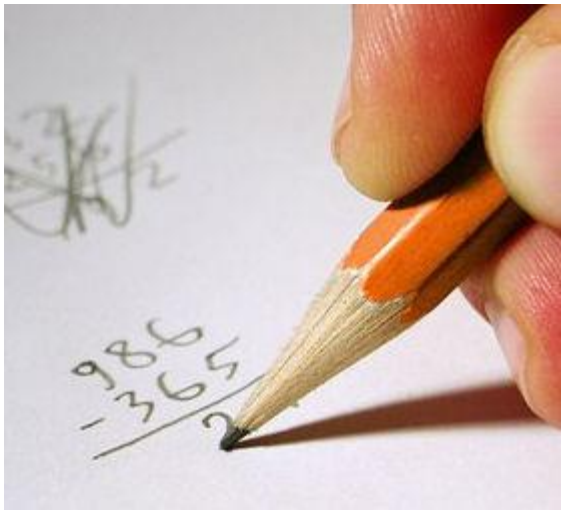
Clapham Terrace Primary School

Calculation Policy 2013 - 2014



Clapham Terrace Primary School- Calculation Policy.

Introduction

Children are introduced to the processes of calculation through practical, oral and mental activities. As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases, and learn to interpret and use the signs and symbols involved. Over time children learn how to use models and images, such as empty number lines, to support their mental and informal written methods of calculation. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to efficient written methods that can be used more generally. By the end of Year 6 children are equipped with mental, written and calculator methods that they understand and can use correctly. When faced with a calculation, children are able to decide which method is most appropriate and have strategies to check its accuracy.

At whatever stage in their learning, and whatever method is being used, children's strategies must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful.

The overall aim is that when children leave Clapham Terrace Primary School they:

- have a secure knowledge of number facts and a good understanding of the four operations;
- are able to use this knowledge and understanding to carry out calculations mentally and to apply general strategies when using one-digit and two-digit numbers and particular strategies to special cases involving bigger numbers;
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads;
- have an efficient, reliable, written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally;
- are capable of selecting the most efficient method for a given calculation which may include the use of a number line.
- use a calculator effectively, using their mental skills to monitor the process, check the steps involved and decide if the numbers displayed make sense.

Mental methods of calculation

Oral and mental work in mathematics is essential, particularly so in calculation. Early practical, oral and mental work must lay the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts. Later work must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. On-going oral and mental work provides practice and consolidation of these ideas.

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills.

Secure mental calculation requires the ability to:

• recall key number facts instantly – for example, all addition and subtraction facts for each number to at least 10 (Year 2), sums and differences of
multiples of 10 (Year 3) and multiplication and division facts up to 10 × 10 (end of year 3);

• use taught strategies to work out the calculation – for example, recognise that addition can be done in any order and use this to add mentally a one digit
number or a multiple of 10 to a one-digit or two-digit number (Year 1), partition two-digit numbers in different ways including into multiples of ten
and one and add the tens and ones separately and then recombine (Year 2).

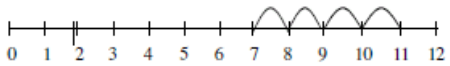
• understand how the rules and laws of arithmetic are used and applied – for example, to add or subtract mentally combinations of one-digit and two-digit
numbers (Year 3), and to calculate mentally with whole numbers and decimals (Year 6).

Written methods of calculation

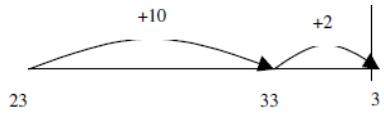
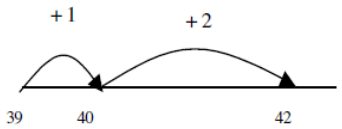
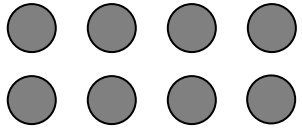
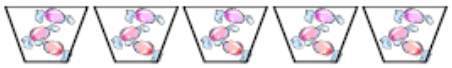
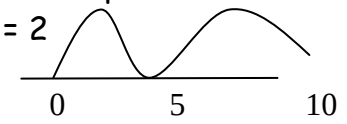
The aim is that by the end of Key Stage 2, the great majority of children should be able to use an efficient method for each operation with confidence and understanding. The challenge for teachers is determining when their children should move on to a refinement in the method and become confident and more efficient at written calculation.

Children should be equipped to decide when it is best to use a mental, written or calculator method based on the knowledge that they are in control of this choice as they are able to carry out all three methods with confidence.

