Christ Church School, Hampstead

A village school in London inspiring ***life in all its fullness***

Maths

Progression in Written Calculation

This calculation policy intends to grow and build progressively through each year group. Each stage is carefully planned and the vast majority of children should be able to demonstrate at some point within the correct year group that they have a good understanding of the outlined method.

By the end of year 6, children will have a range of calculation methods both written and mental – selection will depend on the numbers involved.

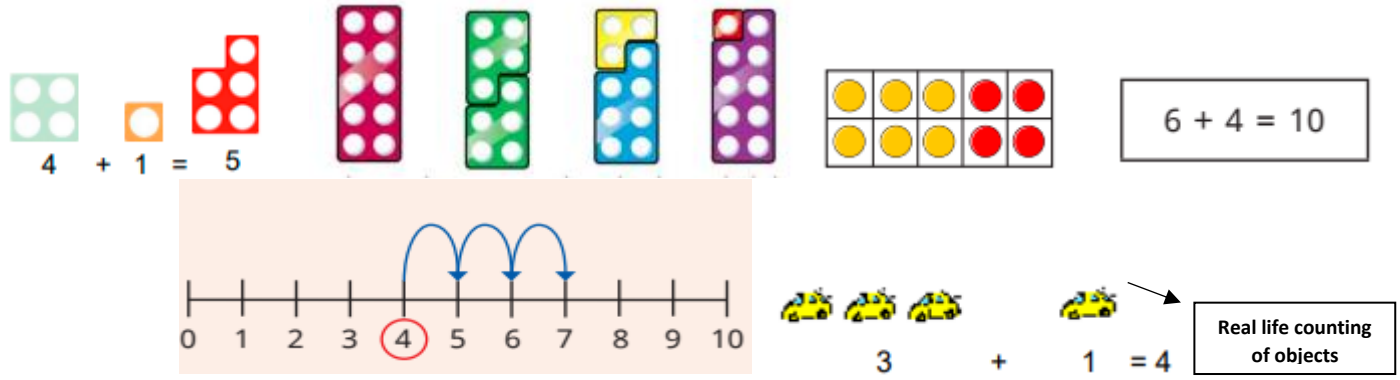
Children should not move on to the next stage if they are ***not ready*** or if they ***aren't confident***. If parents or teachers have concerns about how a child is progressing through the different stages, please speak to the maths leader.

Images and models shown in this policy are still used in later year groups; this policy shows the first point at which these images are introduced and taught.

Addition

Addition and subtraction are inverse operations. Right from the start children should be taught these as related operations. There are four number sentences (two using + and two using -) which can be written to express the relationship between 4 and 6 and 10. It is key to a good understanding of addition and subtraction that 6 + [ ] = 10 and 10 – 6 = [ ] are seen as ways of expressing the same question.

Reception – While doing simple calculations, you may see some of these formal and informal methods being used.



Working towards the following Early Learning Goals:

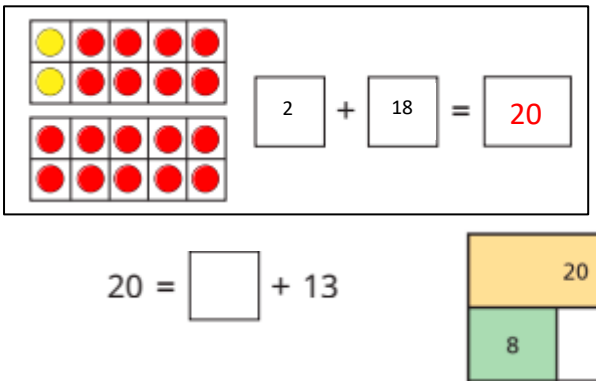
Number:

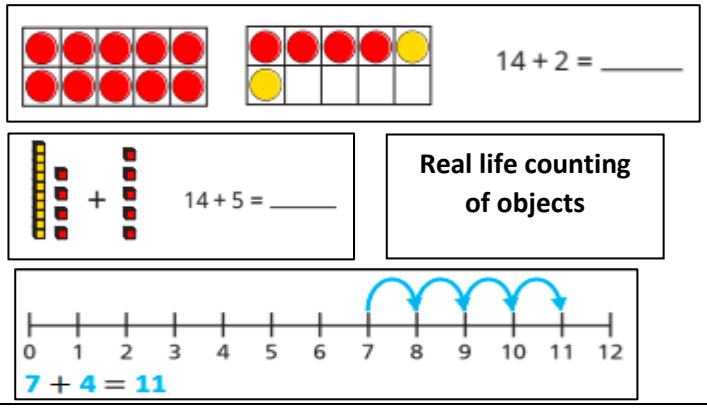
- Have a deep understanding of number to 10, including the composition of each number
- Automatically recall number bonds to 5 and some number bonds to 10

Numerical Patterns:

- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity

Year 1 – Children use the below methods when formally and informally carrying out calculations.





Number Bonds

*Represent and use number bonds within 20

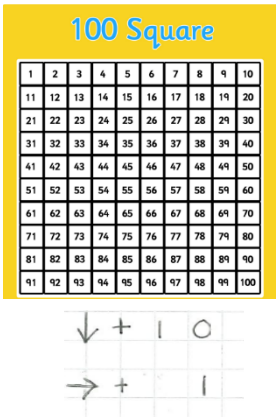
Children use a range of concrete and pictorial representations before moving on to writing addition sentences.

