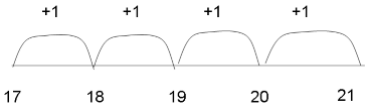
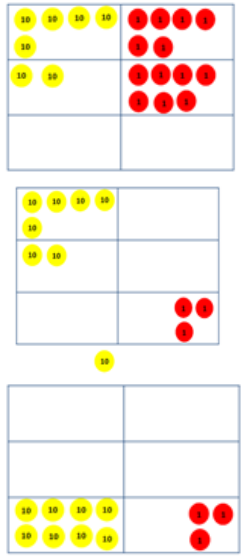
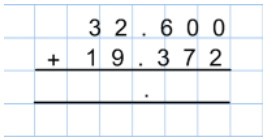
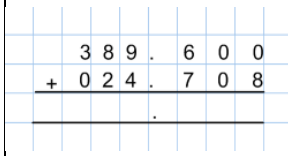
Calculation Policy

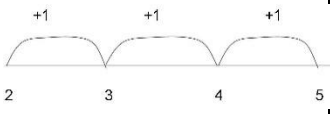
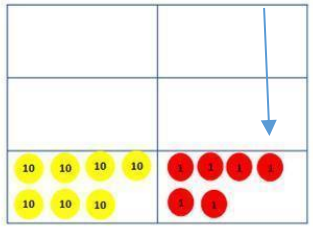
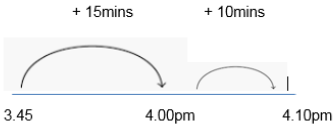
RATIONALE: The 2011 Ofsted published report into *Good Practice in Primary Mathematics* states that "A feature of strong practice in the maintained schools is their clear, coherent calculation policies and guidance, which are tailored to the particular school's context. They ensure consistent approaches and use of visual images and models that secure progression in pupils' skills and knowledge lesson by lesson and year by year."

AIMS: In our schools we aim for children to become fluent in all four operations. Through our policy we aim to provide consistent approaches and guidance to calculation methods across the school, ensuring that pupils develop efficient written methods which them to perform calculations accurately. We aim for them to become fluent in their calculation skills, allowing them, over time, to use their methods to solve increasingly complex problems with accuracy and efficiency. The progression in calculation skills and expectations match the expectations of the National Primary Curriculum for 2014.

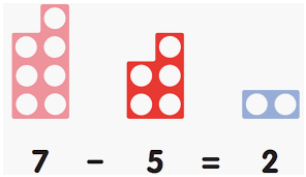
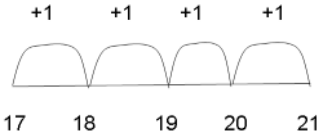
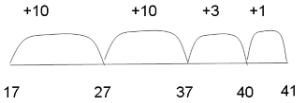
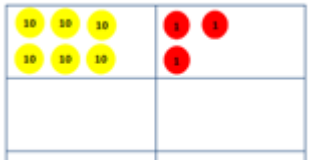
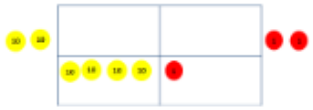
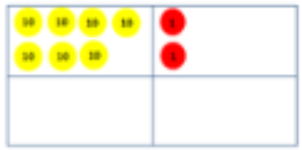
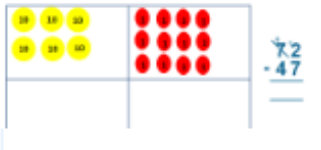
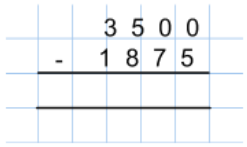
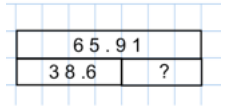
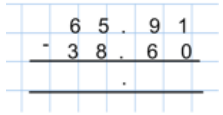
Each operation is broken down into stages. There are recommendations as to when each stage should be introduced, however across our schools we recognise that not all children progress at the same pace. Therefore children will be taught a method that is consistent with their current level. Children should be taught the method at the stage appropriate to their current level of attainment and should move to the next stage as soon as is appropriate in their mathematical development.

