St Augustine's Progression in Calculations Policy Year 1 to Year 6

Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **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.

Introduction

Written methods of calculations are based on mental strategies. Each of the operations builds on mental skills which provide the foundation for jottings and informal written methods of recording. Skills need to be taught, practised and reviewed constantly. These skills lead on to more formal written methods of calculation.

Strategies for calculation need to be represented by models and images to support, develop and secure understanding. This, in turn, builds fluency. When teaching a new strategy it is important to start with numbers that the child can easily manipulate so that they can understand the methodology.

The transition between stages should not be hurried as not all children will be ready to move on to the next stage at the same time, therefore the progression in this document is outlined in stages. Previous stages may need to be revisited to consolidate understanding when introducing a new strategy.

A sound understanding of the number system is essential for children to carry out calculations efficiently and accurately.

Magnitude of Calculations

Year 1 – O + O, O + T0 (numbers up to 20), 0 – 0, TO – O (numbers up to 20), O x O, 0 ÷ 0

Year 2 - TO + O, TO + multiples of 10, TO + TO, O + O + O, TO - O, TO – tens, TO – TO, TO x O, O ÷ O

Year 3 – add numbers with up to three-digits, HTO + multiples of 10, HTO + multiples of 100, subtract numbers up to three-digits, HTO – O, HTO – multiples of 10, HTO – multiples of 100, HTO – HTO, TO x O, TO ÷ O

Year 4 - add and subtract numbers with up to four-digits, ThHTO + ThHTO, ThHTO - ThHTO, add and subtract decimals with up to two decimal places in the context of money, multiply three numbers together, TO x O, HTO x O, TO x O, multiply by zero and one, TO ÷ O, HTU ÷ O

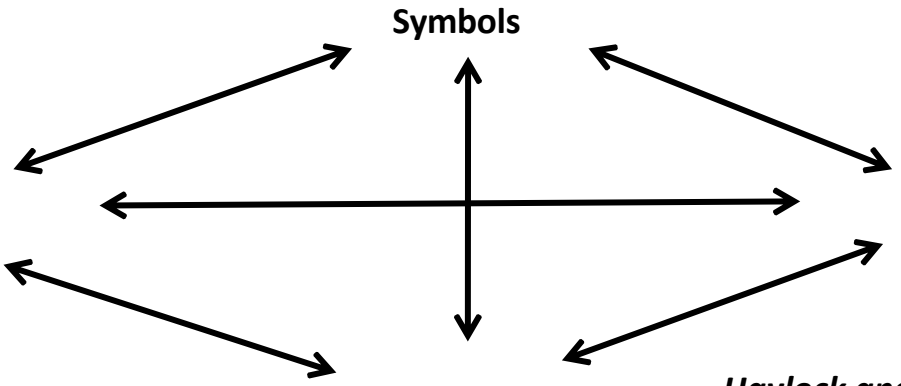
Year 5 – add and subtract numbers with more than four-digits, add and subtract decimals with up to three decimal places, ThHTO x UO ThHTO x TO, HTO x TO, multiply whole numbers and decimals with up to three-decimal places by 10, 100 and 1000, divide numbers with up to four-digits by O (including remainders as fractions and decimals and rounding according to the context)

Year 6 - add and subtract numbers with more than four-digits, add and subtract decimals with up to three decimal places, multiply numbers with up to four-digits by TO, multiply numbers with up to two-decimal places by a whole number, divide numbers up to four-digits by TO (interpreting remainder according to the context), divide decimals up to two-decimal places by O or TO

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. … pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

National Curriculum 2014

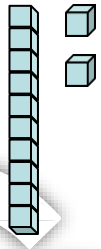
Structuring Learning



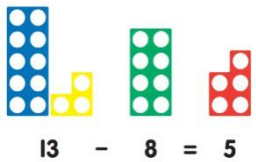
Haylock and Cockburn (2008)

Children <u>must</u> have concrete experiences that enable them to create visual images. They should be encouraged to articulate their learning and to become pattern spotters.

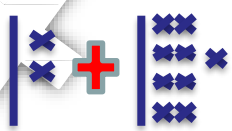
Active/concrete



Communicating Mathematically



Visual



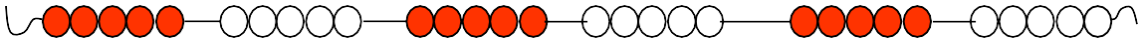
Pattern Spotting

13 - 8

Abstract

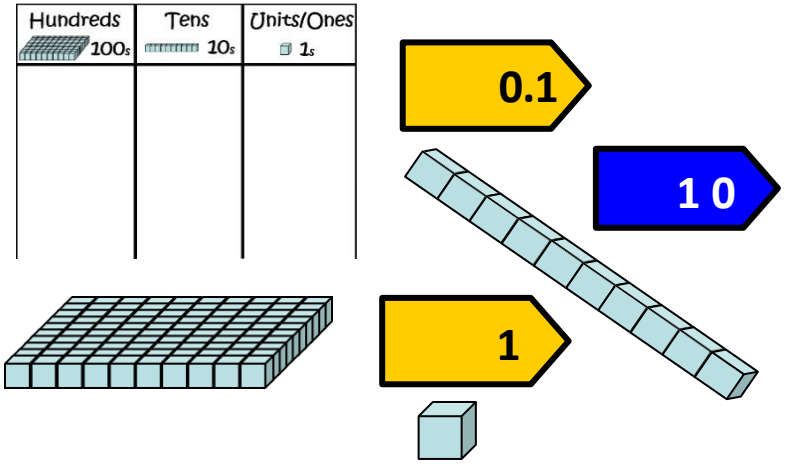
12 + 19

bead string



count stick

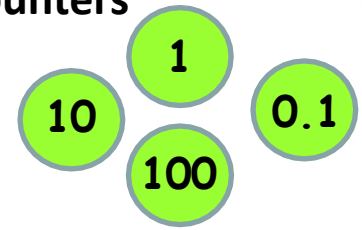
place value apparatus



Multilink

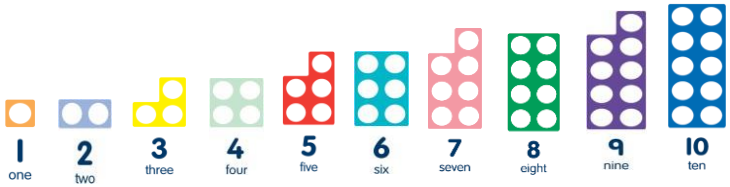
Number fans

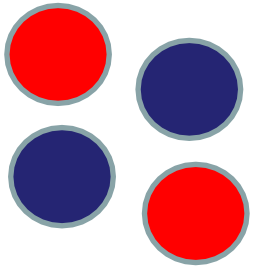
place value counters



Cuisenaire

Numicon

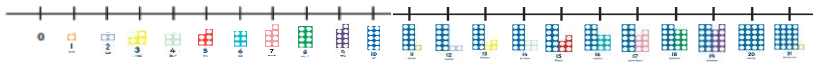




double sided counters

number grids 100 and 200

number line

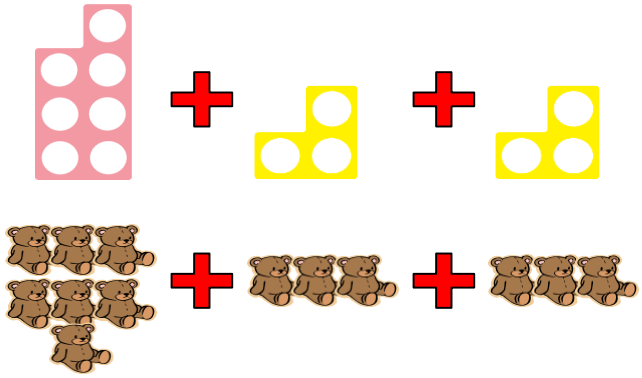


Structures of Addition (Haylock and Cockburn 2008)

Children should experience problems with all the different addition structures in a range of practical and relevant contexts e.g. money and measurement

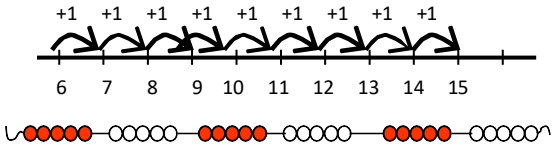
Aggregation

Union of two sets
How many/much altogether?
The total



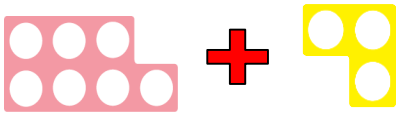
Augmentation

Start at and count on
Increase by
Go up by

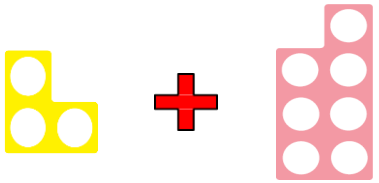


Commutative law

Understand addition can be done in any order
Start with bigger number when counting on
(Explain to children that subtraction does not have this property)



is the same as/equal to (=)



Addition

Pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. Addition and subtraction should be taught together.