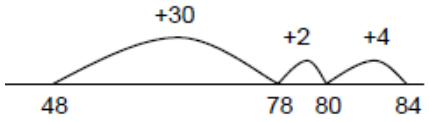
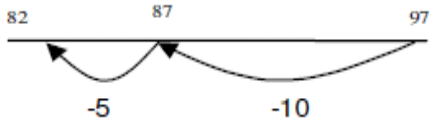
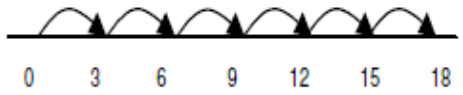
Year 1 -

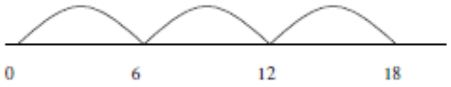
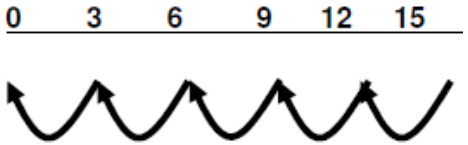
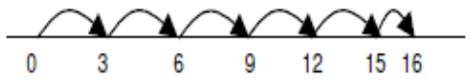
Addition	Subtraction	Multiplication	Division
Record simple mental addition using + and = Be able to complete number sentences where a missing number is shown by a symbol. 3 + 4 = 3 + = 7 Record addition by showing jumps on prepared number lines or moving onto higher numbers with the hundred square: 7 + 4 =  Know number bonds to 10&20	Record simple mental subtractions using – and = Record simple subtractions using pictures / marks: Understand subtraction as take away. Sam has 10p. I take away 4p from him. How much does he have left? Use number lines to jump back. Move onto 100 squares Be able to complete number sentences where a missing number is shown by a symbol. 7 - 3 = 7 - = 4	Count on or back in 1's, 2's, 5's and 10's – using 100 sqaure Multiplication as repeated addition 2 + 2 + 2 = 6 Using practical objects (groups / lots of) Recognise sign and write simple sums 3 x 2 = 6 (using objects/pictures to support)	Sharing with practical objects then drawing the method. End of the year children will start to jump back (showing repeated subtraction) 6 – 2 – 2 – 2 = 0

Year 2 -

Addition	Subtraction	Multiplication	Division
Record mental addition using + and = Be able to complete number sentences where a missing number is shown by a symbol. e.g. 9 + __ = 13 14 + 5 = 10 + __ __ + __ = 14 Partitioning 38 + 61 = 99 30 + 60 = 90 8 + 1 = 9 Use a hundred square. Start with the larger number in an addition where you must bridge through the tens barrier and count on: e.g. 23 + 12 =  	Record simple mental subtractions using – and = Be able to complete missing number sentences: e.g. 18 – 4 = 14 9 + 6 = 20 - __ Use a number line to find a small difference by counting up. E.g. 42 – 39 = 3  Use a number line or a hundred square to bridge through a multiple of 10 e.g. 22 – 5 = 17 Know inverse operations, so + and – can be done in any order e.g. 2 + 7 = 9 7 + 2 = 9 9 – 2 = 7 9 – 7 = 2	Counting on in 2s, 3s, 4s, 5s and 10s. Use of arrays e.g. 2 x 4 =  As repeated addition 5 x 2 = 2 + 2 + 2 + 2 + 2 = 10 Represent problems involving multiplication using pictures and symbols: There are 3 sweets in one bag. How many sweets are there in 5 bags?  Record simple mental multiplication using x and =	Understand the concept of division as **sharing** and **grouping**: Represent problems using pictures and symbols: 12 children need to get into teams of 4 to play a game. How many teams are there?  **Sharing:** 6 sweets are shared between 2 people. How many do they have each?  Division as repeated subtraction 10 ÷ 5 = 2 