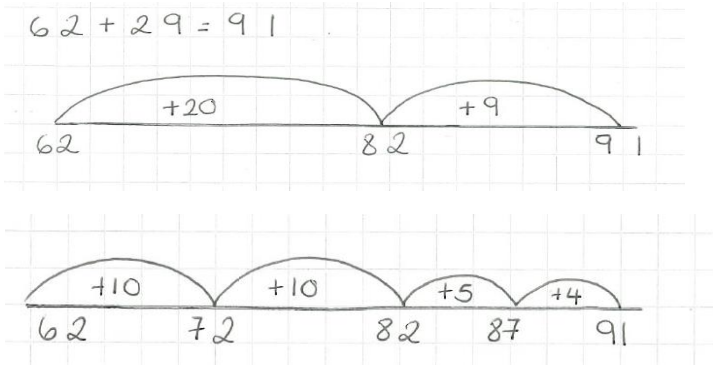
Counting On

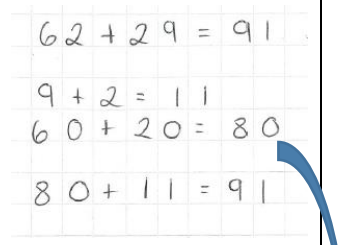
*Add one-digit and two-digit numbers to 20, including zero

*Read, write and interpret mathematical statements involving addition (+) and equals (=) signs

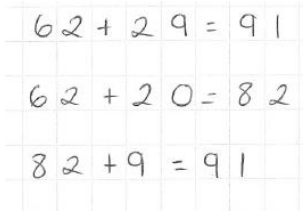
Year 2 – Children should use the below methods to support their fluency development in conjunction with lots of mental maths in class.







Method under review:



Moving Around in 10s and 1s

* Knowing 1 more or 10 more than any given number

Use of a number square to partition a number to add on. For example: 23 + 11 = [ ] , partition eleven into 10 and 1. Then add on 10 and then 1. This method is NOT a substitute for practising counting in 10s and 1s from any given number.

Counting On

* Add ten and multiples of ten, e.g. 76 + 20 as 76, 86, 96 or in one hop 76 + 20.

* Add two 2-digit numbers by counting on in tens and then in ones, e.g. 62 + 29 as 62 add 20 (82) add 9 (91).

Using Place Value

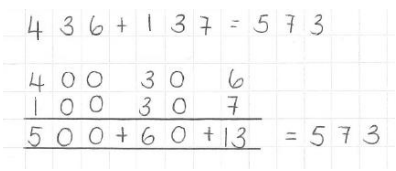
Partitioning, e.g. 62 + 29 as 9 +2 and 60 + 20 = 20. Finally, combine the two totals 80 + 11 = 91

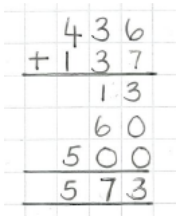
Using Number Facts

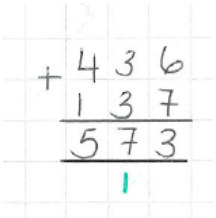
Children should have the opportunity to practise number facts (and secure them) so they can use them with fluency when completing calculations.

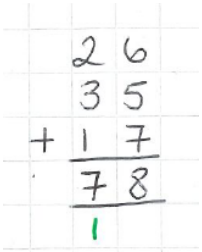
* Know pairs of numbers which make the numbers up to and including 10. E.g. 8 = 4+4. 3+5, 2+6, 1+7 and 10 = 5+5, 4+6, 3+7, 2+8, 1+9, 0+10
* Use of patterns of known facts, e.g. 6+3 = 9. Se we know 36+3 = 39, 66+3 = 69. 53+6 = 59
* Bridging 10, e.g. 57+5 as 57 add 3, then add 2 more

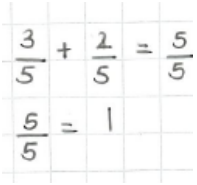
Year 3 - Introduction and embedding of most efficient method











Two methods of expanded addition. Both are acceptable and both having different benefits for leading into the most efficient method. Do not teach both, choose one and stick to it (only change if children have difficulty with one method after repeated attempts to practice – then try the other)

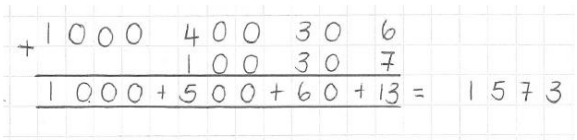
By the end of year 3, children should be able to use compact column addition for:

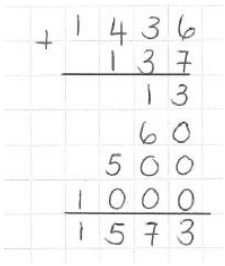
- Two or more 3-digit numbers
- Towers of 2-digit numbers

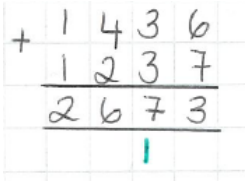
Fractions

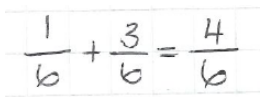
* Recognise complements of any fraction to 1

Year 4









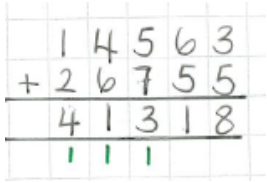
Expanded column addition for those children not yet confident with compact column addition. Consult with Y3 teacher to discuss which method of expanded column addition was taught.