End of Year Expectations

Year 1

0 + 0
TO + 0

} Numbers up to 20

(including adding zero)
Children must experience combining two, **and then more than two**, groups of objects using counting on and the language of addition e.g. add, plus
Children must experience increasing numbers e.g. what is two more than seven ?

Children should solve one step problems and missing number problems.

Compare quantities to say how many less and/or how many more

Year 2

Children should be able to partition numbers in different ways e.g. as 2+2+2+1 or 5+3 or 23 as 20 +3 or 10+13

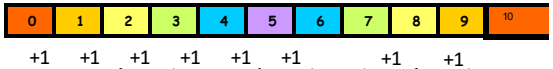
TO + O
TO + tens
T0 + TO
O + O + O

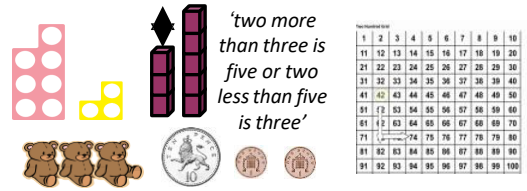
Children should use concrete objects, pictorial representations and add numbers in different contexts e.g. money, measures
ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE** THAN TWO NUMBERS

Children should recognise and use the inverse relationship to solve missing number problems.

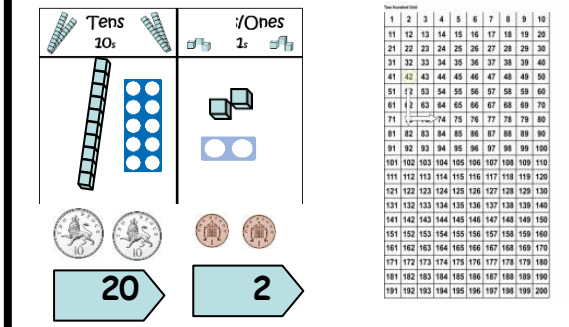
Children should understand the language of sum
Ensure children understand that addition is commutative (can be done in any order)

Possible Concrete and Visual Representations





Use practical resources such as bears, counters, cubes and number lines/hundred grids and progress to a resource such as Numicon to encourage counting in groups rather than ones



Numbered and ***partially numbered*** number lines

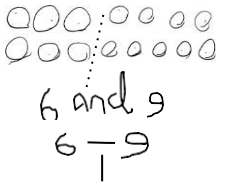
Use Numicon, number grids, place value apparatus/Dienes, place value grids, place value cards, Encourage children to partition numbers rather than counting in ones.

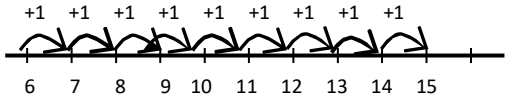
Teacher Modelling/Children's Recording

If using Numicon, children could use printed Numicon icons and stick these in - progressing to recording number sentences alongside

Children may record pictorially progressing to recording number sentences alongside

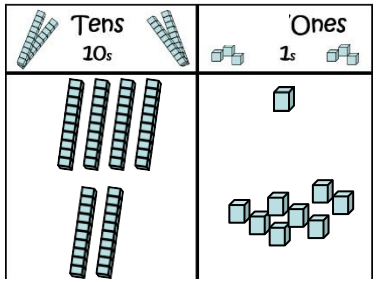
Example





Children apply, develop and secure their understanding of place value

Use jottings and record number sentences



41
+
28

40 + 20 = 60

1 + 8 = 9

60 + 9 = 69

Fluency

Count forwards, to and across 100, beginning with 0 or 1 or from any given number

Switch count between tens and ones e.g. 10, 20, 30, 31, 32, 33 ...

Represent and use number bonds up to 20 (establish addition and subtraction as related operations)

Find one more than a number

Find ten more than a number

Count in multiples of 2s, 5s and 10s starting on multiples to highlight pattern recognition

Vocabulary: count on, add, and, plus, more, sum, total, altogether,

Show increasing fluency in deriving pairs of numbers up to 10 and then up to 20

Use knowledge to derive and use number facts up to 100

Add numbers mentally including TO + O, TO + tens, TO + TO, O + O + O

Vocabulary: count on, add, and, addition, plus, more, sum, total, altogether,

St Augustine's

End of Year Expectations

Year 3

Add numbers with up to three-digits

(leading to formal written column method)

HTO + multiples of 10

HTO + multiples of 100

ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS WITH DIFFERING NUMBERS OF DIGITS

Children should partition numbers, up to 1000, in different ways

e.g. 100 + 40 + 6 or 100 + 30 + 16

Solve problems in different contexts including missing number problems

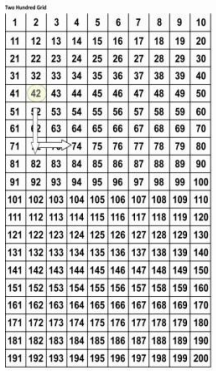
Year 4

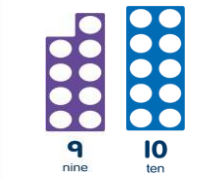
Add numbers with up to four-digits (formal written column method) including numbers with up to two decimal places in the context of money

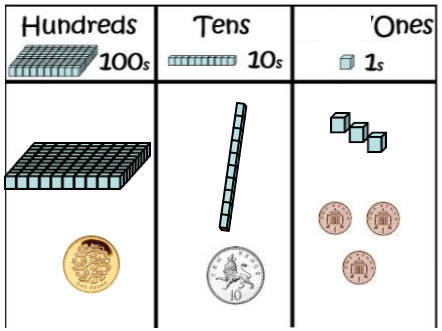
ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

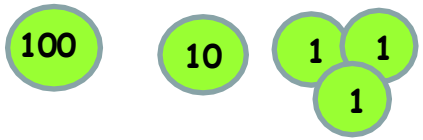
Solve two-step problems in different contexts including missing number problems

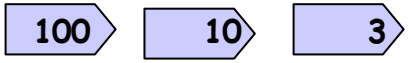
Possible Concrete and Visual Representations



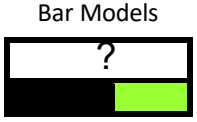


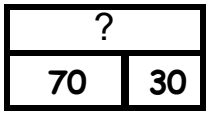


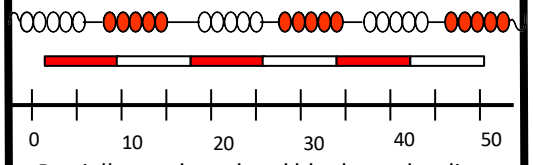




Bar Models







Partially numbered and blank number lines

Teacher Modelling/Children's Recording

Children apply, develop and secure their understanding of place value and begin to record in columns

Manipulatives SHOULD be used alongside algorithms

Column addition (no exchanging) with up to three-digits

```
 40 +  1
 20 +  8
 60 +  9 = 69
```

Expanded recording without exchange

```
 40 +  3
 20 +  8
 60 + 11
 10 +  1   = 71
```

Expanded recording with exchange

```
100 + 40 + 1
100 + 20 + 8
200 + 60 + 9 = 269
```

Expanded recording

```
  H T O
  1 4 1
+ 1 2 8
  2 6 9
```

```
  1. 4 1
+ 1. 2 8
  2, 6 9
```

Compact (column) recording

```
  700 +  80 +  9
+ 600 +  40 +  2
 1300 + 120 + 11 = 1431
  100    10
```

Column addition (with exchanging)

```
  H T O
  7 8 9
+ 6 4 2
  1 4 3 1
    1 1
```

```
  £ 7. 8 9
+ £ 6. 4 2
  £ 1 4. 3 1
      1 1
```

Add decimals in the context of money

Compact (column) recording

Fluency

Count in ones, tens and hundreds maintaining fluency through varied and frequent practice

Count from 0 in multiples of 4, 8, 50 and 100

Find 10 or 100 more than a number

Mentally add HTO + ones, HTO + tens, HTO + hundreds

Perform mental calculations with two-digit numbers, the answer could exceed 100

Vocabulary: count on, add, and, addition, addend addend, plus, more, sum, total, altogether,

Count in 6s, 7s, 9s, 25s and 100s

Find 1000 more than a number

Perform mental calculations with increasingly large numbers to aid fluency

Vocabulary: count on, add, and, addition,addend, plus, more, sum, total, altogether, increase

Addition

Pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. Addition and subtraction should be taught together.

