# Abingdon Primary School



## Calculation Policy 2014

### **About our Calculation Policy**

This policy shows how calculations are taught throughout Abingdon Primary School and has been produced to meet the statutory requirements of the National Curriculum 2014. It is designed to provide children with a clear progression though the calculation strategies.

Early learning of number and calculation in Foundation Stage follows the "Development Matters" EYFS document and this calculation policy is devised to follow on progressively from the content and methods established in the Early Years Foundation Stage.

As there is a greater emphasis on written methods and also the fact that they are introduced at an earlier age, it is vital that children are taught conceptual understanding through a wide range of resources in order to gain deeper understanding and fluency.

### Year Group Expectations

The policy is organised into year groups and is based on expectation for that year group. However, it must be taken into account that some children will take longer to understand and that previous methods should first of all be consolidated, embedded and then once secure, should a child move on. Once a child is secure with a method, they should not quickly move onto the next stage but should be given plenty of opportunities to practise the methods, providing them with many examples of problem solving and reasoning in order to deepen their understanding and master methods.

### **Choosing a Calculation Method**

In order to choose the most efficient method for the numbers in the calculation, children will be taught to and encouraged to go through the following process before carrying out a calculation:



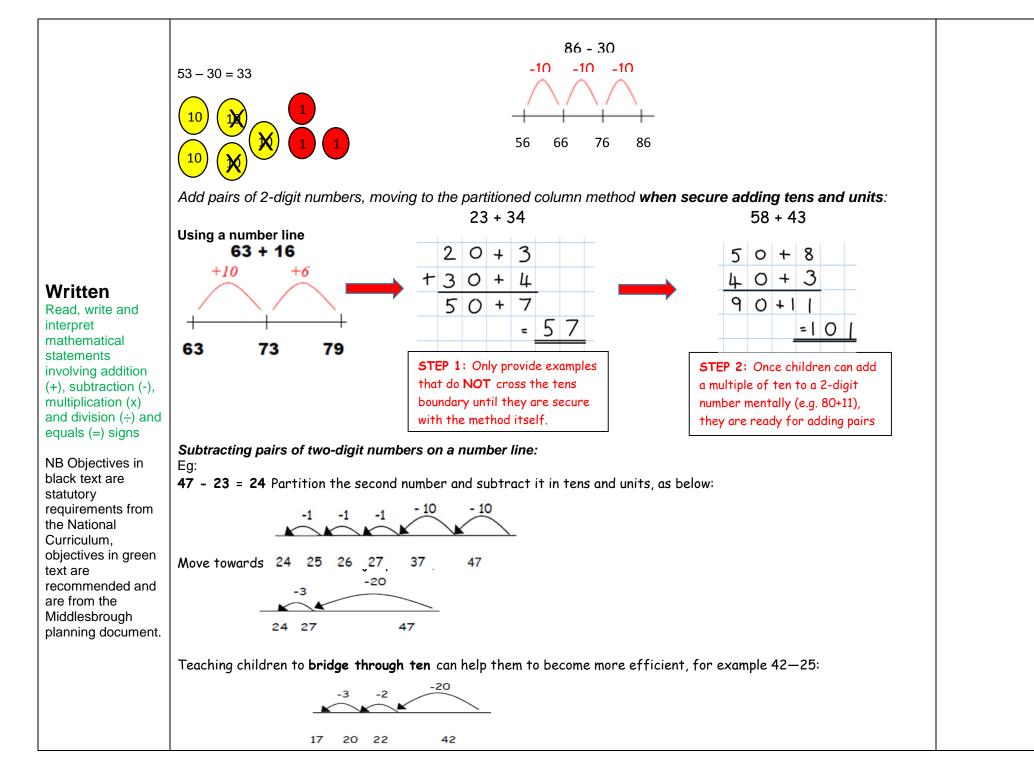
Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is ?