Year 3 -

Addition	Subtraction	Multiplication	Division
Record mental addition using + and = Be able to complete number sentences where a missing number is shown by a symbol. e.g 19 + __ = 33 __ + 14 = 33 10 + __ + 50 = 100 __ + __ + ___ = 100 347 + ___ = 447 Add a two digit number to a near multiple of 10 e.g. 35 + 19 is the same as 35 + 20 – 1 Use empty number lines initially to demonstrate mental addition  	Record mental subtractions using – and = Be able to complete missing number sentences: e.g. 36 – 17 = __ __ - 15 = 19 Find a small difference by counting up: e.g. 102 – 97 = 5 Use empty number line or a hundred square to subtract TO from TO. e.g. 97 – 15 = 72  Subtract mentally a near multiple of 10 by taking away multiple of 10 and adjusting by 1 e.g. 78 – 49 is the same as 78 – 50 + 1	Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20 and the corresponding halves. Record simple mental multiplication using x and = and understand that multiplication is the inverse of division and vice versa. Be able to complete number sentences where a missing number is shown by a symbol: e.g. 6 x __ = 18 6 x 10 = __ 20 = __ x 5 Derive and recall multiplication facts up to 10 x 10 and the related division facts.	Record divisions using ÷ and = Understand that division is the inverse of multiplication and vice versa. Be able to complete number sentences where a missing number is shown by a symbol: Introduce division as grouping (repeated addition) as in Yr 2. e.g. 20 ÷ 4 1 ••••• 2 ••••• 3 ••••• 4 ••••• Use a number line to model grouping. E.g. How many 3's make 18? (6) 

Addition	Subtraction	Multiplication	Division
Partition the second number only in addition problems to aid mental thinking: 43 + 13 = 43 + 10 + 3 = 53 + 3 = 56 Move then onto expanded methods of vertical standard addition adding the most significant digits first to support mental strategies: 67 + 85 140 (representing 60 + 80) 12 (representing 7 + 5) 152 Push method within mental warm-ups	Lead into using standard written method without decomposition. e.g. 48 - 16 32 * Subtractions must be able to be completed without carrying.	Continue to use repeated addition / arrays to help children understand the concept of multiplication. Number lines can be used to model mental strategies: e.g. 6 x 3 = 18  This should lead to partitioning of numbers to multiply: 16 x 5 = 10 x 5 = 50 6 x 5 = 30 30 + 50 = 80 Some more able mathematicians might move on to 'grid method'. (See Y4 methods)	Also understand division as sharing (repeated subtraction) e.g. 15 ÷3 = 5  Also understand that division may result in remainders. e.g. 16 ÷ 3 = 5 r1 Sharing: 16 cakes are shared between 3 children, how many are left over? Grouping: How many groups of 3 can I make from 16 cakes? 

Year 4 -

Addition	Subtraction	Multiplication	Division
Be able to complete number sentences where a missing number is shown by a symbol. e.g 54 + __ = 100 __ + 14 = 39 10 + __ + 50 = 120 __ + __ + ___ = 100 347 + ___ = 547 Add the nearest multiple of 10 and then adjust e.g. 63 + 29 is the same as 63 + 30 – 1 Extended column method will be introduced. e.g. 48 + 16 14 (representing 8 + 6) 50 (representing 40 + 10) 64 With this method units are to be added first which will continue with the standard written method.	Record mental subtractions using – and = Be able to complete missing number sentences: e.g. 100 – 17 = __ __ - 15 = 50 __ - __ = 20 100 - __ - __ = 10 Find a small difference by counting up: e.g. 503 – 496 = 7 Subtract mentally a near multiple of 10 by taking away multiple of 10 and adjusting by 1, e.g. 78 – 49 is the same as 78 – 50 + 1 Standard written method introducing decomposition extending to H,T,O. e.g. 48 - 29 19	Identify the doubles of two-digit numbers, use these to calculate mentally doubles of multiples of 10 and 100 and derive the corresponding halves. Teach children grid method to complete TO X O Extend into HTO X O e.g. 23 x 7 = 161 x | 20 | 3 7 | 140 | 21 Extend to HTO X O e.g. 153 x 4 Derive and recall multiplication facts up to 12 x 12 and the related division facts.	Introduce 'chunking method' (repeated subtraction). Begin with TU ÷ U and include remainders: e.g. 96 ÷ 6 = 16 16 6 96 - 60 (10 x 6) 36 - 36 (6 x 6) 0 Extend to HTU ÷ U Some of the children maybe taught the short division method: 16 6 $9^{3}6$

Addition	Subtraction	Multiplication	Division
Expand to HTU + TU Standard written method e.g. 435 + 24 459 Leading to 'carrying' below the line. e.g. 625 + 48 673 1 Extend to use of decimals in context, for example money. e.g. *know that decimal point must be in line £4.21 +£3.87 £8.08 1	Demonstrate the place value related process that is involved here. e.g. 48 – 29 = 19 Explain to children to 'exchange' the tens from the tens column. Extend to decimals in context of money. e.g. *know that decimal point must be in line £8.98 - £4.35 £4.63		

