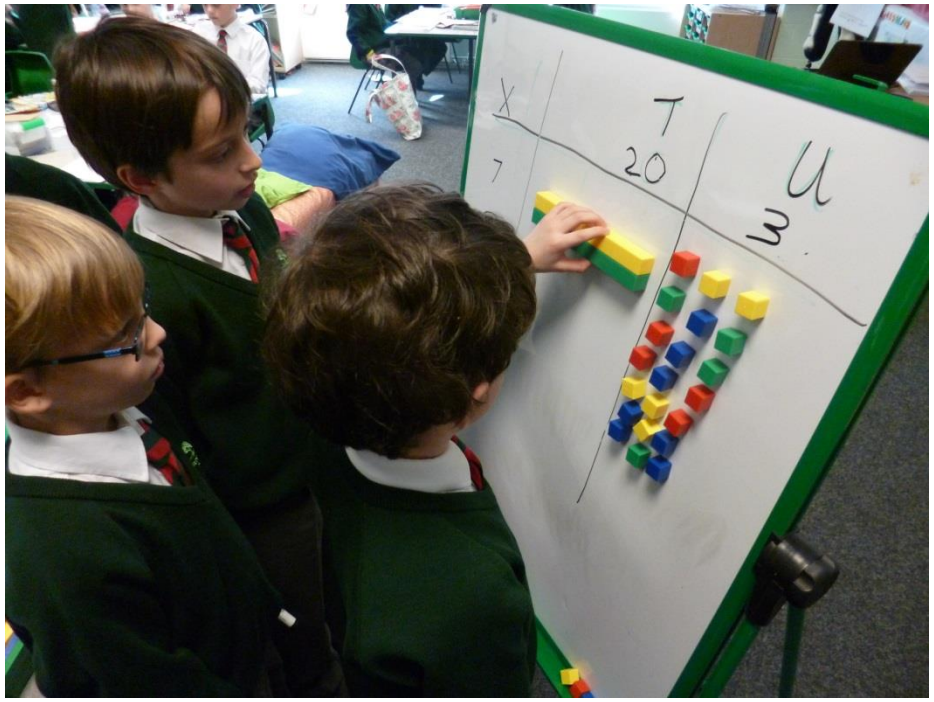
Bushy Hill Junior School

Progression in Multiplication Calculations

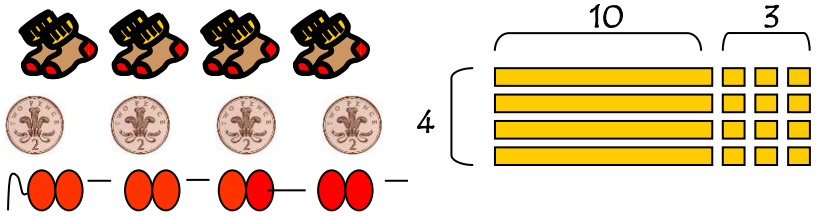


Structures of Multiplication (Haylock and Cockburn 2008)

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

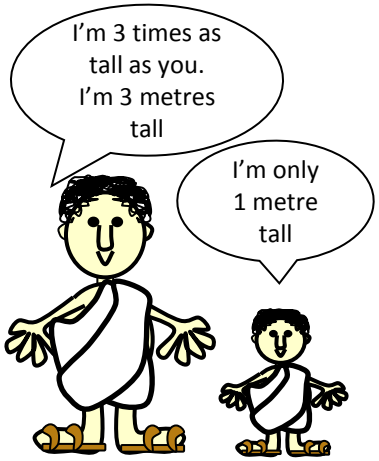
Repeated addition

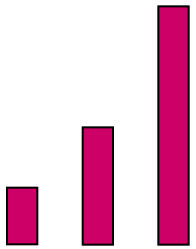
So many lots (sets) of so many
How many (how much) altogether
Per, each



