Calculation Policy

Brookside Primary School

January 2019

Introduction

This policy outlines both the mental and written methods that should be taught from EYFS to Year 6. The policy has been written according to the National Curriculum 2014 and the written calculations for all four operations are as outlined on the appendices of the Programme of Study.

Aims and Objectives

The National Curriculum for mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including 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.

How to use this policy

The document builds on the interconnectedness of mathematics and outlines the progression for addition, subtraction, multiplication and division. It is our intention that addition and subtraction should be taught at the same time to ensure children are able to see the clear links between the operations and the inverse nature of them along with multiplication and division. Children should secure mental strategies. They are taught the strategy of counting forwards and backwards in ones and tens first and then 'special strategies' are introduced. Children are taught to look carefully at the calculation and decide, which strategy they should use. Children should explain and reason as to why they have chosen a strategy and whether it is the most efficient. The formal written methods should be introduced with caution. Calculations that require a written method should be presented to the children and models and images, such as dienes apparatus, place value counters, etc. should be used to ensure children have a conceptual understanding of the written method and that it is not a process that the children use for every type of calculation regardless of whether it can be completed mentally or mentally with jottings i.e. the number line. The policy outlines the mental strategies that children should be encouraged to use: a mental strategy that they can always rely on, e.g. counting in tens and ones, forwards and backwards E.g. 56 – 25 (count back in 10s 56, 46, 36 and back in ones 36, 35, 34, 33, 32, 31); a special strategy they can select from a small range of strategies if they can see something special about the numbers they are being asked to calculate with, e.g. 46 – 24 (I can use near doubles to support my calculation E.g. 46 – 23 – 1). The policy outlines the written methods as suggested on the appendices of the Curriculum 2014 and suggests that children: look at a calculation and decide whether it can be done mentally, mentally with a jotting or whether it needs a written method.

Aims of the policy

To ensure consistency and progression in our approach to calculation

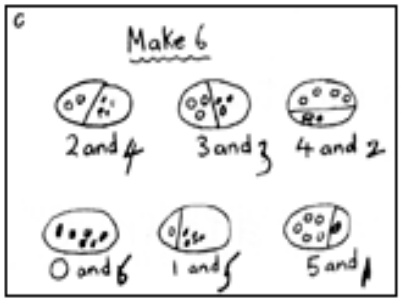
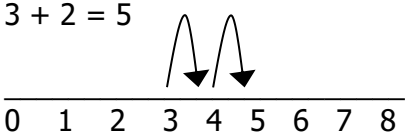
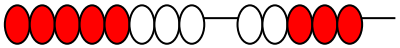
To ensure that children develop an efficient, reliable, formal written methods of calculations for all operations.

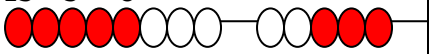
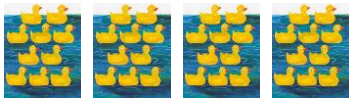
To ensure that children can use these methods with confidence and understating in a range of contexts.

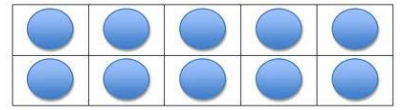
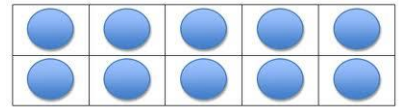
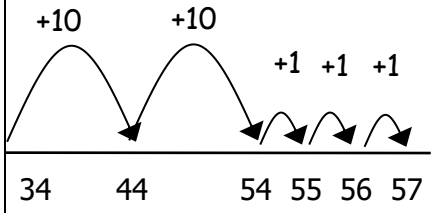
Please also refer to the models and images document, attached as an appendix, and the examples of formal written methods found in the Mathematics appendix of the National Curriculum.

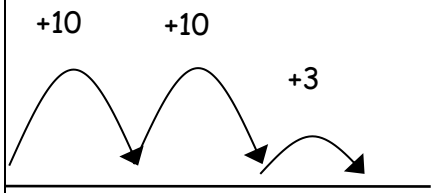
<table>
<tr><th colspan="2">EYFS</th></tr>
<tr><td colspan="2">Children in EYFS will
Children will engage in a wide variety of songs, rhymes, games and activities. They will use practical equipment and through a variety of activates will solve problems involving doubling, halving and sharing. They will explore mathematical vocabulary e.g How many more? Take two teddies away, how many are left? Three sweets for you and three sweets for me. How many sweets altogether? They will relate addition by combining two groups of objects by: counting all and then counting on form the largest number. Children will count back from a given number. All mathematical understanding will be supported by practical resources</td></tr>
<tr><td>Mental Calculation</td><td>Default for ALL children</td></tr>
<tr><td>One more of a given number to 20.
One less than a given number to 20.</td><td>Count in 1's to 20.
Order numbers from 1 –20.
Write numbers from 1- 20.
One more or one less than a given number to 20.
Add and subtract two single-digit numbers using quantities or objects.
Count on or back to solve an addition or subtraction number sentence.
Counts an irregular arrangement of up to 20 objects.
Practical doubling, halving and sharing.</td></tr>
</table>