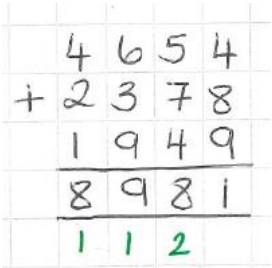
Compact column addition with larger numbers

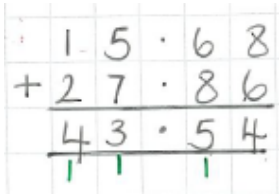
Fractions

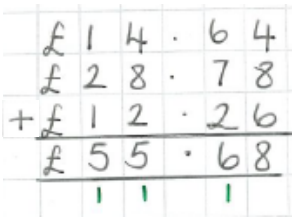
*Adding fractions with the same denominator

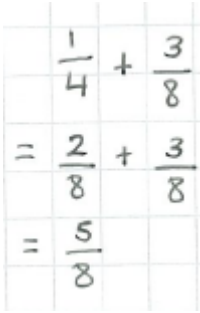
Year 5











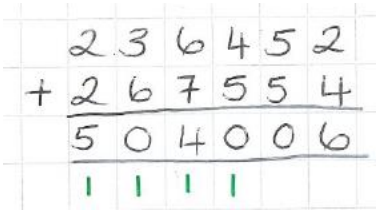
Compact column addition (expanded column may still be used for children who really need it – particularly for money/decimals)

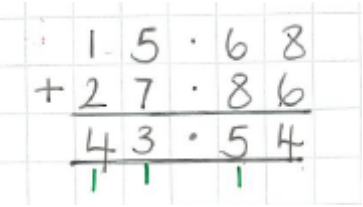
- to add pairs of 5-digit numbers
- towers of several larger numbers
- decimal numbers with up to 2 places
- Adding several amounts of money

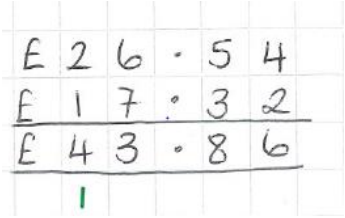
Fractions

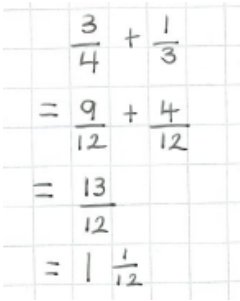
- Adding fractions with related denominators (see example)

Year 6 - Secure Procedural Fluency









Compact Column Addition

* for adding several large numbers (in line with Year 5)
* for decimals with up to two places (including money)

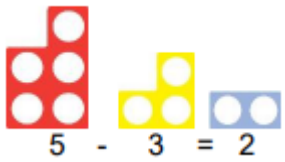
Fractions

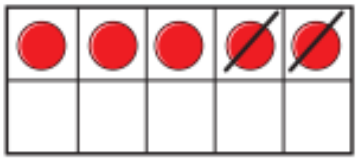
* Adding fractions with unlike denominators

Subtraction

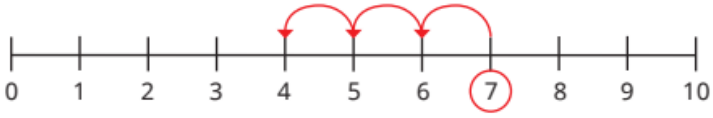
Addition and subtraction are inverse operations. Right from the start children should be taught these as related operations. There are four number sentences (two using + and two using -) which can be written to express the relationship between 4 and 6 and 10. It is key to a good understanding of addition and subtraction that 6 + [ ] = 10 and 10 – 6 = [ ] are seen as ways of expressing the same question.

Reception – While doing simple calculations, you may see some of these formal and informal methods being used.





5 – 3 = 2



Real life counting of objects

Working towards the following Early Learning Goals:

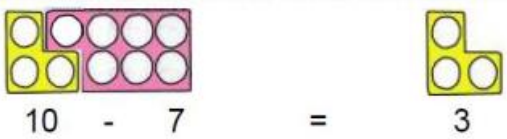
Number:

- Have a deep understanding of number to 10, including the composition of each number
- Automatically recall number bonds up to 5 (including subtraction facts)

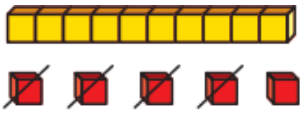
Numerical Patterns:

- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity

Year 1 – Children use the below methods when formally and informally carrying out calculations.



20 - 4 = 16
20 - 16 = 4



15 – 4 = 11

Real life counting of objects and finding the difference

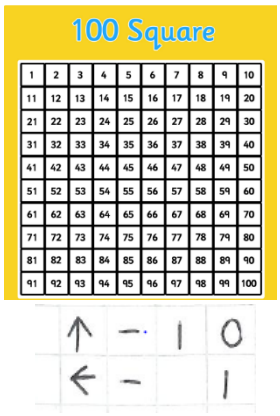
Number Bonds

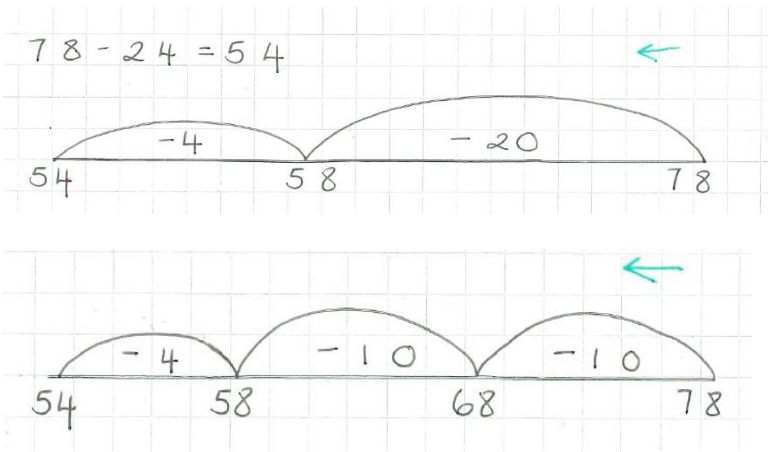
*Represent and use number bonds and related subtraction facts within 20
*Children use a range of concrete and pictorial representations before moving on to writing subtraction sentences.

