3

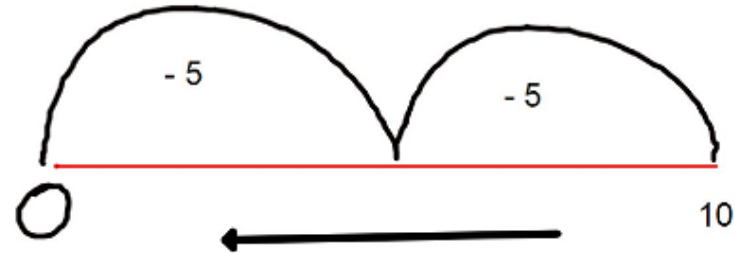
REPEATED SUBTRACTION - (relate to multiplication)

ARRAY

$$10 \div 5$$



ENL



Remainders

$$11 \div 5$$



DIVISION - Year 4

Inverse of multiplication - use times tables facts.

Partitioning

$$\begin{array}{r} 75 \div 5 \\ \swarrow \searrow \\ 50 \quad 25 \\ \downarrow \quad \downarrow \\ 10 \quad 5 = 15 \end{array}$$

CHUNKING

$$75 \div 5$$

$$\begin{array}{r} 15 \\ 5 \overline{) 75} \\ \underline{50} \quad (10 \times 5) \\ 25 \\ \underline{25} \quad (5 \times 5) \\ 0 \end{array}$$

DIVISION - Year 5 & 6

Chunking

$$576 \div 4 =$$

4	5	7	6	
	4	0	0	(100 x 4)
	1	7	6	
	1	6	0	(40 x 4)
		1	6	
		1	6	(4 x 4)
			0	

1. $3509 \div 11 =$

$186 \div 6 =$

	0	3	1
6	1	8	6

no groups of 6 can be made $3 \times 6 = 18$ $1 \times 6 = 6$

		1	3	2	r9
15	1	9	8	9	
	1	5			
		4	8		
		4	5		
			3	9	

Fractions

Year 3 - add and subtract fractions with the same denominator within one whole .

$$\frac{1}{5} + \frac{3}{5} = \frac{4}{5} \qquad \frac{7}{9} - \frac{5}{9} = \frac{2}{9}$$

Year 4 - add and subtract fractions with the same denominator.

$$\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = \qquad \frac{5}{3} - \frac{1}{3} = \frac{4}{3} =$$

Year 5 -
- add and subtract fractions with the same denominator and denominators that are multiples of the same number
- multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams

$$\frac{3}{4} + \frac{4}{12} = \frac{9}{12} + \frac{4}{12} = \frac{13}{12} = 1 \frac{1}{12}$$

$$\frac{3}{4} \times 5 = \frac{3}{4} \times \frac{5}{1} = \frac{15}{4} = 3 \frac{3}{4}$$

$$3 \frac{2}{3} \times 6 = \frac{11}{3} \times \frac{6}{1} = \frac{66}{3} = 22/1$$

Year 6

- add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions
- multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]
- divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$]

$$\frac{3}{8} \times \frac{4}{5} = \frac{12}{40} = \frac{3}{10}$$

$$\frac{2}{3} \div 5 = \frac{2}{3} \div \frac{5}{1} = \frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$$


$$16 \times 5 =$$

Mental Strategies!

$$8 \times 10$$

$$8 \times 5 \times 2$$

$$12 \times 5 + 4 \times 5$$

$$10 \times 5 + 6 \times 5$$

$$16 \times 4 + 16$$

$$\frac{10 \times 16}{2}$$

Teaching for Mastery

- ▶ These methods and overviews have number at heart. A lot of time is spent reinforcing number and concepts to build competency.
- ▶ Ensures the whole class stays together and work as a whole group.
- ▶ They provide plenty of time to build reasoning and problem solving elements into the curriculum.

Fluency

Answer:

$$\begin{array}{r} 32\ 461 \\ + 4\ 352 \\ \hline \end{array} \quad \begin{array}{r} 48\ 276 \\ + 5\ 613 \\ \hline \end{array}$$

Can you think of a sensible story to represent this question?

Using the column method, answer:

$$\begin{array}{l} 54,311 + 425 + 3,501 \\ 35,622 + 24,316 + 7,43 \\ 3,942 + 14,356 + 88 \end{array}$$

Reasoning

- The children will begin to explain their answers and give reasoning for the method they used.

Class 6 are solving this calculation:

$$3,912 + 3,888 =$$

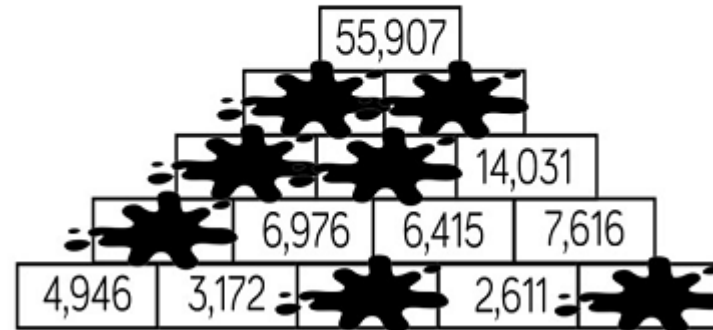
Claire



To solve this I will
double 3,900

Explain why Claire has done this.

Complete the pyramid using addition
and subtraction.



Problem Solving

Solving a problem involves...

- *Identifying and understanding what the problem is*
- *Planning how to solve it*
- *Working out the answer*
- *Checking results*

On Monday, Dupree was paid £114

On Tuesday, he was paid £27 more than Monday.

On Wednesday, he was paid £27 less than Monday.

How much was Dupree paid in total?

How many calculations did you do?

Was there a more efficient way?

Holly has completed this subtraction incorrectly

$$\begin{array}{r} 28701 \\ - 7621 \\ \hline 21180 \end{array}$$

Explain the mistake to Holly and correct it for her.

How can you help at home?

- ▶ Fluency practise
 - ▶ Use maths in everyday life.
 - ▶ Ask your child how they worked a problem out.
 - ▶ NEVER say 'I don't do Maths' or 'I wasn't good at maths when I was at school.'
 - ▶ Make maths FUN!
- ▶ One extra note – please help your child learn their times tables!