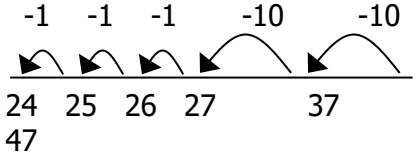
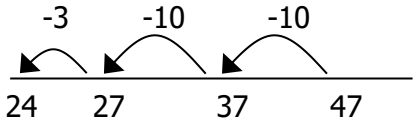
Key Stage 1		
Children in Years 1 and 2 will be given a really solid foundation in the basic building blocks of mental and written arithmetic. Through being taught place value, children will develop an understanding of how numbers work, so that they are confident with 2-digit numbers and beginning to read and say numbers above 100.		
Addition and Subtraction: A focus on number bonds, first via practical hands-on experiences and subsequently using memorisation techniques, enables a good grounding in these crucial facts, and ensures that all children leave Year 2 knowing the pairs of numbers which make all the numbers up to 10 at least. Children will also have experienced and been taught pairs to 20. Children's knowledge of number facts enables them to add several 1-digit numbers, and to add/subtract a 1-digit number to/from a 2-digit number. Another important conceptual tool is the ability to add/subtract 1 or 10, and to understand which digit changes and why. This understanding is extended to enable children to add and subtract multiples of 10 to and from any 2-digit number. The most important application of this knowledge is the ability to add or subtract any pair of 2-digit numbers by counting on or back in 10s and 1s. Children may extend this to adding by partitioning numbers into 10s and 1s.	**Multiplication and Division:** Children will be taught to count in 2s, 3s, 5s and 10s, and will relate this skill to repeated addition. Children will meet and begin to learn the associated ×2, ×3, ×5 and ×10 tables. Engaging in a practical way with the concept of repeated addition and the use of arrays enables children to develop a preliminary understanding of multiplication, and asking them to consider how many groups of a given number make a total will introduce them to the idea of division. Children will also be taught to double and halve numbers, and will thus experience scaling up or down as a further aspect of multiplication and division.	**Fractions:** Fractions will be introduced as numbers and as operators, specifically in relation to halves, quarters and thirds.

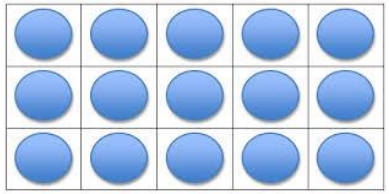
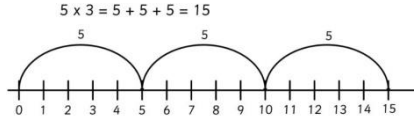
Year 1				
	Mental calculation	Written calculation	Default for ALL children	Models and images
Y1 +	Number bonds ('story' of 5, 6, 7, 8, 9 and 10) Count on in 1s from a given 2-digit number Add two 1-digit numbers Add three 1-digit numbers, spotting doubles or pairs to 10 Count on in 10s from any given 2-digit number Add 10 to any given 2-digit number Use number facts to add 1-digit numbers to 2-digit numbers e.g. *Use 4 + 3 to work out 24 + 3, 34 + 3* Add by putting the larger number first		Pairs with a total of 10 Count in 1s Count in 10s Count on 1 from any given 2-digit number	 3 + 2 = 5   3 + 2 = 5  Children use a number track to count on starting from the largest number 

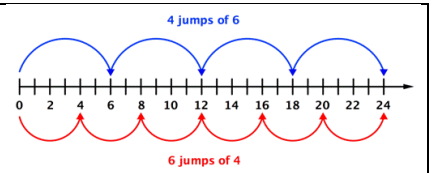
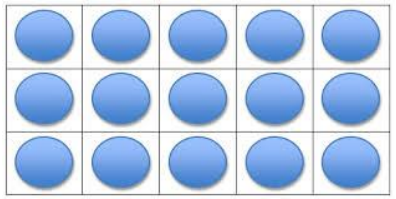
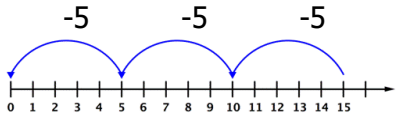
Y1 -	Number bonds ('story' of 5, 6, 7, 8, 9 and 10) Count back in 1s from a given 2-digit number Subtract one 1-digit number from another Count back in 10s from any given 2-digit number Subtract 10 from any given 2-digit number Use number facts to subtract 1-digit numbers from 2-digit numbers e.g. *Use 7 – 2 to work out 27 – 2, 37 – 2*		Pairs with a total of 10 Count back in 1s from 20 to 0 Count back in 10s from 100 to 0 Count back 1 from any given 2-digit number	 6 – 3 = 3 -1 -1 -1 0 1 2 3 4 5 6 7 8 9 10 13 - 5 = 8  Use a number track - put your finger on 8 and count back three. 
Y1 X	Begin to count in 2s, 5s and 10s Begin to say what three 5s are by counting in 5s, or what four 2s are by counting in 2s, etc. Double numbers to 10		Begin to count in 2s and 10s Double numbers to 5 using fingers	Counting in sequences:  

				Arrays: 
Y1 ÷	Begin to count in 2s, 5s and 10s Find half of even numbers to 12 and know it is hard to halve odd numbers Find half of even numbers by sharing Begin to use visual and concrete arrays or 'sets of' to find how many sets of a small number make a larger number		Begin to count in 2s and 10s Find half of even numbers by sharing	Sharing: Share 12 pencils between 2 pots  12 shared between 3  Use arrays to support division: 
Year 2				
	Mental calculation	Written calculation	Default for ALL children	Models and images
Y2 +	Number bonds – know all the pairs of numbers which make all the numbers to 12, and pairs with a total of 20 Count on in 1s and 10s from any given 2-digit number Add two or three 1-digit numbers Add a 1-digit number to any 2-digit number using number		Know pairs of numbers which make each total up to 10 and 20 Add two 1-digit numbers Add a 1-digit number to a 2-digit number by counting on in 1s Add 10 and small multiples of 10 to a 2-digit number by counting on in 10s	Counting on in tens and ones: 34 + 23 = 57 