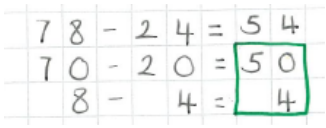
Counting Back/ Finding the Difference

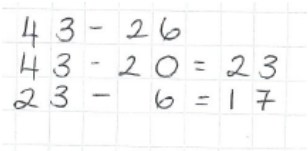
*Read, write and interpret mathematical statements involving addition (+) and equals (=) signs
* Subtract one-digit and two-digit numbers to 20, including zero

Year 2









Moving Around in 10s and 1s

* Knowing 1 less or 10 less than any given number

Use of a number square to partition a number to subtract. For example: 23 - 11 = [ ] , partition eleven into 10 and 1. Then subtract 10 and then subtract 1.
This method is NOT a substitute for practising counting back in 10s and 1s from any given number.

Taking Away

* Subtract 10 and multiples of ten, e.g. 76 – 20 as 76, 66, 56 or in one hop 76 – 20 = 56.

* Subtract two 2-digit number by counting back in tens then in ones, e.g. 78 – 24 as 78 subtract 20 (58) then count back 4 (54).

Counting Up

Find a difference between two numbers on a line, e.g. 51 - 47

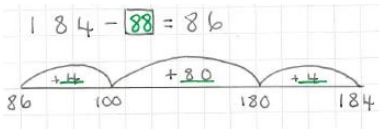
Using Place Value

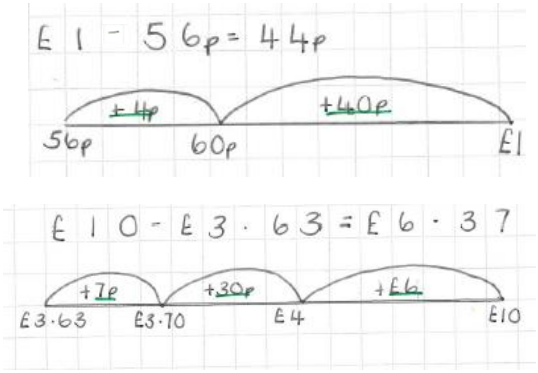
Partitioning, e.g. 78 – 24 as 70 – 20 and 8 – 4 combining the answers: 50 + 4

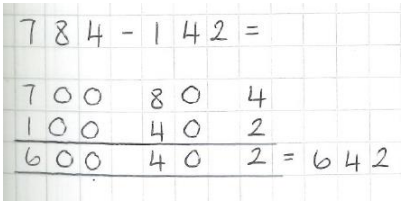
Using Number Facts

Children should have the opportunity to practise number facts (and secure them) so they can use them with fluency when completing calculations.
* Know pairs of numbers which make the numbers up to and including 10. E.g. 10 – 6 = 4, 8 – 3 = 5, 5 – 2 = 3 etc.
* Use of patterns of known facts, e.g. 9 – 3 = 6. Se we know 39-6 = 33, 69-6 = 63. 89-6 = 83
* Bridging 10, e.g. 52 – 6 as 52 subtract 2 then subtract 4 more.

Year 3







Counting Up Subtraction

* Develop counting up subtraction

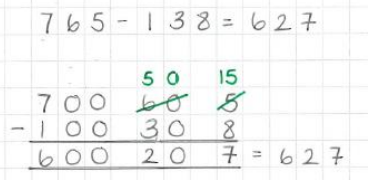
Counting Up Subtraction

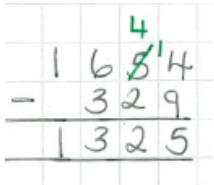
* Develop counting up subtraction to give change from £1 and £10

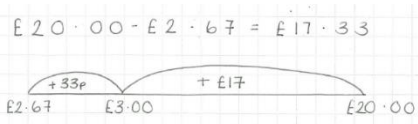
Expanded Column Subtraction (not involving money)

* Only for simple subtractions if children demonstrate good number knowledge in earlier methods

Year 4



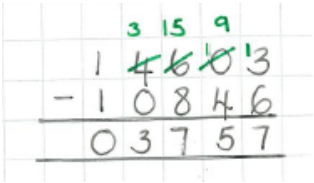
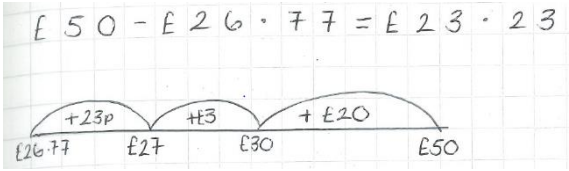
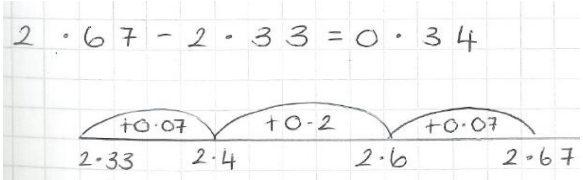
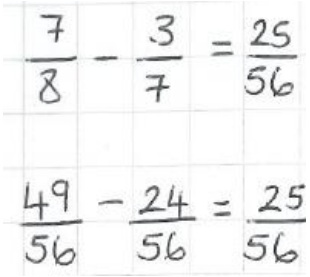