Recall/	Representations	Problem				
mental						
Represent and use number bonds and related subtraction facts within 20	All number bonds need to be taught, not just those to 10 or 20. Physical objects (counters, cubes, etc) can be used to put into groups, finding all different possibilities for each number, writing the number sentences alongside. Eg: Making 5 1+4=5, 2+3=5, 4+1=5, 3+2=5 The same can be done for subtraction facts.	Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial				
Add and subtract one-digit and two- digit numbers to 20, including zero	Use of fingers (number bonds to 10) and bead strings For addition and subtraction use manipulatives, such as: bead strings, cubes or counters, so that their experiences are concrete. Alongside these encourage them to write the appropriate number sentences.	representations, and missing numbe problems such as $7 = \Box - 9$				
Written Read, write and interpret	Video Clip: <u>https://www.youtube.com/watch?v=OkW1Y11tGxw&amp;list=UUVb98bWNgEmk02R7enUrmFA</u>					
mathematical statements involving addition (+), subtraction (-) and equals (=)	When children are ready to move away from manipulatives: Use numbered number lines to add, by counting on in ones. Encourage children to start with the <b>larger</b> number and count on. Eg					
signs	+ 1 +1 +1					
	$6+3=9  \underbrace{4+1+1+1+0}_{0\ 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9\ 10}$ Count back in ones on a numbered number line to take away, with numbers up to 20:					
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$					
	7 − 4 = 3 < <sup>(n</sup> )					
	It is really important that the children understand the equals sign as a sign of equivalence, that what is on one side of it has the same value as what is on the other. Record number sentences in different orders, such as $5 + 5 = 10$ and $10 = 5 + 5$					

#### Key Vocabulary:

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, least, count back , how many left, how much less is\_? difference, count on, strategy, sum, tens, units, ones, partition, addition, column, tens boundary

Objectives	Representations	Problem Solving	
Recall/ Mental Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: * a two-digit number and ones * a two-digit number and tens * two two-digit numbers adding three one- digit numbers	Continue to use concrete objects for number bonds until children are fluent. Video: https://www.youtube.com/watch?v=mEHKmMapWGY Children use numbered lines to support their own calculations using a numbered line to count on and back in ones. Eg 13 + 5 = 18 12 - 3 = 9 12 -	Solve problems with addition and subtraction:* using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methodsSolve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change (copied from Measurement)	
Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot			

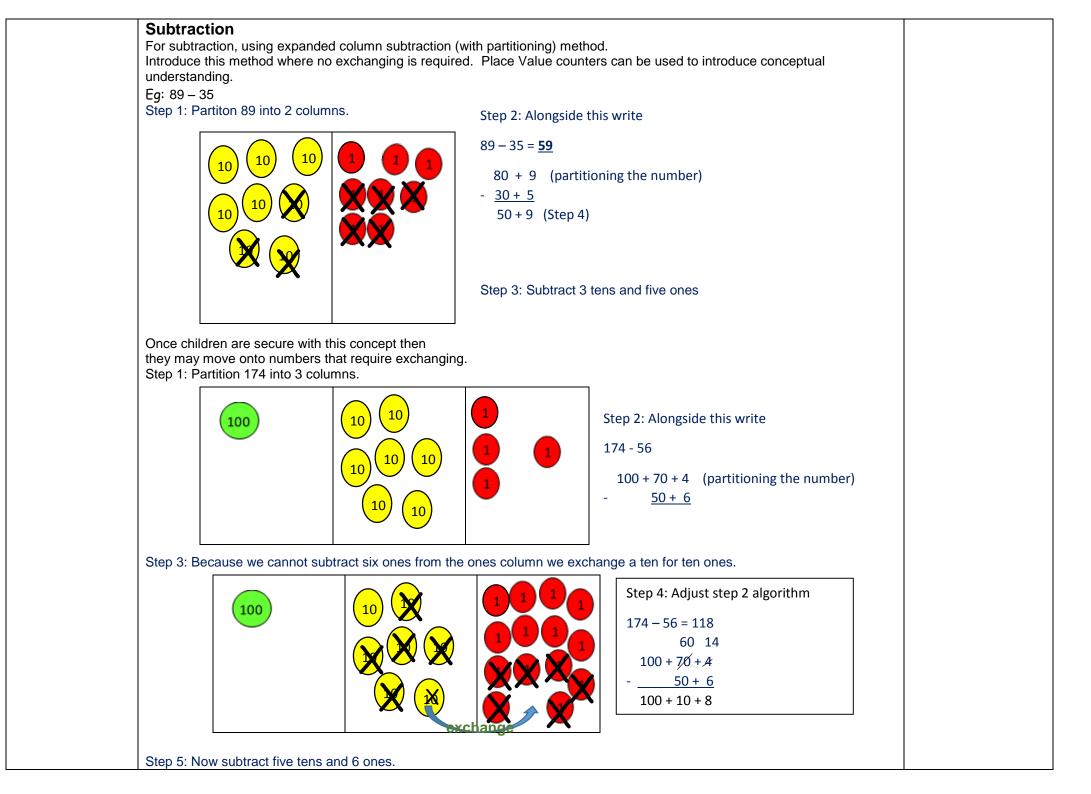


Mental strategy - subtract numbers close together by counting on: Many mental strategies are taught. Children are taught to recognise that when numbers are close together, it is more efficient to count on the difference. They need to be clear about the relationship between addition and subtraction.	
+1 $+1$ $+1$ $+1$ $+1$ $+137 38 39 40 41 42It is really important that the children understand the equals sign as a sign of equivalence, that what is on one side of it has the same value as what is on the other. Record number sentences in different orders, such as 23 + 8 = 31 and 31 = 23 + 8$	

Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units(ones) partition, plus, addition, column, tens boundary, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is\_? difference, strategy, exchange, decrease, hundreds, value, digit, hundreds boundary, increase, vertical, 'carry', expanded, compact

Objectives	Representations	Problem Solving	
Recall/ mental Recall and use addition and subtraction facts to 100 fluently, and derive and use related facts up to 1000	Use of the empty number line can be introduced to support mental calculations. Addition – Starting with the larger number to 'count-on': Eg I have 36p and my mum gives me 28p pocket money. How much money do I have altogether? N.B Only one number is partitioned here M.B Only one number is partitioned here	Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	
Add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens * a three-digit number and bundrada	Two examples of $48 + 36$ +30 +2 +30 +2 +4 48 78 80 84 +2 +34 48 50 84 Subtraction -		
hundreds Use their knowledge of the order of operations to carry out calculations involving the four operations	The steps may be recorded in a different order: $ \begin{array}{c} 74 - 27 = 47 \text{ worked by counting back:} \\ -3 -4 -20 -4 \\ 47 50 54 74 \end{array} $ The steps may be recorded in a different order: $ \begin{array}{c} -20 -3 -4 \\ 47 50 70 74 \end{array} $ Or combined: $ \begin{array}{c} -23 -4 \\ 47 7 70 74 \end{array} $		
	For addition, partitioning can be used as a mental method. Add the hundreds then the tens and finally the ones to form partial sums and then add these partial sums. It is not advised to use this method for subtraction as sometimes 'exchanging' is needed and this should be left for written methods.		

Written Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	Example of addition: 124 + 276 100 + 200 = 300 20 + 70 = 90 4 + 6 = 10 Which is then recorded in a shorter form below 124 + 276 = 300 + 90 + 10 = 400 Written (addition) Introduce the expanded column addition method, using place value counters or Diennes as concepts. Eg: using paper folded into 3 columns or whiteboard with 3 columns, representing HTU
NB Objectives in black text are statutory requirements from the National Curriculum, objectives in green text are recommended and are from the Middlesbrough planning document.	$\begin{array}{c c} 236 + 73 \\ (Partition numbers and put correct number in each column) \\ + & 100 & 10 & 1 & 1 \\ 100 & 10 & 1 & 1 \\ 100 & 10 & 1$
	Most children will move away from a conceptual understanding to carrying out method without counters. Most children will move away from a conceptual understanding to carrying out method without counters. I 0 0



Once pupils are secure with the understanding of "exchanging", they can use the partitioned column method to subtract any 2 and 3-digit numbers. Most children will move away from using place value counters and concrete objects into using the algorithm only.