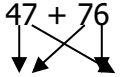
	facts, including bridging multiples of 10 e.g. *45 + 4* e.g. *38 + 7* Add 10 and small multiples of 10 to any given 2-digit number Add any pair of 2-digit numbers			Then becoming more efficient by adding the units in one jump. 34 + 23 = 57  34 44 54 57 Children to continue to use a number line in more efficient ways: - adding tens in one jump and units in one jump - bridging through ten Partitioning: 34 + 25 = 59 30 4 + 20 5 30 + 4 <u>20 + 5</u> 50 + 9 = 59 49 + 26 = 40 + 9 <u>20 + 6</u> 60 + 15 = 75

Y2 -	Number bonds – know all the pairs of numbers which make all the numbers to 12 Count back in 1s and 10s from any given 2-digit number Subtract a 1-digit number from any 2-digit number using number facts, including bridging multiples of 10 e.g. *56 – 3* e.g. *53 – 5* Subtract 10 and small multiples of 10 from any given 2-digit number Subtract any pair of 2-digit numbers by counting back in 10s and 1s or by counting up		Know pairs of numbers which make each total up to 10 and 20 Subtract a 1-digit number from a 2-digit number by counting back in 1s Subtract 10 and small multiples of 10 from a 2-digit number by counting back in 10s	<u>Counting back:</u> Counting back in tens and ones: 47 - 23 = 24  Then becoming more efficient by subtracting the units in one jump:  Children to continue to use a number line in more efficient ways: - subtracting tens in one jump and units in one jump - bridging through ten <u>Counting on:</u> If the numbers involved in the calculation are close together or near to multiples of 10, 100, etc., it can be more efficient to count on.

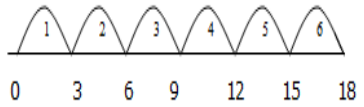
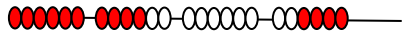
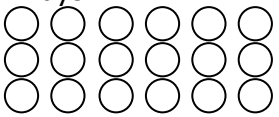
				82 - 68 = +1 +1 +10 +1 +1  68 69 70 80 81 82 Again, become more efficient by: - subtracting the units in one jump - subtracting the tens in one jump and the units in one jump - bridging through ten
Y2 X	Count in 2s, 5s and 10s Begin to count in 3s Begin to understand that multiplication is repeated addition and to use arrays e.g. *3 × 4 is three rows of 4 dots* Begin to learn the ×2, ×3, ×5 and ×10 tables, seeing these as 'lots of' e.g. *5 lots of 2, 6 lots of 2, 7 lots of 2* Double numbers up to 20 Begin to double multiples of 5 to 100 Begin to double 2-digit numbers less than 50 with 1s digits of 1, 2, 3, 4 or 5		Count in 2s, 5s and 10s Begin to use and understand simple arrays e.g. *2 × 4 is two lots of four* Double numbers up to 10 Double multiples of 10 to 50	Arrays:  Repeated addition:  5 10 15  Commutativity: 6 x 4 = 4 x 6

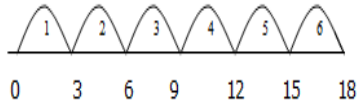
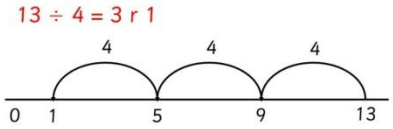
				
Y2 ÷	Count in 2s, 5s and 10s Begin to count in 3s Using fingers, say where a given number is in the 2s, 5s or 10s count e.g. *8 is the fourth number when I count in 2s* Relate division to grouping e.g. *How many groups of 5 in 15?* Halve numbers to 20 Begin to halve numbers to 40 and multiples of 10 to 100 Find 1/2, 1/3, 1/4 and 3/4 of a quantity of objects and of amounts (whole number answers)		Count in 2s, 5s and 10s Say how many rows in a given array e.g. *How many rows of 5 are in an array of 3 × 5?* Halve numbers to 12 Find 1/2 of amounts	Sharing equally: 6 sweets shared between 2 people  Grouping:  Arrays:  Repeated subtraction: 

Lower Key Stage 2		
In Lower Key Stage 2, children build on the concrete and conceptual understandings they have gained in Key Stage 1 to develop a real mathematical understanding of the four operations, in particular developing arithmetical competence in relation to larger numbers.		
Addition and subtraction: Children are taught to use place value and number facts to add and subtract numbers mentally and they will develop a range of strategies to enable them to discard the 'counting in 1s' or fingers-based methods of Key Stage 1. In particular, children will learn to add and subtract multiples and near multiples of 10, 100 and 1000, and will become fluent in complementary addition as an accurate means of achieving fast and accurate answers to 3-digit subtractions. Standard written methods for adding larger numbers are taught, learned and consolidated, and written column subtraction is also introduced.	**Multiplication and division:** This key stage is also the period during which all the multiplication and division facts are thoroughly memorised, including all facts up to 12 × 12. Efficient written methods for multiplying or dividing a 2-digit or 3-digit number by a 1-digit number are taught, as are mental strategies for multiplication or division with large but 'friendly' numbers, e.g. when dividing by 5 or multiplying by 20.	**Fractions and decimals:** Children will develop their understanding of fractions, learning to reduce a fraction to its simplest form, as well as finding non-unit fractions of amounts and quantities. The concept of a decimal number is introduced and children consolidate a firm understanding of 1-place decimals, multiplying and dividing whole numbers by 10 and 100.