Year 5 -

Addition	Subtraction	Multiplication	Division
Be able to complete number sentences where a missing number is shown by a symbol. e.g 154 + __ = 200 __ + 14 = 100 10 + __ + 50 = 500 __ + __ + ___ = 1000 347 + ___ = 1047 Add the nearest multiple of 10 or 100 and then adjust e.g. 458 + 79 is the same as 458 + 80 – 1 Standard written method as in Year 4 extending to Th,H,T,U. Include multiple 'carrying'. e.g. 7648 + 1486 9134 1 1 1	Record mental subtractions using – and = Be able to complete missing number sentences: e.g. 1000 – 170 = __ __ - 150 = 500 __ - __ = 200 1000 - __ - __ = 190 Find a small difference by counting up: e.g. 8006 – 2993 = 5013 Subtract mentally a near multiple of 10 / 100 by taking away multiple of 10 / 100 and adjusting by 1 e.g. 781 – 199 is the same as 781 – 200 + 1	Identify the doubles of two-digit numbers, use these to calculate mentally doubles of multiples of 10 and 100 and derive the corresponding halves. e.g. 45 x 2 = Children continue grid method to complete TO X O and HTO X O e.g. 23 x 7 = 161 x | 20 | 3 7 | 140 | 21 Extend to THTO X TO e.g. 4562 x 14	Introduce 'chunking method' (repeated subtraction). Begin with TU ÷ U and include remainders: e.g. 96 ÷ 6 = 16 16 6 96 - 60 (10 x 6) 36 - 36 (6 x 6) 0 Extend to HTO ÷ O Children will use the standard short written method of division: Include TO.t ÷ O e.g. 196 ÷ 6 = 32 r 4 32 r 4 6 $19^{1}6$ e.g. 14.2 ÷ 3

Addition	Subtraction	Multiplication	Division
Use decimals in context, for example money/measurements. e.g. *know that decimal point must be in line £4.21 +£3.87 £8.08 1	In standard written column method use the word 'exchange' NOT borrow. Use the standard written column method up to numbers with 4 digits including decimals: e.g. 3219 - 1243 6 Extend this to working with decimals and exchanging tens, etc. £8.95 - £4.38 £4.57	Some more able children might e.g. 23 x 28 24 (8 x 3) 160 (8 x 20) 60 (20 x 3) 400 (20 x 20) 644 Extend to standard short multiplication with carrying e.g. 23 346 x 8 x 9 184 3114 2 45 *To include decimals with one decimal point e.g. 12.5 x 2 (refer to expanded method first if necessary – leading to short method with carrying)	

Year 6 -

Addition	Subtraction	Multiplication	Division
Be able to complete number sentences where a missing number is shown by a symbol. e.g 54 + __ = 200 __ + 1.4 = 10 10 + __ + 50 = 250 __ + __ + ___ = 1000 34.7 + ___ = 40 Add the nearest multiple of 10 or 100 or 1000 and then adjust e.g. 458 + 79 is the same as 458 + 80 – 1. Extend to adding 0.9 / 1.9 / 2.9 etc. Standard written method as in Year 5 extending to numbers with any number of digits. Extend decimals to numbers with one or two decimal places. e.g. *know that decimal point must be in line 124.9 + 7.25 132.15 11	Record mental subtractions using – and = Be able to complete missing number sentences: e.g. 1000 – 170 = __ __ - 150 = 500 __ - __ = 200 1000 - __ - __ = 190 Find a difference by counting up: e.g. 0.5 – 0.31 = 0.19 Subtract mentally a near multiple of 10 / 100 by taking away multiple of 10 / 100 and adjusting by 1 e.g. 781 – 199 is the same as 781 – 200 + 1 Standard written method as in Year 5 extending to numbers with any number of digits. Extend to decimals with one or two decimal places. In standard written column method we use the word 'exchange' NOT borrow.	Identify the doubles of two-digit numbers, use these to calculate mentally doubles of multiples of 10 and 100 and derive the corresponding halves. Children will choose their preferred method from chunking or long multiplication. Long multiplication initially with explanation. (some children) e.g. 352 x 27 2464 (352 x 7) * 3 1 7040 (352 x 20) 1 9504 1 *starting with ones numbers Extending to decimals with two decimal places.	Children will continue to use the standard short written method of division: Include TO.t ÷ O e.g. 196 ÷ 6 = 32 r 4 32 r 4 6 19¹6 e.g. 14.2 ÷ 3 Some children will still use the chunking method (see Y5).

	e.g. 324.9 - 7.25 _____ _ known that extra 0's may need to fill in spaces *know that decimal point must be in line 324.90 - 7.25 317.65		