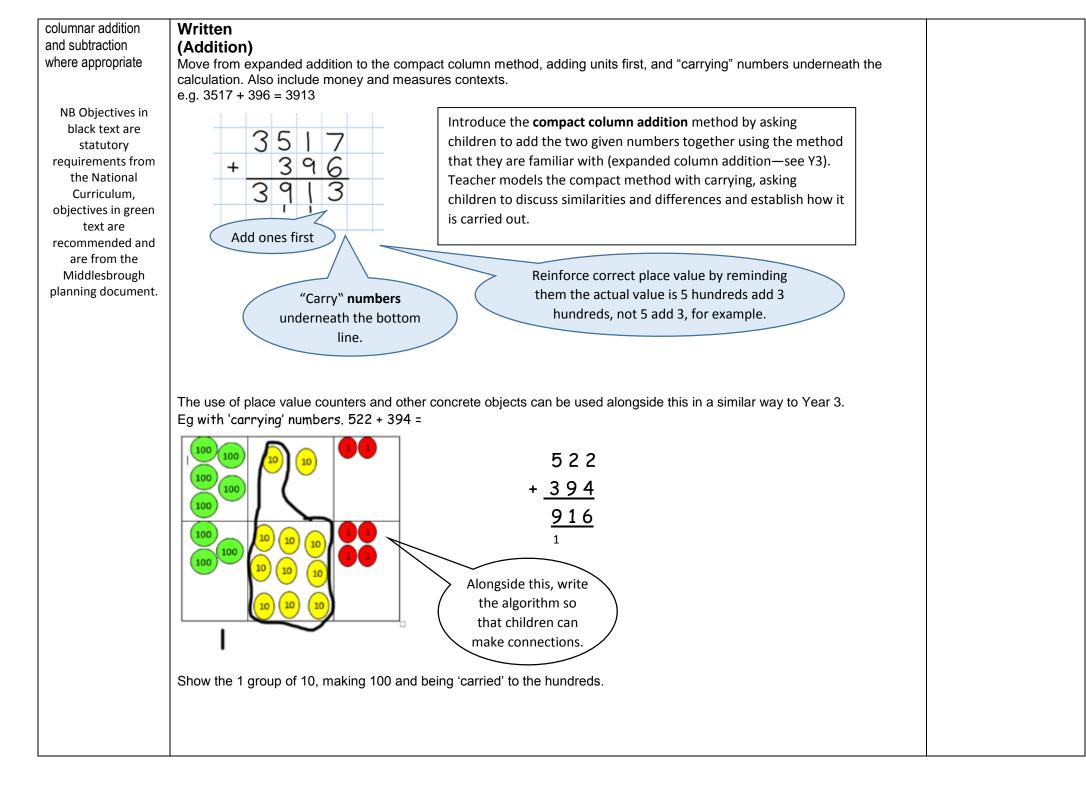
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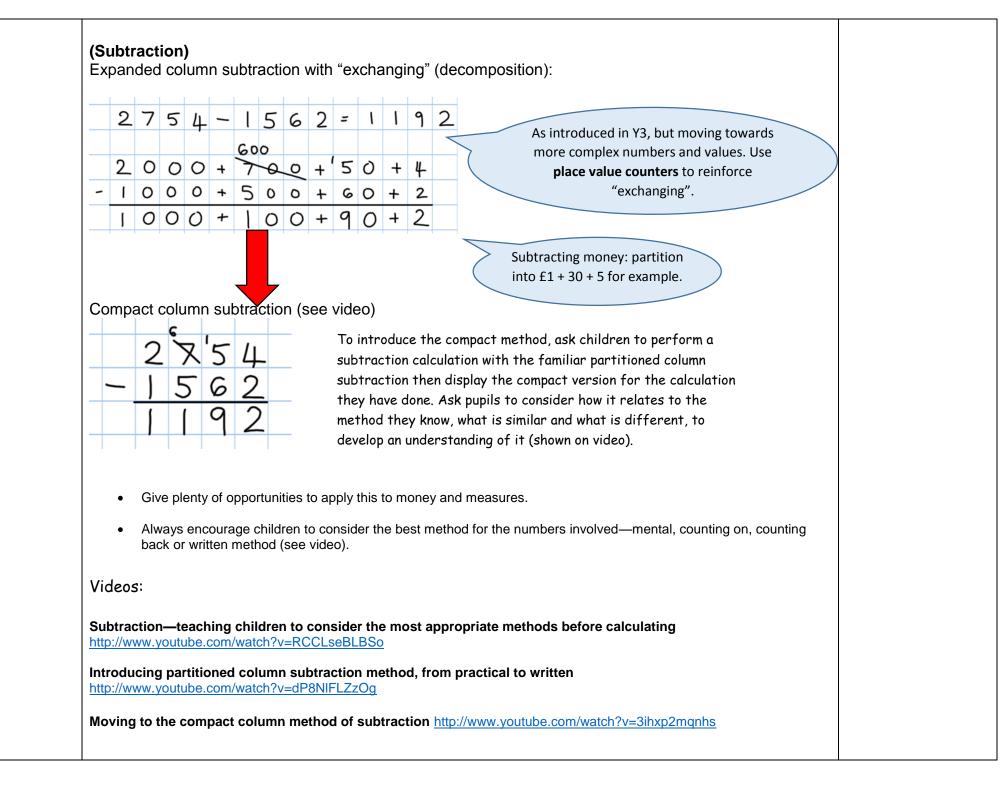
Videos: Subtraction—teaching children to consider the most appropriate methods before calculating http://www.youtube.com/watch?v=RCCLseBLBSo

Introducing partitioned column subtraction method, from practical to written <a href="http://www.youtube.com/watch?v=dP8NIFLZzOg">http://www.youtube.com/watch?v=dP8NIFLZzOg</a>