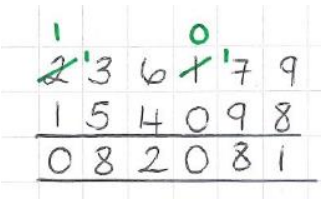
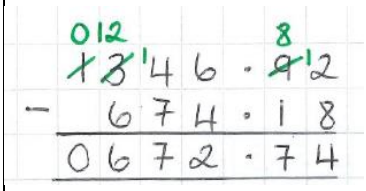
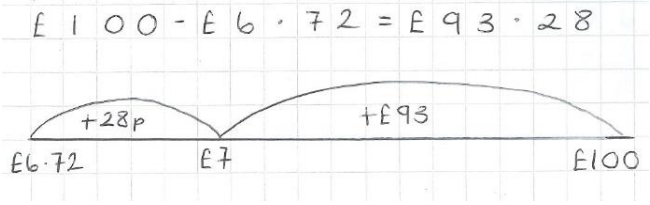
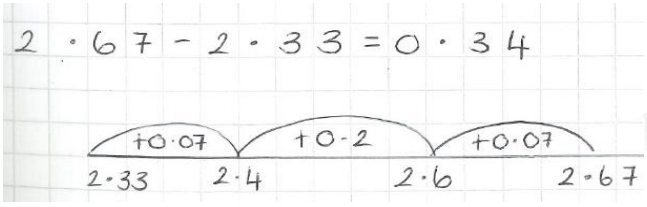
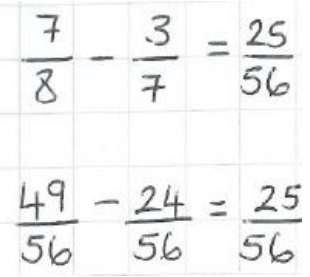


$$\frac{6}{8} - \frac{2}{8} = \frac{4}{8}$$

$$\frac{4}{8} = \frac{1}{2}$$

Expanded Column Subtraction	**Compact Column Subtraction**	**Counting Up Subtraction**	**Fractions**
* Ensure sound place value knowledge before moving onto Compact Column Subtraction	* Begin to use compact column subtraction when suitable knowledge of number is shown through expanded column subtraction	* Counting up subtraction from £10, £20, £50 and £100.	* Subtract like fractions

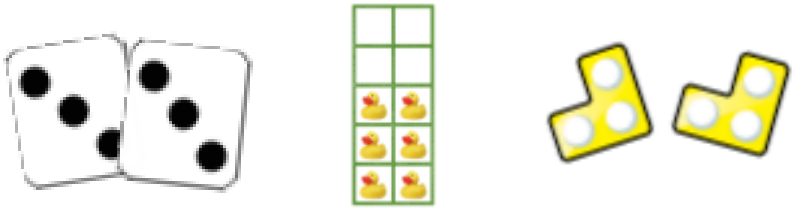
Year 5		
	 	
Compact Column Subtraction * for numbers with up to 5 digits	**Consider self-selecting least error prone methods:** * Counting up when dealing with money (including finding change) * Counting up to subtract decimal numbers	**Fractions** * Subtract fractions with unlike denominators

Year 6		
 	 	
Compact Column Subtraction * for larger numbers (including decimal numbers)	**Consider self-selecting least error prone methods:** * Counting up when dealing with money * Counting up to subtract decimal numbers	**Fractions** * Subtract fractions with unlike denominators

Multiplication

Multiplication and division are inverse operations. Right from the start children should be taught these as related operations. There are four number sentences (two using x and two using ÷ which can be written to express the relationships between 5 and 9 and 45. It is key to a good understanding of division that [ ] x 5 = 45 and 45 ÷ 5 = [ ] are seen as ways of expressing the same question.

Reception – While doing simple calculations, you may see some of these formal and informal methods being used.



Children are given opportunities to build doubles using real objects and mathematical equipment

Working towards the following Early Learning Goals:

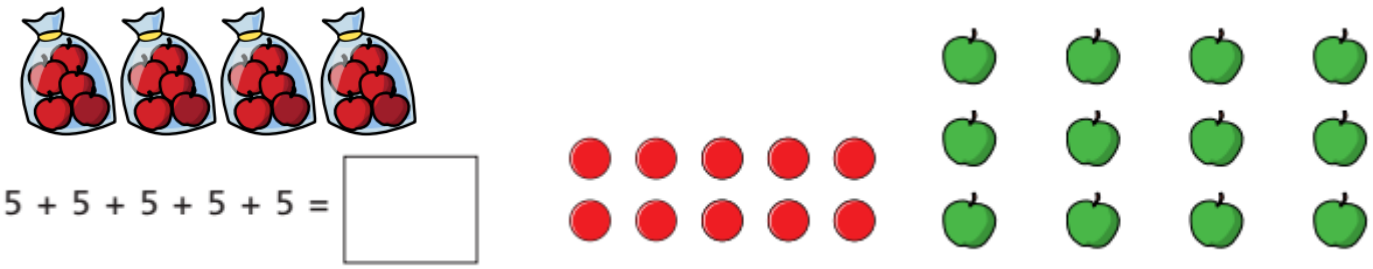
Number:

- Automatically recall number bonds up to 5 and some number bonds to 10, including double facts.