End of Year Expectations

Year 5

Add numbers with more than four-digits and decimals up to three places

(formal written column method)

ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

Solve addition (and subtraction) multi-step problems selecting and justifying methods

Practise mental calculations with increasingly large numbers

Year 6

Add numbers with more than four-digits and decimals up to three places

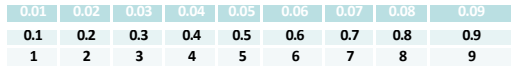
(formal written column method)

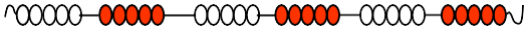
ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS, INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

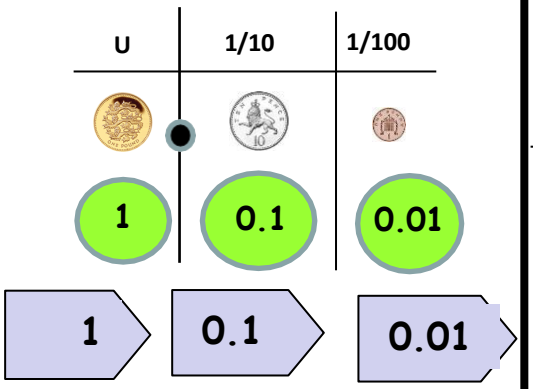
Solve more complex calculations mentally

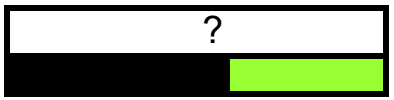
Solve addition (and subtraction) multi-step problems in contexts, deciding which operations and methods to use and why

Possible Concrete and Visual Representations

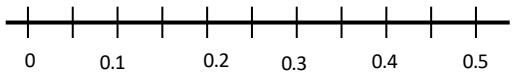








Bar Models



Partially numbered and blank number lines

Teacher Modelling/Children's Recording

Manipulatives could be used alongside algorithms

```
  2141
+ 1128
------
  3269
```

```
  21.41
+  1.12
   0.35
-------
  32.88
```

Column addition (no exchanging)

```
  5189
+ 3128
------
  8317
   1
```

```
  51.89
+  3.128
--------
  55.018
   1 1
```

Column addition (with exchanging)

Addition with decimals up to three decimal places including in different contexts e.g. money and measures

Fluency

Count forwards in powers of ten up to 100000

Count forwards in positive and negative whole numbers through zero

Practise mental calculations with increasingly large numbers

Practise fluency of written methods

Vocabulary: count on, add, and, addition,addend, plus, more, sum, total, altogether, increase

Count in tens and hundreds increasing fluency of order and place value

Perform increasingly complex mental calculations and those with increasingly large numbers to aid fluency

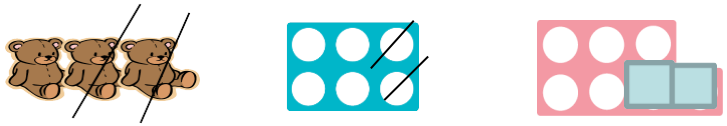
Vocabulary: count on, add, and, addition,addend, plus, more, sum, total, altogether, increase

Structures of Subtraction (Haylock and Cockburn 2008)

Children should experience problems with all the different subtraction structures in a range of practical and relevant contexts e.g. money and measurement

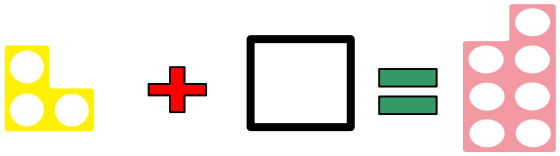
Partitioning

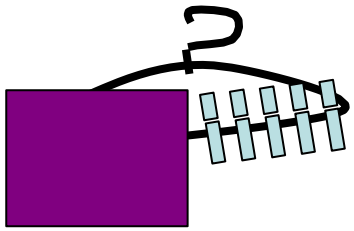
Take away
… how many left?
How many are not?
How many do not?



Inverse-of-addition

What must be added?
How many (much) more needed?

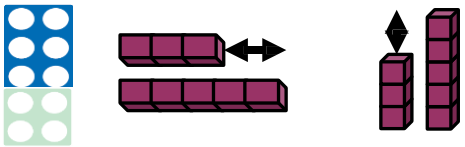




There are ten pegs on the hanger – how many are covered?

Comparison

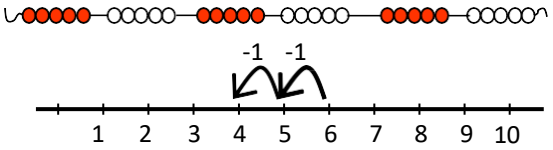
What is the difference?
How many more?
How many less (fewer)?
How much greater?
How much smaller?



'two more than three is five or two less than five is three'

Reduction

Start at and reduce by
Count back by
Go down by



Subtraction

Pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. Addition and subtraction should be taught together.

End of Year Expectations

Year 1

O- O

TO - O

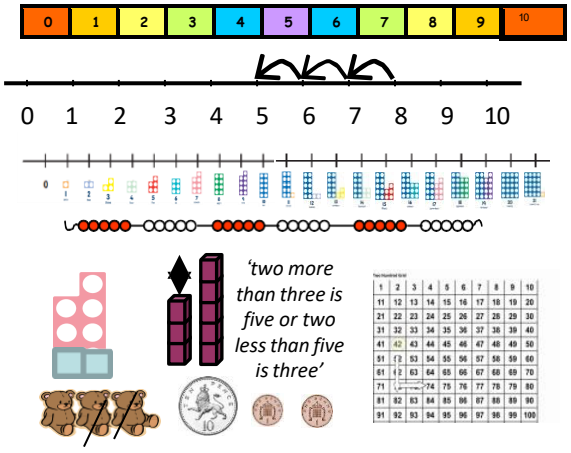
Numbers up to 20

(including subtracting zero)

Understand subtraction as taking away
What is … less than …?)

Compare quantities to say how many less and/or how many more

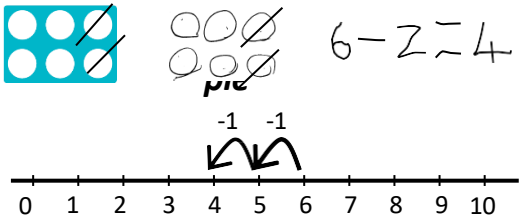
Possible Concrete and Visual Representations



Use practical resources such as bears, counters, cubes and number lines/hundred grids and progress to a resource such as Numicon to encourage counting back in groups rather than ones

Teacher Modelling/Children's Recording

Children may begin recording pictorially progressing to recording number sentences alongside



Children could use printed Numicon icons and stick these in, again progressing to recording number sentences alongside

Fluency

Count backwards (including crossing 100) any given number

Switch count between ones and tens e.g. 33, 32, 31, 30, 20, 10

Represent and use subtraction facts linked to number bonds up to 20 (establish addition and subtraction as related operations)

Find one less than a number

Find ten less than a number

Count back in multiples of 2s, 5s and 10s starting on multiples to highlight pattern

Vocabulary:, leave, take away, fewer, subtract, minus, count back, difference between

Year 2

TO - O

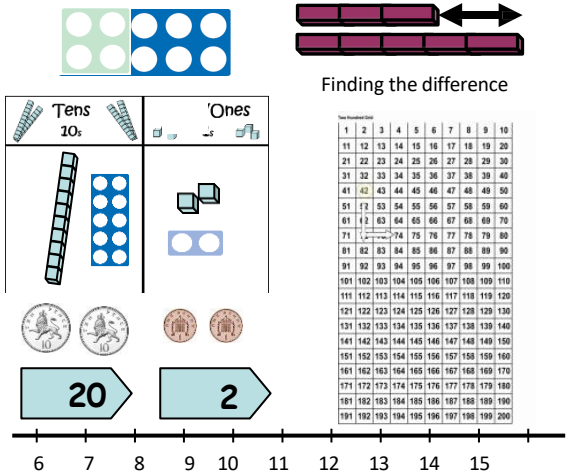
TO - tens

TO - TO

Understand subtraction as taking away **and** finding the difference

Ensure children understand that subtraction is not commutative (can not be done in any order)

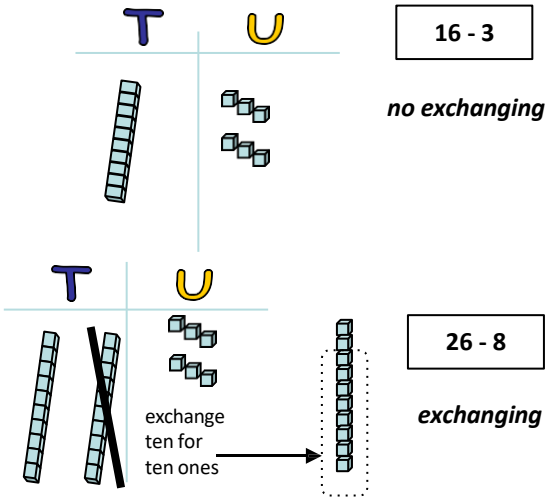
Children should be able to partition numbers in different ways



Numbered and ***partially numbered*** number lines

Children should use concrete materials and pictorial representations, and use numbers in different contexts e,g, money and measures, Encourage children to partition numbers rather than counting in ones.