Year 3				
	Mental calculation	Written calculation	Default for ALL children	Models and images
Y3 +	Know pairs with each total to 20 e.g. *2 + 6 = 8, 12 + 6 = 18, 7 + 8 = 15* Know pairs of multiples of 10 with a total of 100 Add any two 2-digit numbers by counting on in 10s and 1s or by using partitioning Add multiples and near multiples of 10 and 100 Perform place-value additions without a struggle	Use expanded column addition to add two or three 3-digit numbers or three 2-digit numbers Begin to use compact column addition to add numbers with 3 digits Begin to add like fractions e.g. *3/8 + 1/8 + 1/8* Recognise fractions that add to 1 e.g. *1/4 + 3/4*	Know pairs of numbers which make each total up to 10, and which total 20 Add two 2-digit numbers by counting on in 10s and 1s e.g. *56 + 35 is 56 + 30 and then add the 5* Understand simple place-value additions e.g. *200 + 40 + 5 = 245* Use place value to add multiples of 10 or 100	Partitioning 47 + 76  47 = 40 + 7 + 76 70 + 6 110 +13 = 123 Bridge tens: 58 + 37 = 95

	e.g. *300 + 8 + 50 = 358* Use place value and number facts to add a 1-digit or 2-digit number to a 3-digit number e.g. *104 + 56 is 160 since 104 + 50 = 154 and 6 + 4 = 10* *676 + 8 is 684 since 8 = 4 + 4 and* *76 + 4 + 4 = 84* Add pairs of 'friendly' 3-digit numbers e.g. *320 + 450* Begin to add amounts of money using partitioning	e.g. *3/5 + 2/5*		50 + 8 +30 + 7 80 + 15 = 95 Bridge hundreds: 70 + 7 +50 + 8 120 + 15 = 135 Children should be moved on to using an expanded columnar method: 63 + 32 5 (3+2) 90 (60+30) 95 78 + 57 15 (8+7) 120 (70+50) 132
Y3 -	Know pairs with each total to 20 e.g. *8 – 2 = 6* e.g. *18 – 6 = 12* e.g. *15 – 8 = 7* Subtract any two 2-digit numbers Perform place-value subtractions without a struggle	Use counting up as an informal written strategy for subtracting pairs of 3-digit numbers e.g. *423 – 357* Begin to subtract like fractions e.g. *7/8 – 3/8*	Know pairs of numbers which make each total up to 10, and which total 20 Count up to subtract 2-digit numbers e.g. *72 – 47* Subtract multiples of 5 from 100 by counting up	Continue to use empty number lines with increasingly large numbers. Partitioning and decomposition 89 – 57 = 89 – 50 - 7

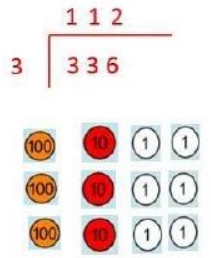
	e.g. *536 – 30 = 506* Subtract 2-digit numbers from numbers > 100 by counting up e.g. *143 – 76 is done by starting at 76. Then add 4 (80), then add 20 (100), then add 43, making the difference a total of 67* Subtract multiples and near multiples of 10 and 100 Subtract, when appropriate, by counting back or taking away, using place value and number facts Find change from £1, £5 and £10		e.g. *100 – 35* Subtract multiples of 10 and 100	89 = 80 + 9 - 57 50 + 7 30 + 2 = 32 Then solve problems that involve exchanging. 70 + 1 - 40 + 6 60 ~~70~~ + 11 - 40 + 6 20 + 5 = 25
Y3 X	Know by heart all the multiplication facts in the ×2, ×3, ×4, ×5, ×8 and ×10 tables Multiply whole numbers by 10 and 100 Recognise that multiplication is commutative Use place value and number facts in mental multiplication e.g. *30 × 5 is 15 × 10* Partition teen numbers to multiply by a 1-digit number e.g. *3 × 14 as 3 × 10 and 3 × 4* Double numbers up to 50	Use partitioning (grid multiplication) to multiply 2-digit and 3-digit numbers by 'friendly' 1-digit numbers	Know by heart the ×2, ×3, ×5 and ×10 tables Double given tables facts to get others Double numbers up to 25 and multiples of 5 to 50	Repeated addition: 3 x 6 =   Arrays:  Partitioning 38 x 5 = 30 x 5 = 150 8 x 5 = 40

				150 + 40 = 190 Move into expanded column multiplication 38 X 5 40 (8 x 5) 150 (30 x 5) 190
Y3 ÷	Know by heart all the division facts derived from the ×2, ×3, ×4, ×5, ×8 and ×10 tables Divide whole numbers by 10 or 100 to give whole number answers Recognise that division is not commutative Use place value and number facts in mental division e.g. *84 ÷ 4 is half of 42* Divide larger numbers mentally by subtracting the 10th multiple as appropriate, including those with remainders e.g. *57 ÷ 3 is 10 + 9 as 10 × 3 = 30 and 9 × 3 = 27* Halve even numbers to 100, halve odd numbers to 20	Perform divisions just above the 10th multiple using horizontal or vertical jottings and understanding how to give a remainder as a whole number Find unit fractions of quantities and begin to find non-unit fractions of quantities	Know by heart the division facts derived from the ×2, ×3, ×5 and ×10 tables Halve even numbers up to 50 and multiples of 10 to 100 Perform divisions within the tables including those with remainders e.g. *38 ÷ 5*	Repeated subtraction: 18 ÷ 3 =  Children should also move onto calculations involving remainders. 