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

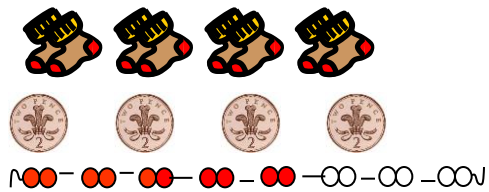
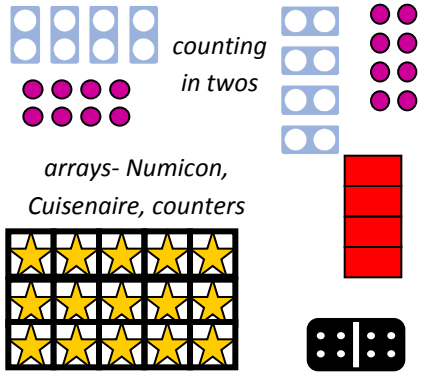
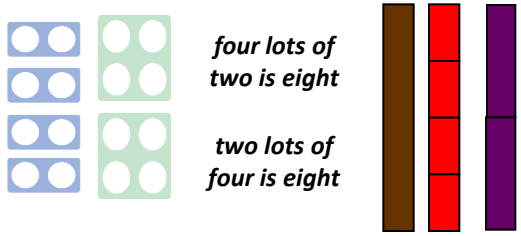
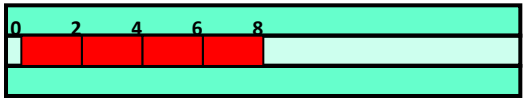
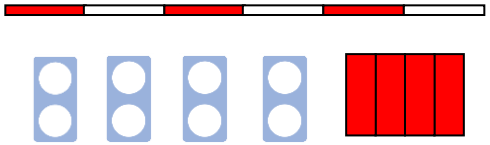
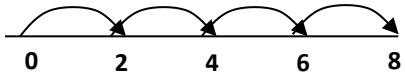
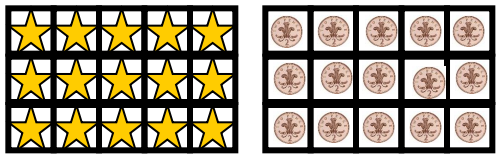
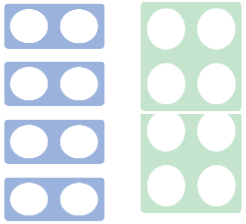
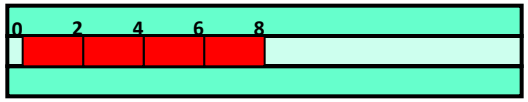
Scaling, scale factor
Doubling, trebling
So many times bigger than (longer than, heavier than, and so on)
So many times as much as (or as many as)

a x b and b x a are equal

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

Multiplication

Pupils develop the concept of multiplication and division and are enabled to use these operations flexibly. Multiplication and division should be taught together.

End of Year Expectations	Possible concrete and visual representation	Children's Recording	Fluency
Year 1 Solve single step practical problems involving multiplication Use concrete objects, pictorial representations to explore grouping Make connections between arrays, number patterns and counting in twos, fives and tens Double numbers and quantities	 *counting in twos*  *arrays- Numicon, Cuisenaire, counters* *flexible array*	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  ***four lots of two is eight*** ***two lots of four is eight***  *track with cuisenaire* 	Count in twos, fives and tens from different multiples e.g. 6, 8, 10, 12 etc Emphasise number patterns Double number and quantities
Year 2 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	 2 + 2 + 2 + 2 = 4 x 2 ***two add two add two add two add two = four lots of two***  0 2 4 6 8  *flexible array*  5 10 15	Record practical work as number sentences  ***4 x 2 = 8*** ***2 x 4 = 8***  	Count in twos, threes, 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

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

End of Year Expectations

Year 3

Develop reliable written methods

Understand and solve scaling problems

Solve problems involving multiplication including correspondence

Year 4

Multiplying three numbers

Solve two-step problems

Multiplying by 0 and by 1

Develop fluency in short multiplication using formal written layout

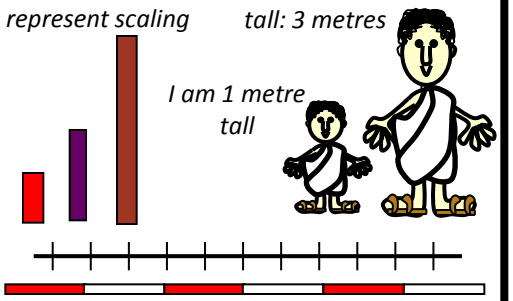
Solve problems involving multiplication including using the distributive law, integer scaling problems and harder correspondence problems