Children apply, develop and secure their understanding of place value and begin to record using jottings and number sentences



Practise addition and subtraction facts to 20

Show increasing fluency in deriving subtraction facts for numbers up to 10 and then up to 20

Use known facts to 20 to derive new facts e.g. 3 + 7 – 30 + 70

Use knowledge to derive and use subtraction number facts up to 100

Vocabulary: subtraction, leave, take away, fewer, subtract, minus, count back, difference between

Subtraction

Pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly. Addition and subtraction should be taught together.

End of Year Expectations

Year 3

Subtract numbers with up to three-digits

(formal written column method)

HTO – O

HTO – multiples of 10

HTO – multiples of 100

HTO – HTO

Children apply, develop and secure their understanding of place value and begin to record in columns

Year 4

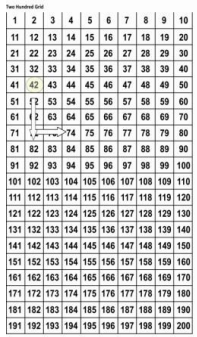
Subtract numbers with up to four-digits including up to two decimal places in the context of money

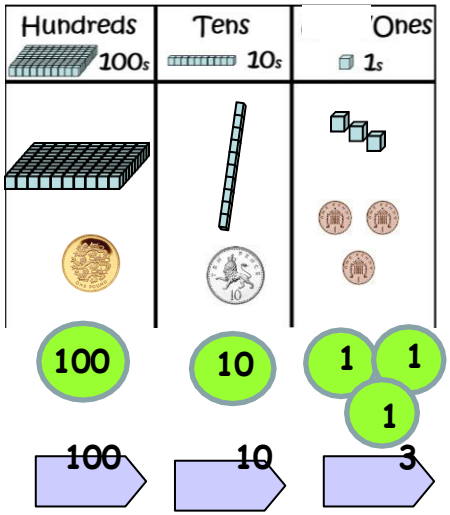
(formal written column method)

Understand subtraction as the inverse of addition

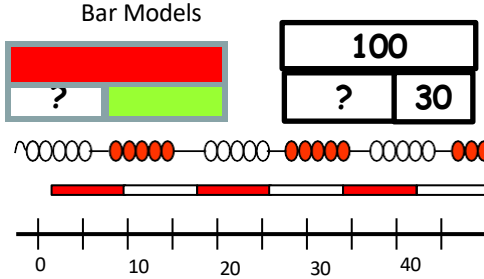
Solve two-step problems deciding upon the appropriate operations and methods and justifying choices made

Possible Concrete and Visual Representations





Bar Models



Teacher Modelling/ Children's Recording

Children SHOULD use manipulatives alongside algorithms to transition between practical and abstract

no exchanging

68 - 23

60 8

− 20 3

40 and 5 = 45

with exchanging

63 - 28

~~50~~ 60 10 + 3

− 20 8

30 and 5 = 35

Column subtraction (no exchanging)

148 -121

100 40 8

− 100 20 1

20 and 7 = 27

148
− 121
27

£1.48
− £1.21
£0.27

Column subtraction (with exchanging)

600 100 + 10 10 + 3

~~700~~ ~~20~~ 3

− 300 60 7

300 and 50 and 6 = 356

723 -367

6 11 1
7 2 3
− 3 6 7
3 5 6

6 11 1
£7.2 3
− £3.6 7
£3.56

Ensure children can solve calculations where zero is a place holder

Fluency

Count back in ones, tens and hundreds maintaining fluency through varied and frequent practice

Switch count between hundreds, tens and ones

e.g 500, 400, 300, 290, 280, 270, 269, 268, 267

Mentally add HTU + ones, HTU + tens, HTU + hundreds

Perform mental calculations with two-digit numbers, the answer could exceed 100

Find ten and a hundred less than a number with up to three-digits

Vocabulary: subtraction, leave, take away, fewer, subtract, minus, count back, difference between, minuend, subtrahend.

Count back in 6, 7, 9, 25 and 1000

Count back through zero to include negative numbers

Find 1000 less than a number

Continue to practise mental calculations with increasingly large numbers to aid fluency

Vocabulary: subtraction, leave, take away, fewer, subtract, minus, count back, difference between, minuend, subtrahend.

Subtraction

Pupils develop the concept of addition and subtraction and are enabled to use these operations flexibly.
Addition and subtraction should be taught together.

End of Year Expectations

Year 5

Subtract numbers with more than four-digits

Subtract numbers with up to three decimal places

Subtract larger numbers with more than four digits and those involving numbers up to three decimal places

(formal written column method)

ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

Solve (addition) and subtraction multi-step problems selecting and justifying methods

Year 6

Subtract numbers with more than four-digits

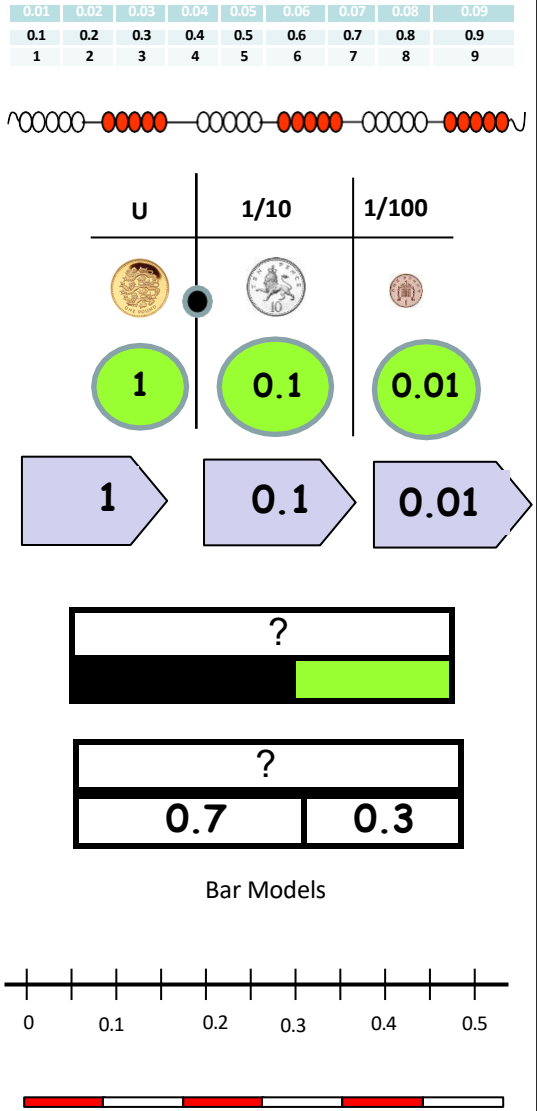
Subtract numbers with up to three decimal places

Subtract multi-digit numbers including numbers with up to three decimal places

(formal written column method)

ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

Solve (addition) and subtraction multi-step problems in contexts, deciding which operations and methods to use and why



Teacher Modelling/ Children's Recording

Children might use manipulatives alongside algorithms

Column subtraction (no exchanging)

```
 13548
-12128
------
  1420
```

Column subtraction (with exchanging)

```
    2  13 11  1
   1 3  4 2  3
-  1  2  6  7  8
-----------------
         7  4  5
```

Ensure children can solve calculations where zero is a place holder

```
  1.4 8
- 1.2 1
-------
  0. 2 7
```

Column subtraction (no exchanging)

Column subtraction (with exchanging)

```
   6  11  1
   7 . 2  3
-  3 . 6  7
-----------
   3 . 5  6
```

Subtraction with decimals up to three decimal places including in different contexts e.g. money and measures

Fluency

Count backwards in powers of ten up to one million

Count backwards in positive and negative whole numbers through zero

Practise mental calculations with increasingly large numbers

Vocabulary: subtraction, leave, take away, fewer, subtract, minus, count back, difference between,minuend, subtrahend.