Year 4				
	Mental calculation	Written calculation	Default for ALL children	Models and images
Y4 +	Add any two 2-digit numbers by partitioning or counting on Know by heart/quickly derive number bonds to 100 and to £1 Add to the next 100, £1 and whole number e.g. *234 + 66 = 300* e.g. *3·4 + 0·6 = 4* Perform place-value additions without a struggle e.g. *300 + 8 + 50 + 4000 = 4358* Add multiples and near multiples of 10, 100 and 1000 Add £1, 10p, 1p to amounts of money Use place value and number facts to add 1-, 2-, 3- and 4-digit numbers where a mental calculation is appropriate e.g. *4004 + 156 by knowing that 6 + 4 = 10 and that 4004 + 150 = 4154 so the total is 4160*	Column addition for 3-digit and 4-digit numbers e.g. 5347 2286 +1495 9128 121 Add like fractions e.g. *3/5 + 4/5 = 7/5 = 1 2/5* Be confident with fractions that add to 1 and fraction complements to 1 e.g. *2/3 + _ = 1*	Add any 2-digit numbers by partitioning or counting on Number bonds to 20 Know pairs of multiples of 10 with a total of 100 Add 'friendly' larger numbers using knowledge of place value and number facts Use expanded column addition to add 3-digit numbers	76 + 47 13 (6 + 7) 110 (70 + 40) 123 Bridging the tens: 47 + 35 = 81 46 + 35 81 1 Bridging the hundreds: 78 + 57 = 78 + 57 135 1 1 Use larger numbers (up to 4 digits): 168 + 56 = 168 + 56 224 11

Y4 -	Subtract any two 2-digit numbers Know by heart/quickly derive number bonds to 100 Perform place-value subtractions without a struggle e.g. *4736 – 706 = 4030* Subtract multiples and near multiples of 10, 100, 1000, £1 and 10p Subtract multiples of 0·1 Subtract by counting up e.g. *503 – 368 is done by adding* *368 + 2 + 30 + 100 + 3 (so we added 135)* Subtract, when appropriate, by counting back or taking away, using place value and number facts Subtract £1, 10p, 1p from amounts of money Find change from £10, £20 and £50	Use expanded column subtraction for 3- and 4-digit numbers Use complementary addition to subtract amounts of money, and for subtractions where the larger number is a near multiple of 1000 or 100 e.g. *2002 – 1865* Subtract like fractions e.g. *4/5 – 3/5 = 1/5* Use fractions that add to 1 to find fraction complements to 1 e.g. *1 – 2/3 = 1/3*	Use counting up with confidence to solve most subtractions, including finding complements to multiples of 100 e.g. *512 – 287* e.g. *67 + _ = 100*	Partitioning and decomposition 754 - 86 700 + 50 + 4 - 80 + 6 600 140 ~~700~~ + ~~50~~ + ^{1}4 - 80 + 6 600 + 60 + 8 = 668 £8.95 - £4.38 8 + 0.9 + 0.05 - 4 + 0.3 + 0.08 8 + 0.8 + 0.15 - 4 + 0.3 + 0.08 4 + 0.5 + 0.07 614 1 7~~5~~4 - 286 468
Y4 X	Know by heart all the multiplication facts up to 12 × 12	Use a vertical written method to multiply a 1-digit number by a 3-digit number (ladder method)	Know by heart multiplication tables up to 10 × 10 Multiply whole numbers by 10 and 100	Expanded short multiplication: 38 x 4 = 152

	Recognise factors up to 12 of 2-digit numbers Multiply whole numbers and 1-place decimals by 10, 100, 1000 Multiply multiples of 10, 100 and 1000 by 1-digit numbers e.g. *300 × 6* e.g. *4000 × 8* Use understanding of place value and number facts in mental multiplication e.g. *36 × 5 is half of 36 × 10* e.g. *50 × 60 = 3000* Partition 2-digit numbers to multiply by a 1-digit number mentally e.g. *4 × 24 as 4 × 20 and 4 × 4* Multiply near multiples by rounding e.g. *33 × 19 as (33 × 20) – 33* Find doubles to double 100 and beyond using partitioning Begin to double amounts of money e.g. *£35·60 doubled is £71·20*	Use an efficient written method to multiply a 2-digit number by a number between 10 and 20 by partitioning	Use the grid method to multiply a 2-digit or a 3-digit number by a number ≤ 6	30 + 8 X 4 32 (4 x 8 = 32) 120 (4 x 30 = 120) 152 This becomes refined: 38 x 4 = 38 x 4 32 (4 x 8) 120 (4 x 30) 152 Use this method to multiply TU X U, HTU X U
Y4 ÷	Know by heart all the division facts up to 144 ÷ 12 Divide whole numbers by 10, 100, to give whole number answers or answers with 1 decimal place	Use a written method to divide a 2-digit or a 3-digit number by a 1-digit number Give remainders as whole numbers Begin to reduce fractions to their simplest forms	Know by heart all the division facts up to 100 ÷ 10 Divide whole numbers by 10 and 100 to give whole number answers or answers with 1 decimal place Perform divisions just above the 10th multiple using the written	Repeated subtraction: Introduction to short division using place value counters to support conceptual understanding:

	Divide multiples of 100 by 1-digit numbers using division facts e.g. *3200 ÷ 8 = 400* Use place value and number facts in mental division e.g. *245 ÷ 20 is half of 245 ÷ 10* Divide larger numbers mentally by subtracting the 10th or 20th multiple as appropriate e.g. *156 ÷ 6 is 20 + 6 as 20 × 6 = 120 and 6 × 6 = 36* Find halves of even numbers to 200 and beyond using partitioning Begin to halve amounts of money e.g. *half of £52·40 is £26·20*	Find unit and non-unit fractions of larger amounts	layout and understanding how to give a remainder as a whole number Find unit fractions of amounts	 Begin with numbers which are easily divisible: $4\overline{)804}$ = 201 Move on to more complex calculations: $6\overline{)8^{2}0^{2}4}$ = 134 Division with remainders: $7\overline{)8^{1}0^{3}4}$ = 114 r 6

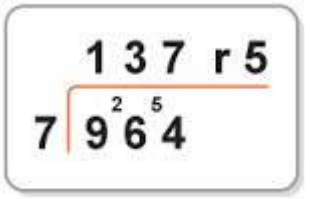
Upper Key Stage 2		
Children move on from dealing mainly with whole numbers to performing arithmetic operations with both decimals and fractions.		
Addition and subtraction: Children will consolidate their use of written procedures in adding and subtracting whole numbers with up to 6 digits and also decimal numbers with up to 2 decimal places. Mental strategies for adding and subtracting increasingly large numbers will also be taught. These will draw upon children's robust understanding of place value and knowledge of number facts. Negative numbers will be added and subtracted.	**Multiplication and division:** Efficient and flexible strategies for mental multiplication and division are taught and practised, so that children can perform appropriate calculations even when the numbers are large, such as *40 000 × 6* or *40 000 ÷ 8*. In addition, it is in Years 5 and 6 that children extend their knowledge and confidence in using written algorithms for multiplication and division.	**Fractions, decimals, percentages and ratio:** Fractions and decimals are also added, subtracted, divided and multiplied, within the bounds of children's understanding of these more complicated numbers. Children will also calculate simple percentages and ratios.

Year 5				
	Mental calculation	Written calculation	Default for ALL children	Models and images
Y5 +	Know number bonds to 1 and to the next whole number Add to the next 10 from a decimal number e.g. *13·6 + 6·4 = 20* Add numbers with 2 significant digits only, using mental strategies e.g. *3·4 + 4·8* e.g. *23 000 + 47 000* Add 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000 e.g. *8000 + 7000* e.g. *600 000 + 700 000* Add near multiples of 10, 100, 1000, 10 000 and 100 000 to other numbers e.g. *82 472 + 30 004*	Use column addition to add two or three whole numbers with up to 5 digits Use column addition to add any pair of 2-place decimal numbers, including amounts of money Begin to add related fractions using equivalences e.g. 1/2 *+ 1/6 = 3/6 + 1/6* Choose the most efficient method in any given situation	Add numbers with only 2 digits which are not zeros e.g. *3·4 + 5·8* Derive swiftly and without any difficulty number bonds to 100 Add 'friendly' large numbers using knowledge of place value and number facts Use expanded column addition to add pairs of 4- and 5-digit numbers	625 + 48 = 673 (1) 367 + 85 = 452 (1 1) Continue this method to involve larger numbers and decimals. 7648 + 1486 = 9134 (1 1 1) 76.8 + 43.4 = 120.2 (1 1)

	Add decimal numbers which are near multiples of 1 or 10, including money e.g. *6·34 + 1·99* e.g. *£34·59 + £19·95* Use place value and number facts to add two or more 'friendly' numbers, including money and decimals e.g. *3 + 8 + 6 + 4 + 7* e.g. *0·6 + 0·7 + 0·4* e.g. *2056 + 44*			
Y5 -	Subtract numbers with 2 significant digits only, using mental strategies e.g. *6·2 – 4·5* e.g. *72 000 – 47 000* Subtract 1- or 2-digit multiples of 10, 100, 1000, 10 000 and 100 000 e.g. *8000 – 3000* e.g. *60 000 – 200 000* Subtract 1- or 2-digit near multiples of 10, 100, 1000, 10 000 and 100 000 from other numbers e.g. *82 472 – 30 004* Subtract decimal numbers which are near multiples of 1 or 10, including money e.g. *6·34 – 1·99* e.g. *£34·59 – £19·95*	Use compact or expanded column subtraction to subtract numbers with up to 5 digits Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000 Use complementary addition for subtractions of decimal numbers with up to 2 places, including amounts of money Begin to subtract related fractions using equivalences e.g. 1/2 – *1/6 = 2/6* Choose the most efficient method in any given situation	Derive swiftly and without difficulty number bonds to 100 Use counting up with confidence to solve most subtractions, including finding complements to multiples of 1000 e.g. *3000 – 2387*	Decomposition: 614 1 754 - 286 468 Continue this method to involve larger numbers and decimals.