Possible concrete and visual representation

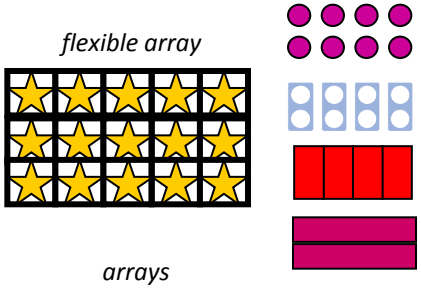
Cuisenaire to represent scaling

Statue is 3 times as tall: 3 metres

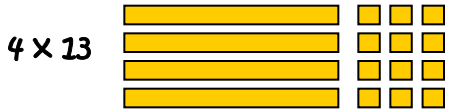
I am 1 metre tall



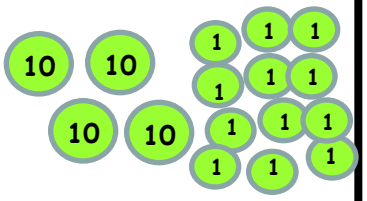
flexible array

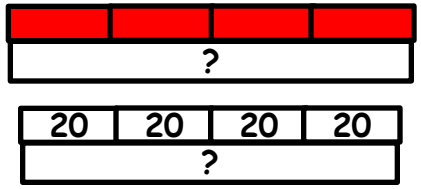


arrays



place value counters



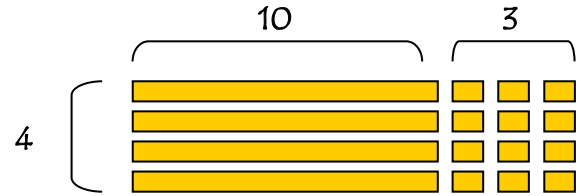


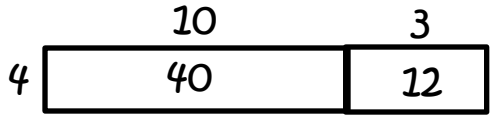
bar models

Teacher Modelling/Children's Recording

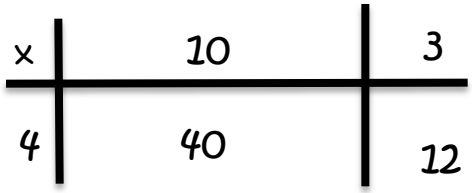
Children must use manipulatives alongside algorithms

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 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

Count in multiples of 6, 7, 9, 25 and 1000

Recall and use multiplication facts up to 12 x 12 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

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

End of Year Expectations

Year 5

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 TU

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

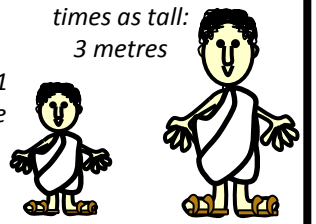
Solve problems involving all four operations

Possible concrete and visual representation

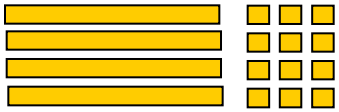
Cuisenaire to represent scaling

Statue is 3 times as tall: 3 metres

I am 1 metre tall

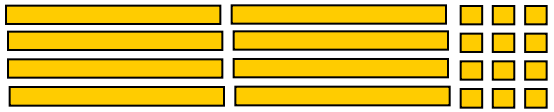


flexible array

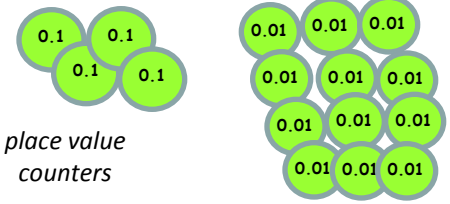


4 x 13

4 x 23



arrays



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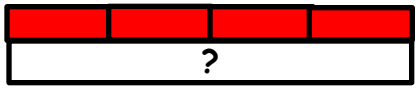
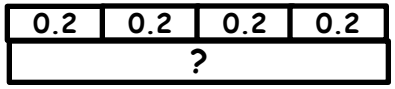
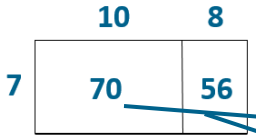


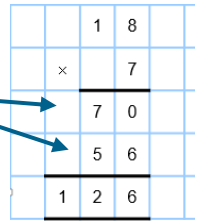


bar models

Teacher Modelling/Children's Recording

Children might use manipulatives alongside algorithms



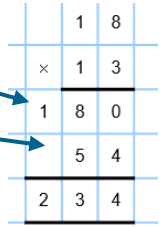


Short multiplication

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

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

x	10	8
10	100	80
3	30	24



Long multiplication

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

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

Undertake mental calculations with increasingly large numbers

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