Undertake mental calculations with increasingly large numbers and more complex calculations

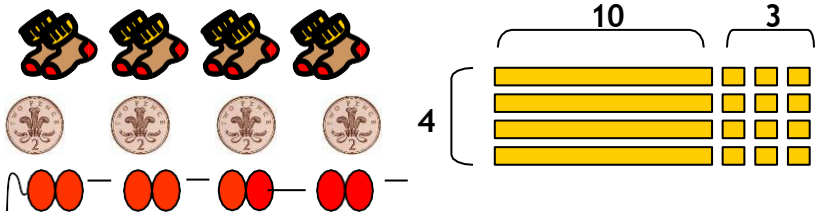
Vocabulary: subtraction, leave, take away, fewer, subtract, minus, count back, difference between, minuend, subtrahend.

Structures of Multiplication (Haylock and Cockburn 2008)

Children should experience problems with all the different multiplication structures in a range of practical and relevant contexts e.g. money and measurement

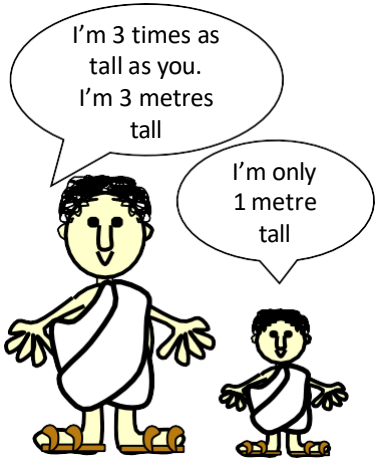
Repeated addition

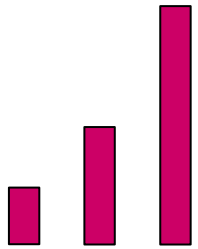
So many lots (sets) of so many
How many (how much) altogether
Per, each



Scaling

Scaling, scale factor
Doubling, trebling
So many times bigger than (longer than, heavier than, and so on)
So many times as much as (or as many as)





scaling with Cuisenaire

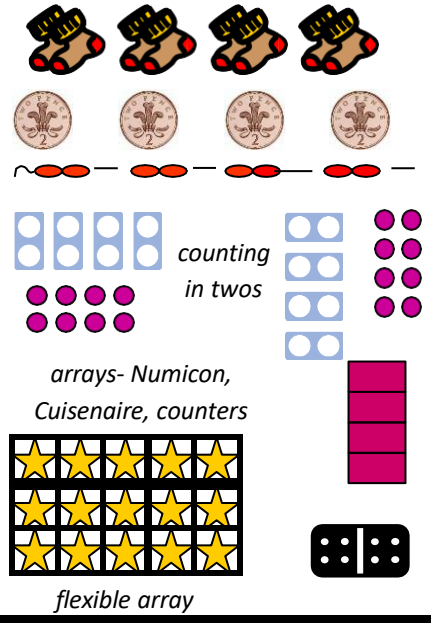
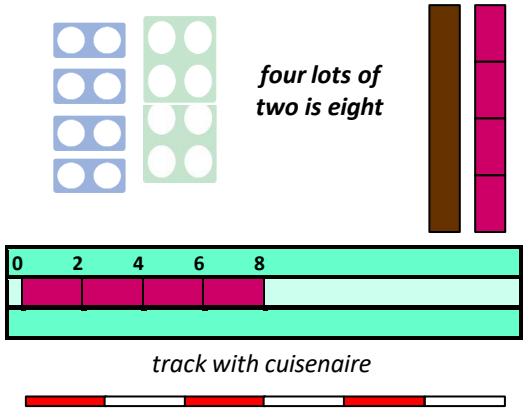
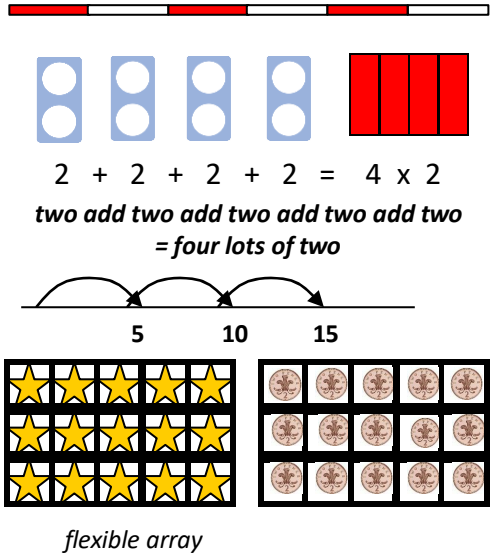
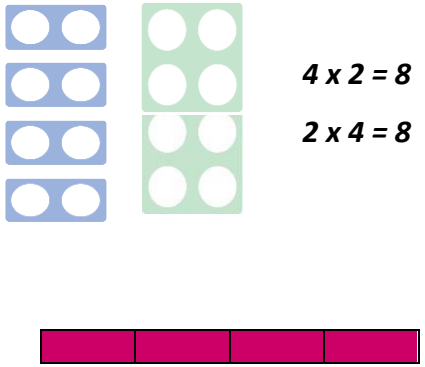
Commutative law

Scaling, scale factor
Doubling, trebling
So many times bigger than (longer than, heavier than, and so on)
So many times as much as (or as many as)

a x b and b x a are equal

4 x 2 is the same as/equal to 2 x 4

Multiplication – refer to structures of multiplication

End of Year Expectations	Possible concrete and visual representation	Children's Recording	Fluency
Year 1 O x O Numbers up to 20 Solve single step practical problems involving multiplication Use concrete objects, pictorial representations Make connections between arrays, number patterns and counting in twos, fives and tens Double numbers and quantities		Practical only e.g. link to small world Using concrete objects, pictorial representations and arrays with the support of an adult – take photographs/draw pictures – if using Numicon small icons could be stuck in 	Count in twos, fives and tens from different multiples e.g. 6, 8, 10, 12 etc Emphasise number patterns Double number and quantities **Vocabulary: lots of, multiplied, double, groups of, array, multiply, times, multiplication**
Year 2 TO x O Understand multiplication as repeated addition Calculate mathematical statements for multiplication within the tables and write them using symbols Understand and solve problems involving arrays Ensure children understand that multiplication is commutative (can be done in any order) Understand that multiplication and division are inverse operations		Record practical work as number sentences 	Count in twos, fives from zero and tens from any number e.g. 6, 8, 10, 12 etc Emphasise number patterns Introduction to multiplication tables. Practise to become fluent in multiplication facts for 2, 5 and 10 Solve multiplication problems mentally **Vocabulary: lots of, multiplied, double, groups of, array, multiply, times, multiplication**

Multiplication – multiplication and division should be taught together– refer to structures of multiplication

End of Year Expectations

Year 3

TO x O

Develop reliable written methods

Understand and solve scaling problems

Solve problems involving multiplication including correspondence

Year 4

TO x O

HTO x O

Multiplying three numbers

Solve two-step problems

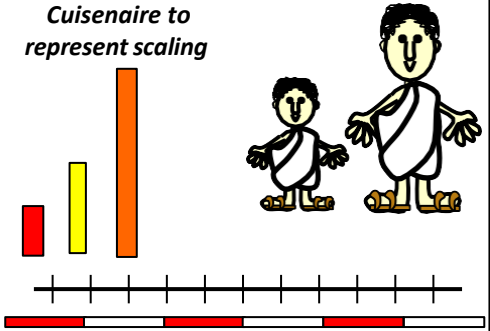
Multiplying by 0 and by 1

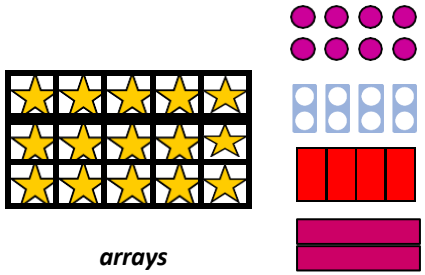
Develop fluency in short multiplication using formal written layout

Solve problems involving multiplication including using the distributive law, integer scaling problems and harder correspondence problems