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Objectives	Representations	Problem Solving	
Recall/ Mental Recall and use addition and subtraction facts to 1000 fluently, and derive and use related facts up to 10000 Add and subtract numbers mentally, including: * a three-digit number and ones * a three-digit number and tens * but the order of operations to carry out calculations involving the four operations <b>Written</b> Add and subtract numbers with up to 4 digits using the formal written methods of	Continue to build on mental methods taught in Year 3. Children should be encouraged to decide whether a mental method or a written method would be most efficient for the calculation. Counting on as a mental strategy for subtraction: Continue to reinforce counting on as a strategy for close-together numbers (e.g. 121–118), and also for numbers that are "nearly" multiples of 10, 100, 1000 or £s, which make it easier to count on (e.g. 102-89, 131–79, or calculating change from £1 etc.). • Start at the smaller number and count on in tens first, then count on in units to find the rest of the difference: $\frac{+10}{+10}$ $\frac{+10}$	Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	





Key Vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units (ones), partition, plus, addition, column, tens boundary, hundreds boundary, increase, "carry", expanded, compact, vertical, thousands, hundreds, digits, inverse, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is\_? difference, count on, strategy, exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, thousandths, decimal point, decimal places

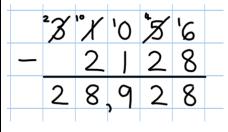
Objectives	Representations					
Recall/ Mental Recall and use addition and subtraction facts to 1000 fluently, and derive and use related facts up to 100000 Add and subtract numbers mentally with increasingly large numbers Use their knowledge of the order of operations to carry out calculations involving the four operations <b>Written</b> Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar	Children will become increasingly confident in deciding on most efficient method for the calculation depending on the numbers involved. Mental methods previously taught in Years 3 and 4 will be reinforced and the use of the empty number line should be encouraged when dealing with problems involving time and negative numbers. The use of the empty number line can also be useful for money word problems. Eg: A film starts at 10:15 and lasts for 2 hours and 17 minutes. What time does the film end? Step 1: Write the start time at the left hand side of the empty number line Step 2: Add on 2 hours and 17 minutes by partitioning the minutes into 'easy' chunks. In this case 15m + 2m. The temperature in London is 9°C. The temperature in Moscow is -7°C. What is the difference in temperature? Step 1: When finding 'difference' we put both values onto the empty number line shaller value to the left. In this case -7°C and 9°C.	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why				

addition and subtraction)	Written (Addition)	
	Add numbers with more than 4 digits including money, measures and decimals with different numbers of decimal places.	
NB Objectives in black text are statutory requirements from the National Curriculum, objectives in green text are		
recommended and are from the Middlesbrough planning document.	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
	1       9       0       1         3       6       5         +       0       7       0         2       3       3       6         1       1       7       0         2       3       3       6         5       Empty decimal places can be filled with zero to show the place value in each column.         Say "6 tenths add 7 tenths" to reinforce place value.	

#### Subtraction

(including money, measures, decimals.)

Compact column subtraction (with "exchanging").



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0

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Children who are still not secure with number facts and place value will need to remain on the partitioned column method until ready for the compact method. Place value counters can be used alongside this (see Year 4).

Subtracting with larger integers.

Subtract with decimal values, including mixtures of integers and decimals, aligning the decimal point.

Add a "zero" in any empty decimal places to aid understanding of what to subtract in that column.

Video: Moving to the compact column method of subtraction http://www.youtube.com/watch?v=3ihxp2mgnhs

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Objectives	Representations				
Recall/ Mental Recall and use addition and subtraction facts to 1000 fluently, and derive and use related facts up to 1000000 Perform mental calculations, including with mixed operations and large numbers Use their knowledge of the order of operations to carry out calculations involving the four operations <b>Written</b> Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)	Children should be given the opportunity to rehearse a range of mental calculations and they should do this with confidence and fluency. The quickly decide on the most efficient method for the numbers involved. Reinforce the use of the empty number line for calculations involving time, negative numbers and some money word problems. Children should be encouraged to use a checking strategy (Eg: calculating using a different method or using the inverse). Written (Addition) Add several numbers of increasing complexity 2 3 • 3 6 1 4 • 0 8 0 5 9 • 7 7 0 + 1 • 3 0 0 7 9 • 7 7 0 + 1 • 3 0 0 7 9 • 7 7 0 + 1 • 3 0 0 7 9 • 7 7 0 + 1 • 3 0 0 7 9 • 7 7 0 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9	Solve addition and subtraction multi- step problems in contexts, deciding which operations and methods to use and why Solve problems involving addition, subtraction, multiplication and division			