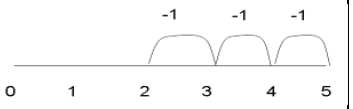
Addition

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Children understand the concept of addition as the combining of two groups. They understand that when they add two numbers the answer will be larger. They understand the + and = symbols and use these correctly in number sentences. Calculations should be written on either side of the equals sign to that = is not just interpreted as the answer **6 + 2 = 8** **8 = 6+2** Children use Numicon and visual representations to add two numbers. **2 + 3 = 5** Extending to counting up	Children add 2 and 3 digit numbers using a number line. **17 + 4 = 21**  The number line is extended to partitioning and adding tens then units when faced with larger numbers. Children use known number facts to help them bridge through multiples of 10. * **17 + 14 = 31** Children are supported in developing an understanding that addition and subtraction are inverse operations.	Children are introduced to the column method using **numbers appropriate to their current level of attainment.** Initially place value counters or deines are used, extending to the short formal method (without exchanging). 42 + 34 = Children are taught to set out as: 42 +34 addition sign on the left —— Place Value counters are to be brought down, beginning with the ones column, then tens, then hundreds, in preparation for regrouping.	Children use the short written method using carrying **with numbers appropriate to their current level of attainment.** The digit carried goes underneath the answer. Initially place value counters or deines are used to secure an understanding of exchanging.  Place Value counters are to be brought down, beginning with the ones column, then tens, then hundreds, regrouping as necessary This leads into the written representation below:	Children use larger numbers and decimals of varying digits. They should arrange calculations carefully, *using place holders.* Examples: 32.6 + 19.372 =  24.708 + 389.6 =  Children use decimals in real life contexts e.g. money, millilitres, metres.	Not applicable for addition

in 1s on a number line.  	(* number line is stage 4 method for the addition of time and duration)	 Children *begin* to use the inverse operation to check their addition calculations.	56 + 27 83 1 Thousands example: addition Sign on the left 7 8 9 3 + 5 3 8 5 13 2 7 8 1 1 3 1 . 7 6 +1 8 . 0 7 4 9 . 8 3 1 Children *routinely* use the inverse operation to check their addition calculations. Number line is to be used for time and duration addition. For Example: The appointment was 25 minutes late, they should have been in at 3.45pm. What time did they get in, instead?  		
	Recommended by the end of Year 1	**Recommended by the end of Year 2 (with deines, place value counters) Year 4 and beyond**	**Recommended by the end of Year 3 with deines and place value counters. Year 4 and beyond**	**Recommended for Year 5 and beyond**	

Subtraction

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Children understand the concept of subtraction as taking a number away from another. They understand that subtraction causes numbers to become smaller. They understand the - and = symbols and use these correctly in number sentences. Calculations should be written on either side of the equals sign to that = is not just interpreted as the answer 6 - 2 = 4 4 = 6 - 2 Children use Numicon and visual representations to subtract two numbers.  7 – 5 = 2 	Children find the difference by counting on using a number line. Number lines should be a representation of a child's thought process and should lead to quick mental strategies.  **21-17 = 4** The number line is extended to partitioning and counting on to find greater differences.  **41 – 17 = 24** Children are supported in developing an understanding that subtraction and addition are inverse operations.	Children are introduced to the column method using **numbers appropriate to their current level of attainment.** Initially place value counters or deines are used, extending to the short formal method (without borrowing). **63 - 22 = 41**  Children remove 2 from the 63 and place it out of the grid, they then move the ones down into the lowest box.  The process is repeated with tens, then hundreds.	Children use the short written method using exchanging **with numbers appropriate to their current level of attainment.** *The adjustments are recorded above the calculation* **72 – 47 = 25**   	Children use larger numbers and decimals of varying digits. They should arrange calculations carefully, *using place holders.* They should use and apply understanding of whole and parts. Examples: 3.5L – 1873 ml =  Children should use conversion of measurements in written calculations. Examples:   	Not applicable for subtraction