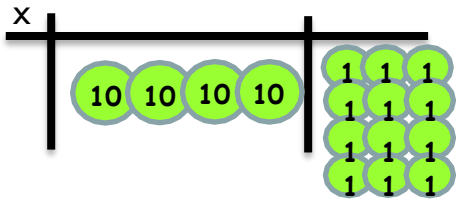
Possible concrete and visual representation

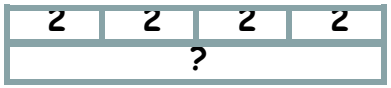
Cuisenaire to represent scaling





arrays



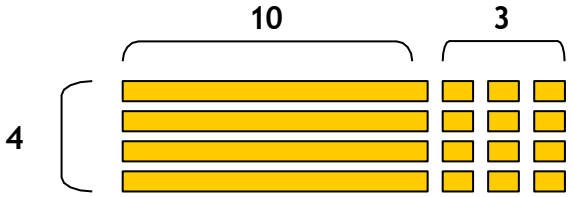


bar models

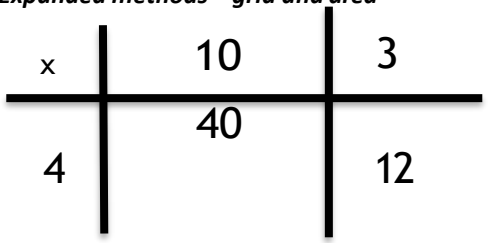
Teacher Modelling/Children's Recording

Children must use manipulatives alongside algorithms

4 x 13 'four lots of thirteen'



Expanded methods – grid and area



40 + 12 = 52

Progressing to developing fluency in short multiplication

$$\begin{array}{r} 13 \\ \times\ 4 \\ \hline 52 \\ \hline 1 \end{array} \qquad \begin{array}{r} 133 \\ \times\ 4 \\ \hline 532 \\ \hline 11 \end{array}$$

Start with digits that are below five so children can practise method without encountering difficulty with multiplication tables

Fluency

Count from 0 in multiples of 4, 8, 50 and 100

Use multiples of 2, 3, 4, 5, 8, 10, 50 and 100

Practise mental recall of multiplication tables – 3, 4 , 6 and 8x times tables

Connect the 2, 4 and 8 times tables using doubling

Develop efficient mental methods using commutativity and multiplication facts to derive related facts e.g. 4 x 4 x 12 = 12 x 4 x 5 = 12 x 20

Vocabulary: lots of, multiplied, double, groups of, array, multiply, times, multiplication, product

Count in multiples of , 7, 9, 25 and 1000

Recall and use multiplication facts up to 12 x 12 (7x, 9x, 11, 12x) with increasing fluency

Derive multiplication facts with up to three-digits

Recognise and use factor pairs and commutativity in mental calculations

Use the distributive law

Combine knowledge of number facts and rules of arithmetic to solve mental and written calculations e.g. 2 x 6 x 5 = 10 x 6

Vocabulary: lots of, multiplied, double, groups of, array, multiply, times, multiplication, product

Multiplication - multiplication and division should be taught together– refer to structures of multiplication

End of Year Expectations

Year 5

Th H T O x O
H T O x T O
Th H T O x T O

Multiply decimals with up to three decimal places

Identify multiples and factors including finding all factor pairs of a number, and common factors of two numbers

Solve problems involving all four operations where larger numbers are used by decomposing them into their factors

Multiply whole numbers and those involving decimals by 10, 100 & 1000

Understand and use multiplication and division as inverses including in problems involving missing numbers and balancing equations

Solve problems involving multiplication and division including scaling by simple fractions

Know and use the vocabulary of prime numbers, prime factors and composite (non-prime)

Recognise and square and cube numbers and associated notation

Year 6

Multiply numbers up to 4-digit x TO

Multiply numbers with up to two decimal places x whole number

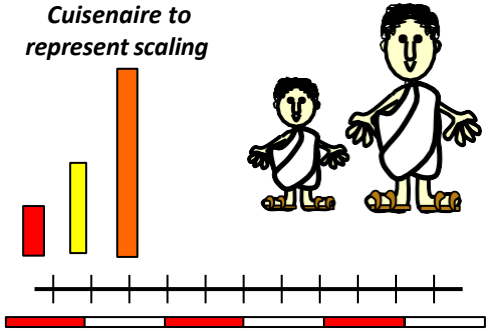
Multiply multi-digit numbers up to four-digits by a two-digit whole number

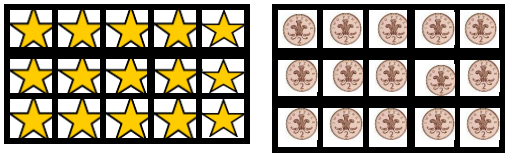
Multiply single –digit numbers with up to two-decimal places by whole numbers

Solve problems involving all four operations

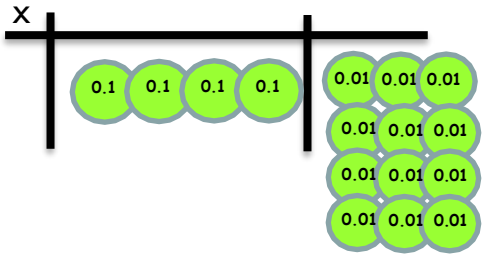
Possible concrete and visual representation

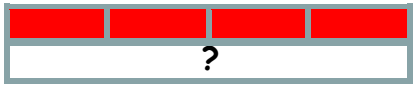
Cuisenaire to represent scaling

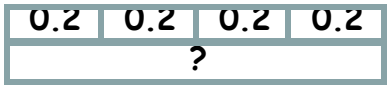




arrays







bar models

Teacher Modelling/Children's Recording

Children might use manipulatives alongside algorithms

Short multiplication

```
1 3 2 4
      x 6
-------
7 9 4 4
-------
1 1 2
```

Short multiplication

```
  3 . 2 4
      x 6
-----------
1 9 . 4 4
-----------
  1   2
```

Long multiplication

```
  1 3 2 4
      x 2 6
-----------
  7 9 4 4
  1 1 2
2 6 4 8 0
-----------
3 4 4 2 4
-----------
  1 1 1
```

Long multiplication

```
    3 . 2 4
      x 2 6
-------------
  1 9 . 4 4
    1   2
6 4 . 8 0
-------------
8 4 . 2 4
-------------
  1   1
```

Fluency

Count forwards in steps of powers of 10 from any given number up to 1 000 000

Practise and extend use of formal written method of short multiplication

Apply all multiplication tables frequently. Commit them to memory and use them confidently to make larger calculations

Multiply numbers mentally drawing upon known facts

Vocabulary: lots of, multiplied, double, groups of, array, multiply, times, multiplication, product

Undertake mental calculations with increasingly large numbers

Continue to use all multiplication tables to calculate mathematical statements in order to maintain fluency

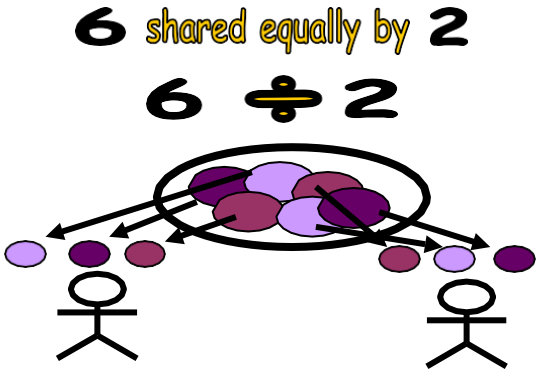
Vocabulary: lots of, multiplied, product, double, groups of, array, multiply, times, multiplication

Structures for Division (Haylock and Cockburn 2008)

Children should experience problems with the different division structures in a range of practical and relevant contexts e.g. money and measurement

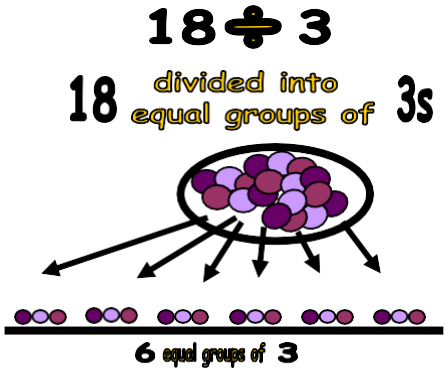
Equal-sharing

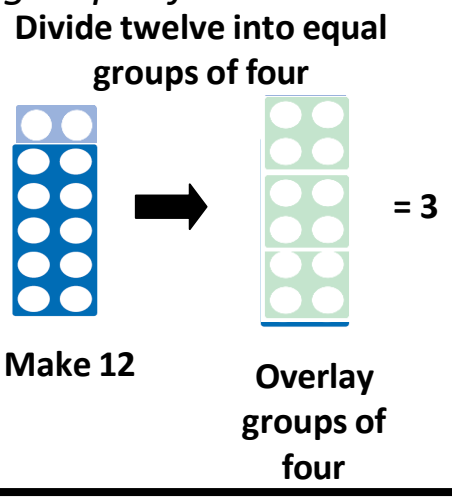
Sharing equally between
How many (much) each?