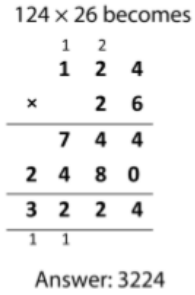
	Use counting up subtraction, with knowledge of number bonds to 10, 100 or £1, as a strategy to perform mental subtraction e.g. *£10 – £3·45* e.g. *1000 – 782* Recognise fraction complements to 1 and to the next whole number e.g. *1 2/5 + 3/5 = 2*			
Y5 X	Know by heart all the multiplication facts up to 12 × 12 Multiply whole numbers and 1- and 2-place decimals by 10, 100, 1000, 10 000 Use knowledge of factors and multiples in multiplication e.g. *43 × 6 is double 43 × 3* e.g. *28 × 50 is 1/2 of 28 × 100 =1400* Use knowledge of place value and rounding in mental multiplication e.g. *67 × 199 as 67 × 200 – 67* Use doubling and halving as a strategy in mental multiplication e.g. *58 × 5 is half of 58 × 10* e.g. *34 × 4 is 34 doubled twice*	Use short multiplication to multiply a 1-digit number by a number with up to 4 digits Use long multiplication to multiply 3-digit and 4-digit numbers by a number between 11 and 20 Choose the most efficient method in any given situation Find simple percentages of amounts e.g. *10%, 5%, 20%, 15% and 50%* Begin to multiply fractions and mixed numbers by whole numbers ≤ 10 e.g. *4 × 2/3 = 8/3 = 2 2/3*	Know multiplication tables to 12 × 12 Multiply whole numbers and 1-place decimals by 10, 100 and 1000 Use knowledge of factors as aids to mental multiplication e.g. *13 × 6 is double 13 × 3* e.g. *23 × 5 is 1/2 of 23 × 10* Use the grid method to multiply numbers with up to 4 digits by 1-digit numbers Use the grid method to multiply 2-digit numbers by 2- digit numbers	Expanded short multiplication: 238 x 6 48 (8 x 6) 180 (30 x 6) 1200 1428 1 Short multiplication: 238 x 6 1428 24 Use this method to multiply ThHTU X U.

	Partition 2-digit numbers, including decimals, to multiply by a 1-digit number mentally e.g. *6 × 27 as 6 × 20 (120) plus 6 × 7 (42)* e.g. *6·3 × 7 as 6 × 7 (42) plus 0·3 × 7 (2·1)* Double amounts of money by partitioning e.g. *£37·45 doubled is £37 doubled (£74) plus 45p doubled (90p) giving a total of £74·90*			Expanded long multiplication: Use this method when beginning to multiply by more than a single digit. 28 x 14 = 392 28 X 14 32 (8 x 4) 80 (20 x 4) 80 (8 x 10) 200 (20 x 10) 392 1 Move on to long multiplication: 28 x 14 = 392 28 X 14 3 112 280 392
Y5 ÷	Know by heart all the division facts up to 144 ÷ 12 Divide whole numbers by 10, 100, 1000, 10 000 to give whole	Use short division to divide a number with up to 4 digits by a number ≤ 12 Give remainders as whole numbers or as fractions	Know by heart division facts up to 121 ÷ 11 Divide whole numbers by 10, 100 or 1000 to give answers with up to 1 decimal place	Short division: HTU ÷ U and ThHTU ÷ U (divide by numbers up to 12)

	number answers or answers with 1, 2 or 3 decimal places Use doubling and halving as mental division strategies e.g. *34 ÷ 5 is (34 ÷ 10) × 2* Use knowledge of multiples and factors, as well as tests for divisibility, in mental division e.g. *246 ÷ 6 is 123 ÷ 3* e.g. *We know that 525 divides by 25 and by 3* Halve amounts of money by partitioning e.g. *1/2 of £75·40 = 1/2 of £75 (£37·50) plus half of 40p (20p) which is £37·70* Divide larger numbers mentally by subtracting the 10th or 100th multiple as appropriate e.g. *96 ÷ 6 is 10 + 6, as 10 × 6 = 60 and 6 × 6 = 36* e.g. *312 ÷ 3 is 100 + 4 as 100 × 3 = 300 and 4 × 3 = 12* Know tests for divisibility by 2, 3, 4, 5, 6, 9 and 25 Know square and cube numbers Reduce fractions to their simplest form	Find non-unit fractions of large amounts Turn improper fractions into mixed numbers and vice versa Choose the most efficient method in any given situation	Use doubling and halving as mental division strategies Use an efficient written method to divide numbers ≤ 1000 by 1-digit numbers Find unit fractions of 2- and 3-digit numbers	 0 5 4 r 6 OR ½ 12 | 6 6 5 4

Year 6				
	Mental calculation	Written calculation	Default for ALL children	Models and images
Y6 +	Know by heart number bonds to 100 and use these to derive related facts e.g. *3·46 + 0·54* Derive, quickly and without difficulty, number bonds to 1000 Add small and large whole numbers where the use of place value or number facts makes the calculation do-able mentally e.g. *34 000 + 8000* Add multiples of powers of 10 and near multiples of the same e.g. *6345 + 199* Add negative numbers in a context such as temperature where the numbers make sense Add two 1-place decimal numbers or two 2-place decimal numbers less than 1 e.g. *4·5 + 6·3* e.g. *0·74 + 0·33* Add positive numbers to negative numbers e.g. *Calculate a rise in temperature or continue a sequence beginning with a negative number*	Use column addition to add numbers with up to 5 digits Use column addition to add decimal numbers with up to 3 decimal places Add mixed numbers and fractions with different denominators	Derive, swiftly and without difficulty, number bonds to 100 Use place value and number facts to add 'friendly' large or decimal numbers e.g. *3·4 + 6·6* e.g. *26 000 + 54 000* Use column addition to add numbers with up to 4-digits Use column addition to add pairs of 2-place decimal numbers	Extend the column method to add numbers with any number of digits and decimals. 760487 + 145864 906351 1 111
Y6 -	Use number bonds to 100 to perform mental subtraction of	Use column subtraction to subtract numbers with up to 6 digits	Use number bonds to 100 to perform mental subtraction of	Extend the column method to subtract numbers with any number of digits and decimals.