Extending to counting back in 1s on a number line.  		Children use written methods alongside the diennes, before moving onto more abstract methods. 6 3 - 2 2 4 2 subtraction sign on left Children *begin* to use the inverse operation to check their subtraction calculations.	Children use written methods alongside the diennes, before moving onto more abstract methods. 8 1 7 8 9 3 5 3 8 5 2 5 0 8 Subtraction sign on the left Children routinely use the inverse operation to check their subtraction calculations .		
	Recommended by the end of Year 1	**Recommended by the end of Year 2 (with deines, place value counters) Year 4 and beyond**	**Recommended by the end of Year 3 with deines and place value counters. Year 4 and beyond**	**Recommended for Year 5 and beyond**	

Multiplication

Stage 1

Children begin to understand the concept of multiplication as 'groups' of. They recognise the x sign and use Numicon and visual representations to show groupings of amounts.

3 groups of 3

3 x 3 = 9

3 groups of 2

3 x 2 = 6

4 groups of 2
4 x 2 = 8

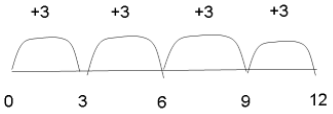
Stage 2

Children describe multiplication as an array and begin to recognise that multiplication can be done in any order.

2 x 3 = 6

3 x 2 = 6

This is extended to using a number line, showing multiplication as repeated addition.



3 + 3 + 3 + 3 = 12

OR

4 x 3 = 12

Children are supported in developing an understanding that multiplication and division are inverse operations.

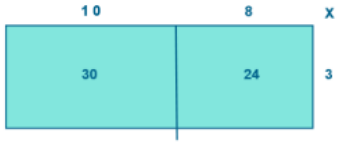
Stage 3

Children use arrays and partition of the arrays as a bridge to grid method. They **use numbers appropriate to their current level of attainment.**

Children use the grid method as an informal method to carry out multiplication calculations

First with counters

. Then...



30 +
24
54

Stage 4

Children use the short written method using carrying **with numbers appropriate to their current level of attainment.**

23 x 8 =

Encourage estimating first as previous stage.

E = 20 x 10 = 200

2 3

x 8

2 4 (3 x 8)

1 6 0 (20 x 8)

1 8 4

Progressing to:

2 3

x 8

1 8 4

2

sign

left

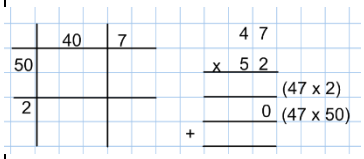
Stage 5

Children multiply TU by TU and HTU by TU

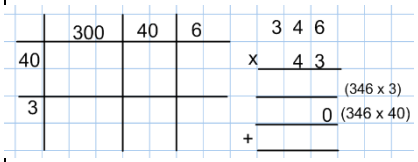
Children use the grid method then formal written method, with expanded brackets as a first step to multiplying by TU.

Examples:

47 x 52 =



346 x 43 =



Stage 6

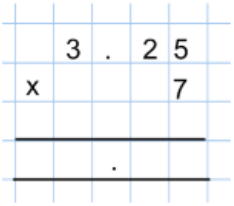
Children multiply decimal numbers by a whole

Children should round and estimate first

Example:

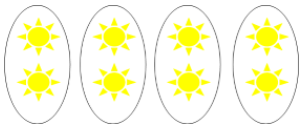
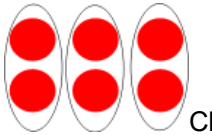
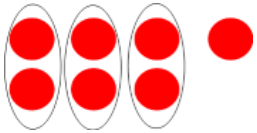
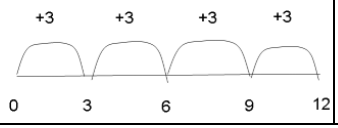
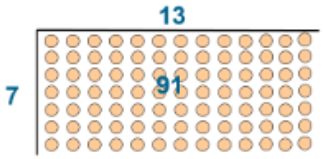
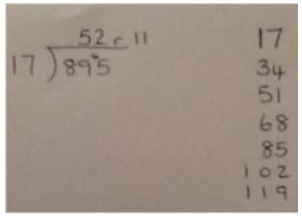
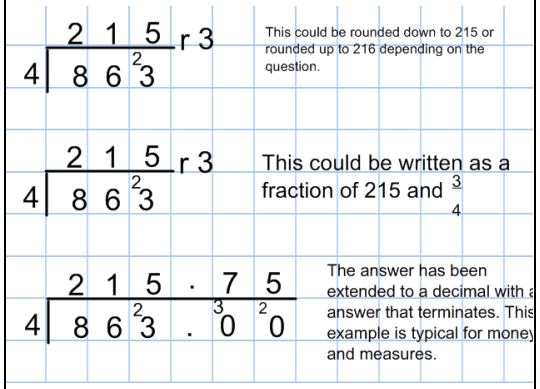
3.25 x 7 = would become 3 x7 ≈ 21

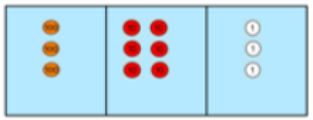
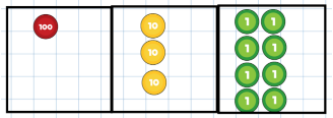
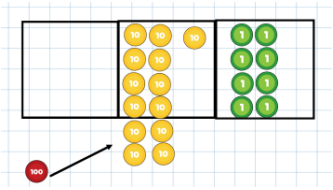
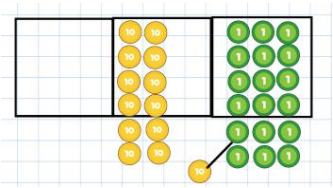
They then use formal written methods for multiplication, remembering to *include place value in answers.*



		Children will also estimate their answers first. **18 x 3 =** E = 20 x 3 = 60	Progressing to a 3 x 1 digit number 125 x 4 125 x 4 20 (5 x 4) 80 (20 x 4) 400 (100 x 4) 500		Children will multiply decimal by decimal. Example: **3.2 x 7.23** would become **32 x 7.23.** Use the formal written multiplication method then adjust the final answer by diving by 10.
	Recommended by the end of Year 2	**Recommended by the end of Year 3**	**Recommended by the end of Year 4**	**Recommended for Year 5 and beyond**	**Recommended for Year 6 and beyond**

Division

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
Children begin to understand the concept of division as grouping and sharing and recognise the ÷ sign. They use visual representations to show sharing amounts equally **6 shared equally by 3** **6 ÷ 3 = 2**  **8 shared equally into 4 groups** **8 ÷ 4 = 2**	Children describe division as sharing into equal groups  Children They develop an understanding of remainders as a 'part left'  **7 ÷ 3 = 2 r 1** This is extended to using a number line to show division as repeated addition and thus creating a link between multiplication and division.  	Children use arrays to support their understanding of a formal written method. They use **numbers appropriate to their current level of attainment.**  . Then… Children use the short written method to divide numbers, including decimals, by a single digit. They use **numbers appropriate to their current level of attainment and exchange where necessary** Children look at how many 'groups' of can we get… For Example…. 363 ÷ 3 =	Children use long written method to divide number, including decimals, by two and three digits. They use **numbers appropriate to their current level of attainment.** **Children will have remainders for calculations**  	Children should use formal written method for division but then consider what should happen with any remainders. - Write as a terminating decimal - Decimal to a specific number of places - Remainder as a fraction - Round the remainder up or down - Example: 863 ÷ 4 =  	Not applicable for division

	So… **12 ÷ 3 = 4**	 1 2 1 This progresses into exchanging 138 ÷ 6 =   			
	Recommended by the end of Year 2	**Recommended by the end of Year 4**	**Recommended by the end of Year 5**	**Recommended for Year 5 and beyond**	