Inverse of multiplication (Grouping)

So many lots (sets/groups) of so many
Share equally in to groups of …





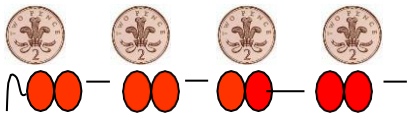
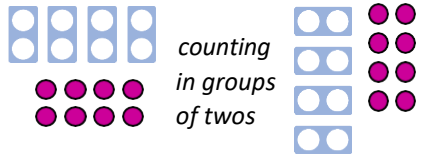
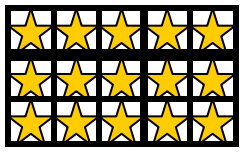
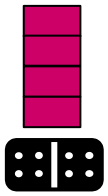
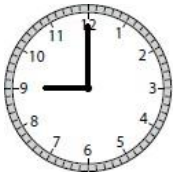
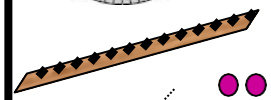
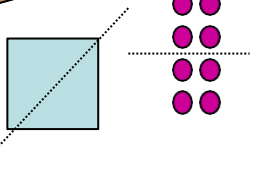
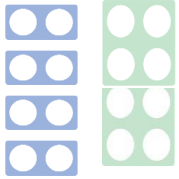
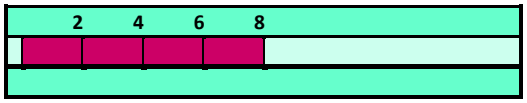
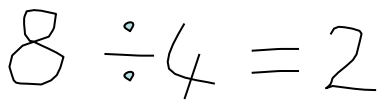
Ratio structure

comparison
inverse of scaling structure of multiplication
scale factor (decrease)

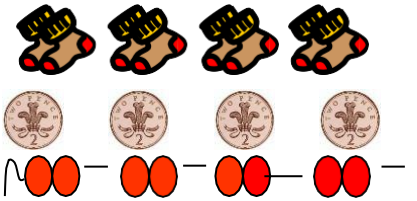
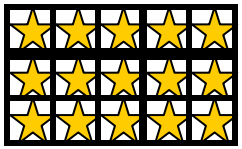
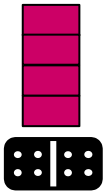
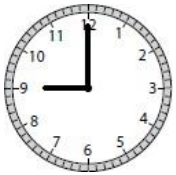
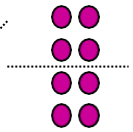
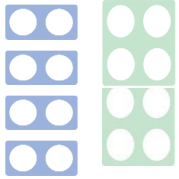
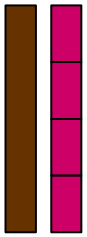
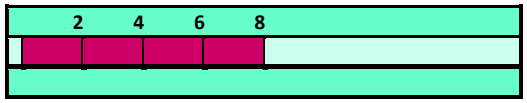
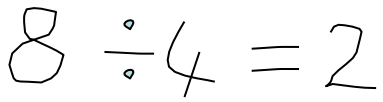
Barney earns three times more than Fred. If Barney earns £900 how much does Fred earn?

Jo's journey to school is three times as long as Ella's. If Jo walks to school in 30 minutes how long does it take Ella?

Division

End of Year Expectations	Possible concrete and visual representation	Teacher Modelling/Children's Recording	Fluency
Year 1 O ÷ O Solve single step practical problems involving division Use concrete objects, pictorial representations Understand division as grouping and sharing Use the language of 'sharing equally between' Find halves and then quarters	   *counting in groups of twos* *arrays- Numicon, Cuisenaire, counters*   *flexible array*  *straw bundles*  *clock face* *½ past/ ¼ to … past* *five minute divisions*   *half a length* *half a shape* *half a group of objects*	Practical only e.g. link to small world Using concrete objects, pictorial representations and arrays with the support of an adult – take photographs/draw pictures – if using Numicon small icons could be stuck in  ***Eight can be divided into four equal groups of 2***  *track with cuisenaire*	Count in twos, fives and tens from different multiples e.g. 6, 8, 10, 12 etc Emphasise patterns Double numbers and quantities Find simple fractions of objects, numbers and quantities
Year 2 O ÷ O Solve single step practical problems involving division Use concrete objects, pictorial representations Understand division as grouping Find halves and then quarters Work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete quantities e.g. marbles, sweets, cherries and continuous quantities e.g. cakes, pizzas, chocolate bars and relate to fractions and measures		Record as number sentences using ÷ and = 8 ÷ 4 Eight divided into four equal groups = two in each group  	Count back in twos, fives from zero and tens from any number e.g. 12, 10, 8, 6 etc Emphasise patterns Connect ten times table to place value and five times table to divisions on a clock face Introduction to multiplication tables. Practise to become fluent in division facts for 2, 5 and 10 Solve division problems involving grouping and sharing

Division - multiplication and division should be taught together– refer to structures of division

End of Year Expectations	Possible concrete and visual representation	Children's Recording	Fluency
Year 1 O ÷ O Solve single step practical problems involving division Use concrete objects, pictorial representations Understand division as grouping and sharing Use the language of 'sharing equally between' Find halves and then quarters	 *counting in groups of twos* *arrays- Numicon, Cuisenaire, counters*   *flexible array*  *straw bundles*  *clock face* *½ past/ ¼ to … past* *five minute divisions*   *half a length* *half a shape* *half a group of objects*	Practical only e.g. link to small world Using concrete objects, pictorial representations and arrays with the support of an adult – take photographs/draw pictures – if using Numicon small icons could be stuck in  ***Eight can be divided into four equal groups of 2***   *track with cuisenaire*	Count in twos, fives and tens from different multiples e.g. 6, 8, 10, 12 etc Emphasise patterns Find simple fractions of objects, numbers and quantities **Vocabulary: equal groups of, divided by, lots of, divide, division, halve, half, share equally**
Year 2 O ÷ O Solve single step practical problems involving division Use concrete objects, pictorial representations Understand division as grouping Find halves and then quarters Work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete quantities e.g. marbles, sweets, cherries and continuous quantities e.g. cakes, pizzas, chocolate bars and relate to fractions and measures		Record as number sentences using ÷ and = 8 ÷ 4 Eight divided into four equal groups = two in each group  	Count back in twos, threes, fives from zero and tens from any number e.g. 12, 10, 8, 6 etc Emphasise patterns Connect ten times table to place value and five times table to divisions on a clock face Introduction to multiplication tables. Practise to become fluent in division facts for 2, 5 and 10 Solve division problems involving grouping and sharing **Vocabulary: equal groups of, divided by, lots of, divide, division, halve, half, share equally**

Division - multiplication and division should be taught together– refer to structures of division

End of Year Expectations

Year 3

TO ÷ O

Develop a reliable written method for division

Solve problems involving missing numbers

Solve problems including those that involve scaling

Recognise, find and name ½ and ¼ of an object, shape or quantity

Understand the link between unit fractions and division

Connect 1/10 to division by 10

Count in tenths

Year 4

TO ÷ O
HTO ÷ O

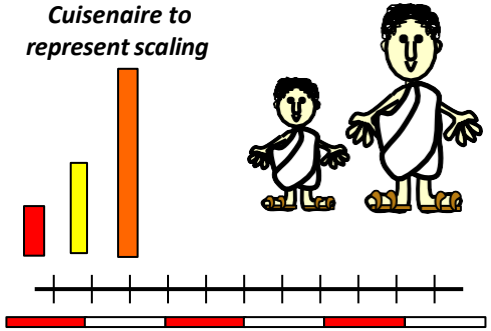
Become fluent in the formal written method of short division with exact answers when dividing by a one-digit number

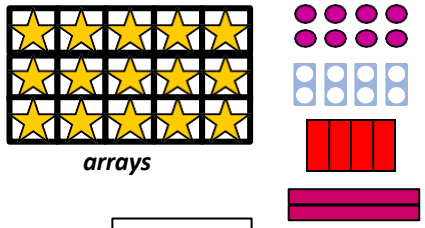
Divide one- or two-digit numbers by 10 or 100, identifying value of digits as tenths or hundredths