Numerical Patterns:

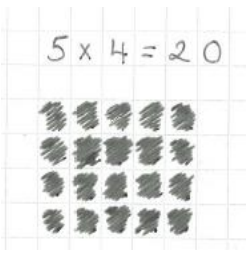
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

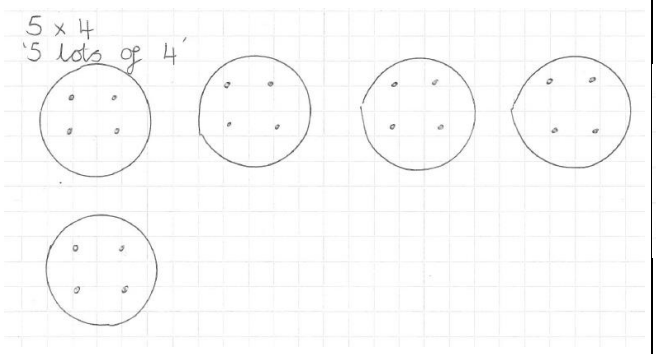
Year 1 – Children use the below methods when formally and informally carrying out calculations.

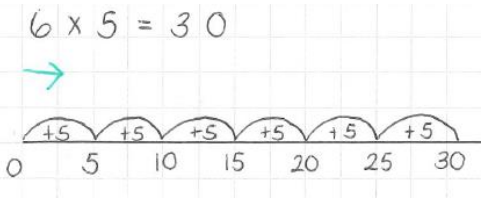


*solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Year 2







Grouping

* Use arrays to find answers to multiplication and relate to 'clever' counting.
e.g. 5 x 4 as five lots of four things and 6 x 5 as six steps in the 5s count as well as six lots of five
* Understand that 5 x 3 can be worked out as three 5s or five 3s

Counting in steps ('Clever' counting)

* Count in 2s, 5s and 10s along a number line
* Begin to count in 3s
* Solve simple multiplication problems using the clever counting method, e.g. 6 x 5 = 30 by hopping along the line in 5s.

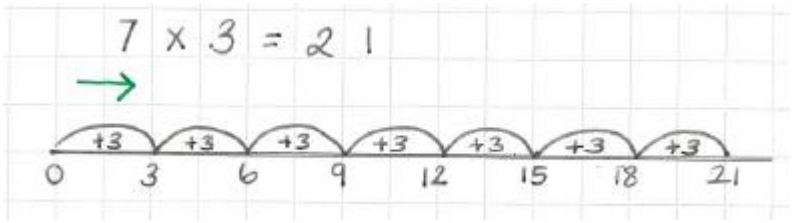
Doubling and Halving

* Begin to know doubles of multiples of 5 to 100, e.g. double 35 is 70

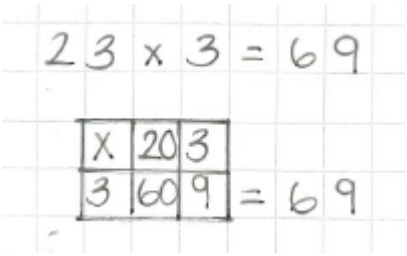
Use Number Facts

* Know doubles to double 20
* 2x, 5x, 10x tables, relating these to 'clever counting, in 2s, 5s and 10s, e.g. 5 x 10, and 10, 20, 30, 40, 50 is five steps in the tens count

Year 3

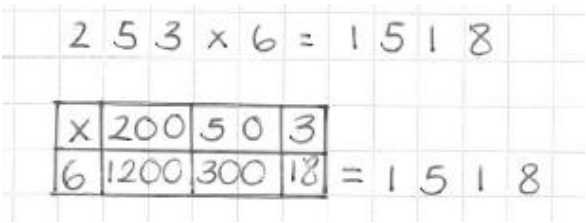


Counting on/Repeated addition
* hopping along an empty number line/landmarked number line to solve simple multiplications

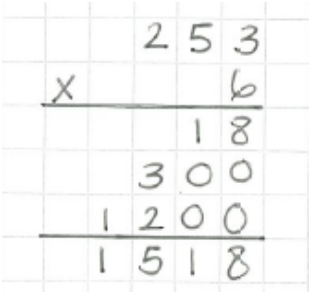


Grid Multiplication (building on partitioning)
* to multiply 2-digit numbers by a 1-digit number

Year 4



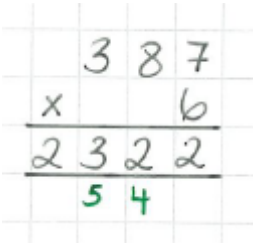
Grid Multiplication
* To multiply up to 3-digit numbers by 1-digit numbers



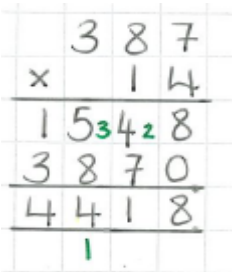
Vertical Multiplication (as a precursor to short multiplication)
* for 3-digit numbers by a 1-digit number

(Although we acknowledge the fact that some children prefer to stick with grid multiplication a little longer and this is fine).

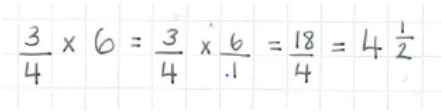
Year 5



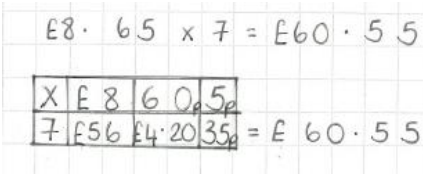
Short Multiplication
* of 2 digit, 3-digit and 4-digit numbers by 1-digit numbers



Long Multiplication
* of 2-digit, 3-digit and 4-digit numbers by teen numbers

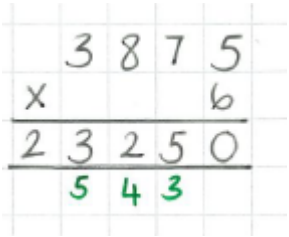


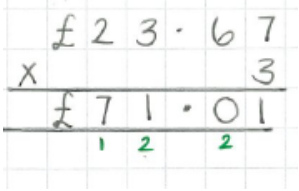
Fractions
* Multiplying fractions by single-digit numbers