	any pair of integers by complementary addition e.g. *1000 – 654 as 46 + 300 in our heads* Use number bonds to 1 and 10 to perform mental subtraction of any pair of 1-place or 2-place decimal numbers using complementary addition and including money e.g. *10 – 3·65 as 0·35 + 6* e.g. *£50 – £34·29 as 71p + £15* Use number facts and place value to perform mental subtraction of large numbers or decimal numbers with up to 2 places e.g. *467 900 – 3005* e.g. *4·63 – 1·02* Subtract multiples of powers of 10 and near multiples of the same Subtract negative numbers in a context such as temperature where the numbers make sense	Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000 or 10 000 Use complementary addition for subtractions of decimal numbers with up to 3 places, including money Subtract mixed numbers and fractions with different denominators	numbers up to 1000 by complementary addition e.g. *1000 – 654 as 46 + 300 in our heads* Use complementary addition for subtraction of integers up to 10 000 e.g. *2504 – 1878* Use complementary addition for subtractions of 1- place decimal numbers and amounts of money e.g. *£7·30 – £3·55*	5 14 17 14 ~~6~~ ~~5~~ 1 3 ~~8~~ ~~5~~ 1 4 - 3 6 8 3 7 8 2 8 5 4 7 6
Y6 X	Know by heart all the multiplication facts up to 12 × 12 Multiply whole numbers and decimals with up to 3 places by 10, 100 or 1000 e.g. *234 × 1000 = 234 000* e.g. *0·23 × 1000 = 230*	Use short multiplication to multiply a 1-digit number by a number with up to 4 digits Use long multiplication to multiply a 2-digit number by a number with up to 4 digits Use short multiplication to multiply a 1-digit number by a	Know by heart all the multiplication facts up to 12 × 12 Multiply whole numbers and 1- and 2-place decimals by 10, 100 and 1000 Use an efficient written method to multiply a 1-digit or a teen	Long multiplication: 56 x 27 392 (7 x 56) 1120 (20 x 56) 1512 1

	Identify common factors, common multiples and prime numbers and use factors in mental multiplication e.g. *326 × 6 is 652 × 3 which is 1956* Use place value and number facts in mental multiplication e.g. *4000 × 6 = 24 000* e.g. *0·03 × 6 = 0·18* Use doubling and halving as mental multiplication strategies, including to multiply by 2, 4, 8, 5, 20, 50 and 25 e.g. *28 × 25 is a quarter of 28 × 100 = 700* Use rounding in mental multiplication e.g. *34 × 19 as (34 × 20) – 34* Multiply 1- and 2-place decimals by numbers up to and including 10 using place value and partitioning e.g. *3·6 × 4 is 12 + 2·4* e.g. *2·53 × 3 is 6 + 1·5 + 0·09* Double decimal numbers with up to 2 places using partitioning e.g. *36·73 doubled is double 36 (72) plus double 0·73 (1·46)*	number with 1 or 2 decimal places, including amounts of money Multiply fractions and mixed numbers by whole numbers Multiply fractions by proper fractions Use percentages for comparison and calculate simple percentages	number by a number with up to 4 digits by partitioning (grid method) Multiply a 1-place decimal number up to 10 by a number ≤ 100 using the grid method	Once children are secure and confident with this method, move onto more compact and efficient methods. 386 x 70 27020 4 5 24 X16 144 240 384 124 × 26 becomes  Answer: 3224 Children to continue to practise and develop formal short and long multiplication method with larger numbers and decimals.

Y6 ÷	Know by heart all the division facts up to 144 ÷ 12 Divide whole numbers by powers of 10 to give whole number answers or answers with up to 3 decimal places Identify common factors, common multiples and primes numbers and use factors in mental division e.g. *438 ÷ 6 is 219 ÷ 3 which is 73* Use tests for divisibility to aid mental calculation Use doubling and halving as mental division strategies, for example to divide by 2, 4, 8, 5, 20 and 25 e.g. *628 ÷ 8 is halved three times:* *314, 157, 78·5* Divide 1- and 2-place decimals by numbers up to and including 10 using place value e.g. *2·4 ÷ 6 = 0·4* e.g. *0·65 ÷ 5 = 0·13* e.g. *£6·33 ÷ 3 = £2·11* Halve decimal numbers with up to 2 places using partitioning e.g. *Half of 36·86 is half of 36 (18) plus half of 0·86 (0·43)* Know and use equivalence between simple fractions,	Use short division to divide a number with up to 4 digits by a 1-digit or a 2-digit number Use long division to divide 3-digit and 4-digit numbers by 'friendly' 2-digit numbers Give remainders as whole numbers or as fractions or as decimals Divide a 1-place or a 2-place decimal number by a number ≤ 12 using multiples of the divisors Divide proper fractions by whole numbers	Know by heart all the division facts up to 144 ÷ 12 Divide whole numbers by 10, 100, 1000 to give whole number answers or answers with up to 2 decimal places Use an efficient written method, involving subtracting powers of 10 times the divisor, to divide any number of up to 1000 by a number ≤ 12 e.g. *836 ÷ 11 as 836 – 770 (70 × 11) leaving 66 which is 6 × 11, giving the answer 76* Divide a 1-place decimal by a number ≤ 10 using place value and knowledge of division facts	Children to continue to use written methods to solve short division for increasingly large numbers and decimal numbers 496 ÷ 11 becomes 4 5 r 1 5 1 1 | 4 9 6 Answer: $45\frac{1}{11}$ Extend to decimals with up to two decimals places. 87.5 ÷ 7 = 12.5 1 2 . 5 7 | 8 ^{1}7.^{3}5 Moving on to short division with any remainder shown as a decimal. 1 2 6 . 3 3 6 | 7 ^{1}5 ^{3}8 . ^{2}0 ^{2}0 With any remainder shown as a fraction

	decimals and percentages, including in different contexts Recognise a given ratio and reduce a given ratio to its lowest terms			