Solve two-step problems in different contexts, choosing the appropriate operation, working with increasingly harder numbers including correspondence questions e.g. three cakes shared equally between 10 children

Possible concrete and visual representation

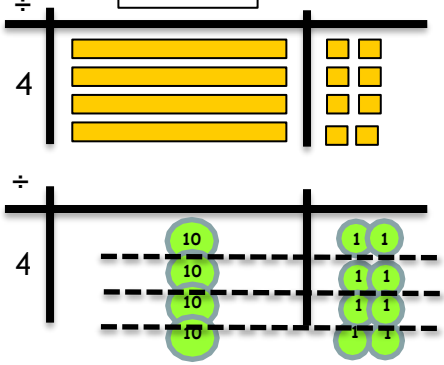
Cuisenaire to represent scaling

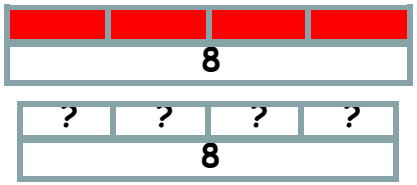




arrays

48 ÷ 4

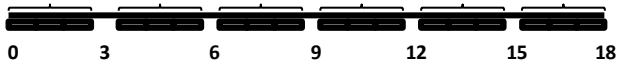




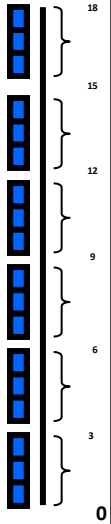
bar models

Teacher Modelling/Children's Recording

Children <u>should</u> use manipulatives alongside algorithms



Repeated subtraction - chunking



Ensure children see/understand the link between grouping on a number line and vertical recording for chunking

95 ÷ 5 = <u>19</u>

95
- 50 (<u>10</u> x 5)
45
- 25 (<u>5</u> x 5)
20
- 20 (<u>4</u> x 5)
0

Fact Box

2 x 5 = 10

5 x 5 = 25

10 x 5 = 50

Progressing to short division- no remainders

560 ÷ 4

÷	1	4	0
4	5	6	0

1

See Appendix 1 – teaching short division with manipulatives

Fluency

Recall and use related division facts for the 3, 4 and 8x tables (Continue to practise other tables)

Write and calculate mathematical statements for division using what is known

Use division facts to derive related division facts e.g. using 6 ÷ 3 = 2 to work out 60 ÷ 3 = 20

Vocabulary: equal groups of, divided by, lots of, divide, divisible by, factor, division, halve, half, share equally, dividend, divisor, quotient

Continue to practise recalling division facts for multiplication tables up to 12 x 12

Practise mental methods and extend this to three-digit numbers for example 200 x 3 = 600 into 600 ÷ 3 = 200

Use place value, known and derived facts to divide mentally, including dividing by 1

Recognise and use factor pairs and commutativity in mental calculations

Vocabulary: equal groups of, divided by, lots of, quotient, divide, divisible by, factor, division, halve, half, share equally, dividend, divisor, quotient.

Division - multiplication and division should be taught together– refer to structures of division

End of Year Expectations

Year 5

Divide numbers with up to 4 digits by Os

Identify factors , including finding all factor pairs of a number, and common factors of two numbers

Practise and extend the formal written method of short division: numbers up to four-digits by a one-digit number and interpret remainders appropriately for the context

Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding as appropriate for the context

Use multiplication and division as inverses

Solve problems involving division including scaling down by simple fractions and problems involving simple rates

Divide whole numbers and those involving decimals by 10, 100 & 1000

Year 6

Divide numbers with up to 4 digits by TO

Divide decimals up to two-decimal places by O or TO

Divide numbers up to 4-digits by a 2-digit whole number using formal written methods of long division, interpret remainders as whole numbers, fractions or by rounding, as appropriate for the context

Divide numbers with up to 2 decimal places by 1-digit and 2-digit whole numbers, initially in practical contexts involving money and measures

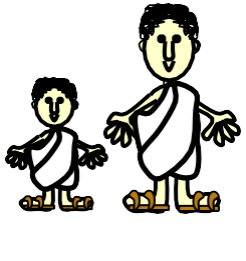
Understand the relationship between unit fractions and division

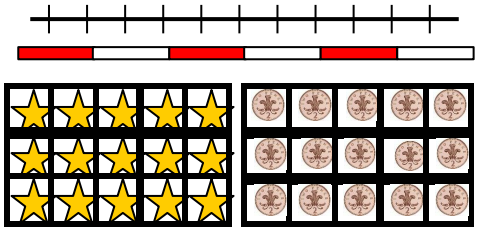
Recognise division calculations as the inverse of multiplication

Solve problems involving division

Possible concrete and visual representation

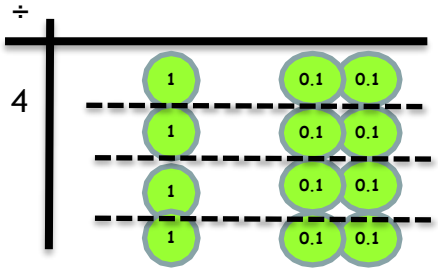
Cuisenaire to represent scaling





arrays

4.8 ÷ 4



bar models

Teacher Modelling/Children's Recording

Children might use manipulatives alongside algorithms

Short division

564 ÷ 5

```
  1 1 2 . 8
      1   4
5 | 5 6 4 . 0
```

remainder as a decimal

See Appendix 1 – teaching short division with manipulatives

Long division

```
  2 3 r 8
24 | 5 6 0
   - 4 8
   -----
     8 0
   - 7 2
   -----
       8
```

remainder as a whole number

560 ÷ 4

without remainder

```
  1 4 0
4 | 5 16 0
```

```
  1 1 2   2/5
5 | 5 6 14
```

remainder as a fraction

560 ÷ 24

```
  2 3   8/24 (1/3)
24 | 5 6 0
   - 4 8
   -----
     8 0
   - 7 2
   -----
       8
```

remainder as a fraction in its lowest form

Fluency

Count backwards in steps of powers of 10 for any given number up to 1 000 000

Count backwards with positive and negative whole numbers through zero

Practise mental calculation with increasingly large numbers

Apply all multiplication tables and related division facts frequently, commit them to memory and use them to confidently to make larger calculations

Vocabulary: groups of, divided by, lots of, left over, quotient, divide, divisible by, factor, remainder, division, halve, half, share, dividend, divisor, quotient.

Practise division for larger numbers, using the formal written methods of short and long division

Continue to use all multiplication tables and division facts to maintain fluency

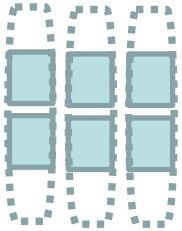
Perform mental calculations, including with mixed operations and larger numbers

Vocabulary: groups of, divided by, lots of, left over, quotient, divide, divisible by, factor, remainder, division, halve, half, share, dividend, divisor, quotient

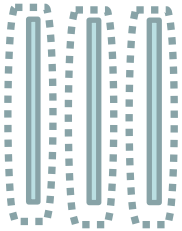
Moving to written algorithms
Short Division – no exchange

÷	2	1	2
3	6	3	6

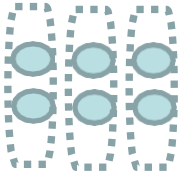
Divide 6 hundreds into 3 equal groups
How many in each group?



Divide 3 tens into 3 equal groups
How many in each group?



Divide 6 ones into 3 equal groups
How many in each group?

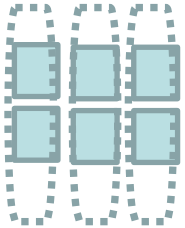


Appendix 1

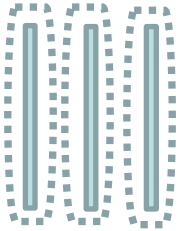
Moving to written algorithms
Short Division – with exchange

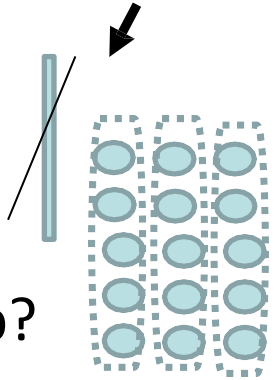
÷	2	1	5
3	6	4	$^{1}5$

Divide 6 hundreds into 3 equal groups
How many in each group?



Divide 4 tens into 3 equal groups
How many in each group?
Exchange the remaining ten into ten ones





Divide 15 ones into 3 equal groups
How many in each group?

Appendix 1