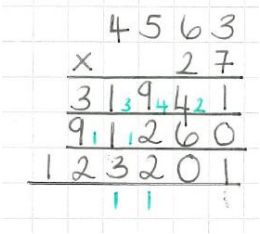
Decimals
* Grid multiplication of numbers with up to 2 decimal places by a single-digit number(including money)

Year 6

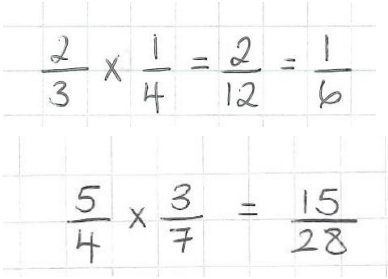




Short Multiplication
* of 2 digit, 3-digit and 4-digit numbers by 1-digit numbers
* of decimal numbers using x100 and ÷ 100
* of money



Long Multiplication
* of 2-digit, 3-digit and 4-digit numbers by 2-digit numbers



Fractions
* Multiplying proper and improper fractions

NB: Children should use grid method in year 6 ONLY as a default method if they struggle with long multiplication. Remember that if a calculation has more steps then it is more error prone.

Division

Multiplication and division are inverse operations. Right from the start children should be taught these as related operations. There are four number sentences (two using x and two using ÷ which can be written to express the relationships between 5 and 9 and 45. It is key to a good understanding of division that [ ] x 5 = 45 and 45 ÷ 5 = [ ] are seen as ways of expressing the same question.

Reception – While doing simple calculations, you may see some of these formal and informal methods being used.

Children are given opportunities distribute objects equally.

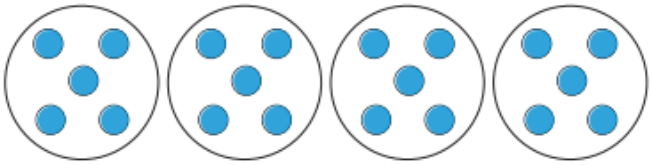
Working towards the following Early Learning Goals:

Numerical Patterns:

- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

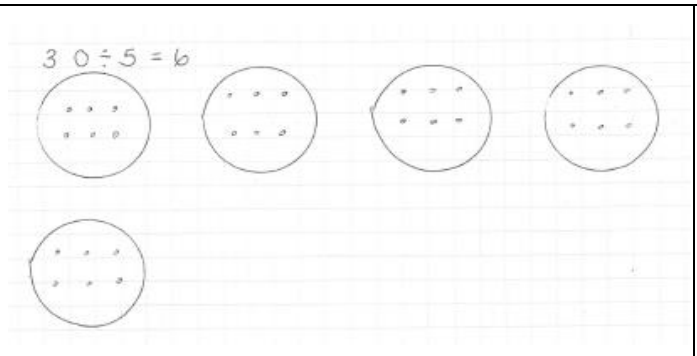
Year 1 – Children use the below methods when formally and informally carrying out calculations.

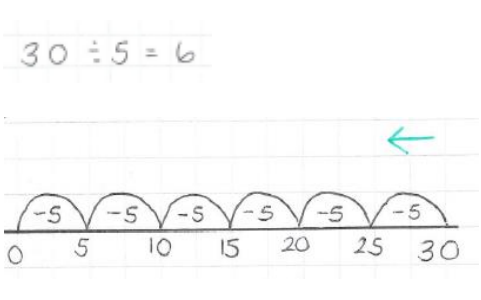
Share the bananas between 5 friends.



Sharing	Grouping
*solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.	*solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Year 2





Grouping	Sharing	Counting in steps ('Clever' counting)
* Relate division to multiplication by using arrays.	* Solve division problems by sharing into piles, e.g. 30 ÷ 5 = 6 by creating 5 piles and sharing 30 in an equal fashion	* Count backwards in 2s, 5s and 10s along a number line * Solve simple division problems using the clever counting method, e.g. 6 ÷ 5 = 30 by hopping back along the line in 5s.

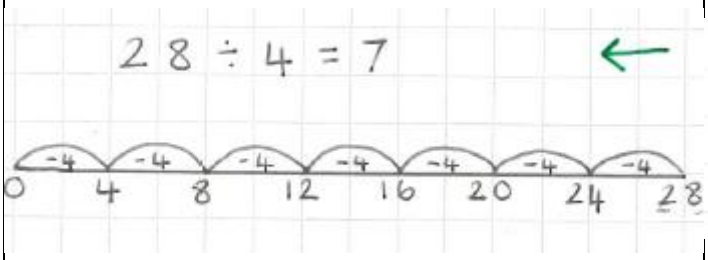
Doubling and Halving

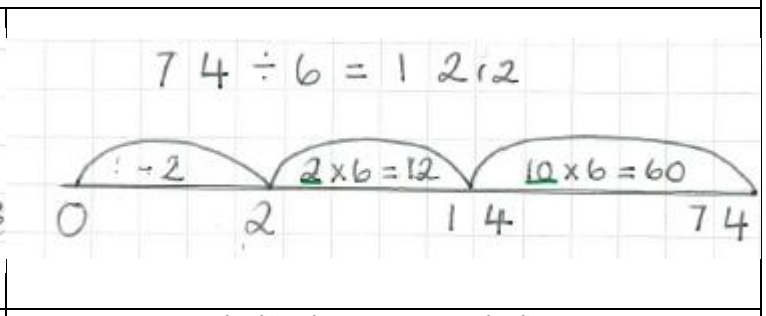
* Find half of numbers up to 40, including realising that half of an odd number gives a remainder of 1 or an answer containing a ½.
* Begin to know half of multiples of 10 to 100, e.g. half of 70 is 35.

Use Number Facts

* Know halves of even numbers to 24 * Know 2x, 5x, 10x division facts * Begin to know 3x division facts

Year 3





Repeated Subtraction

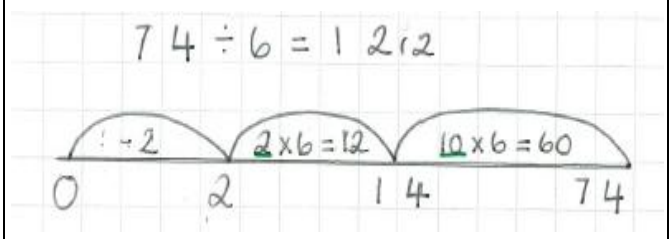
* hopping back on an empty number line/landmarked number line to solve simple multiplications (including remainders)

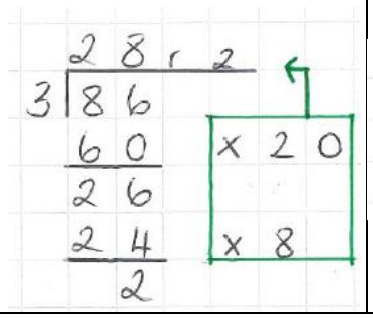
Chunking along an Empty Number line

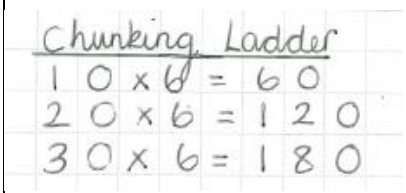
* hopping back on an empty number line by taking out efficient chunks of multiples of 10

NB This is only for children who are secure with the first method and understand the link between multiplication and division.

Year 4







Chunking along an Empty Number line

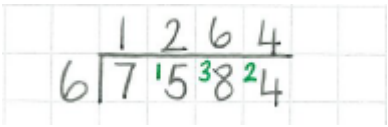
* hopping back on an empty number line by taking out efficient chunks of multiples of 10

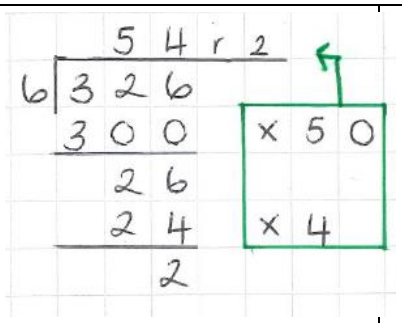
Mental Method (using chunking) in Written Form

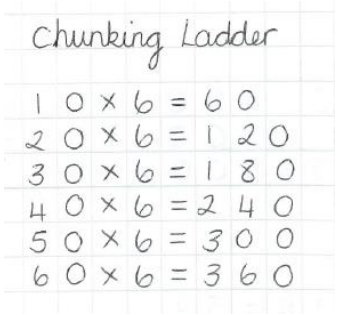
* Securely dividing 2 - digit numbers by a single digit number using chunking (including remainders)

NB: A basic chunking ladder is encouraged to help children. They should start with 10x, 20x, 40x, 100x, 50x and move around smartly (by doubling and halving multiples etc.) to create the ladder. This relies on secure knowledge of how to multiply by 10 and 100.

Year 5







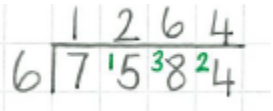
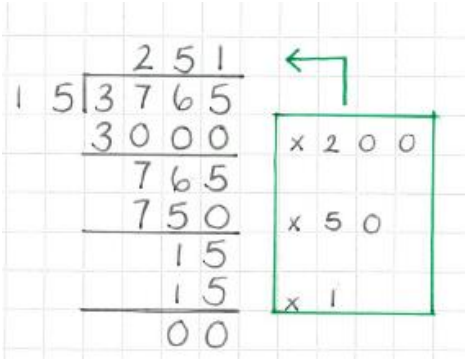
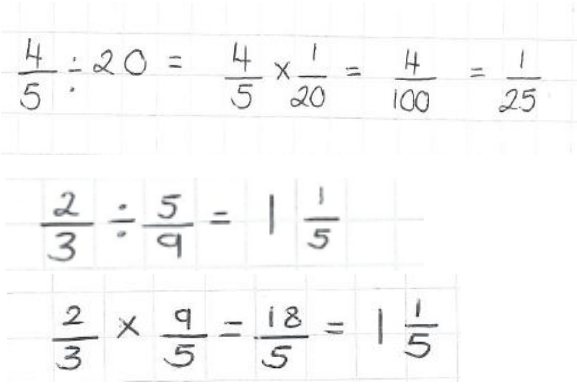
Short Division

* 3-digit and 4-digit numbers by single-digit numbers

Mental Method (using chunking) in Written Form

* 3-digit number divided by single-digit numbers (including remainders)

NB: A chunking ladder is encouraged to help children. They should start with 10x, 20x, 40x, 100x, 50x and move around smartly (by doubling and halving multiples etc.) to create the ladder. This relies on secure knowledge of how to multiply by 10 and 100.

Year 6		
		
Short Division * 3-digit and 4-digit numbers by single-digit numbers	**Long Division using chunking (not standard long division)** * 3-digit and 4-digit numbers by two-digit numbers	**Fractions** * Divide by whole numbers *Divide by fractions