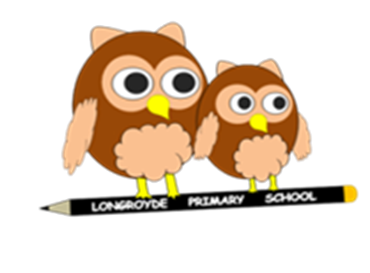
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| **Progression in Calculation** |
| **June 2018** |



This document outlines the Progression in Calculations for KS1 and KS2 at Longroyde Primary School.

* The ‘Written Methods’ section contains the National Curriculum objective(s) and the end of year expectations and an example of this is provided.
* The ‘Developing Conceptual Understanding’ section illustrates how to build children’s understanding of the formal methods using a range of specific practical equipment and representations. The expected language for the formal methods is modelled in this section in the older year groups – this language should be used throughout whenever the formal method is used.
* The ‘Foundations’ section for each year group highlights the skills and knowledge that should be addressed on a regular basis within this year group to ensure that children have the requisite fluency to address the new approaches required.

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|  | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
| **Written Methods** | Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs | Add and subtract two two-digit numbers using concrete objects, pictorial representations progressing to formal written methods  4 6  + 2 7  7 3  1 | Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction  4 2 3  + 8 8  5 1 1  1 1 | Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition where appropriate  2 4 5 8  + 5 9 6  3 0 5 4  1 1 1 | Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) | Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why |
| **Developing conceptual understanding** | Number bonds    (Ten frame) Numicon  Use bonds of 10 to calculate bonds of 20  Count all  Count on  8  Count on, on number track, in 1s    Part-whole | Number track / Number line – jumps of 1 then efficient jumps using number bonds  18 + 5 = 23      46 + 27 = 73 Count in tens then bridge.    25 + 29 by + 30 then -1  (Round and adjust)  Partition and recombine  46 + 27 = 60 + 13 = 73  24 +10  +10  +10 = 54  Regrouping to make ten | Number line: 264 + 158 efficient jumps    40 + 80 = 120 using 4 + 8 = 12  So 400 + 800 = 1200    243 + 198  by +200 then -2  (Round and adjust)  Pairs that make 100  23 + 77    Base ten/Place value counters, 100s, 10s, 1s  24+15    264 + 158 **(Regrouping)**            = 422  (Also with £, 10p and 1p) | Place Value Counters 2458 + 596    Show 2458 and 596    Combine the 1s.  Exchange ten 1s  for a 10 counter.    Combine the 10s.  Exchange ten 10s  for a 100 counter.    Combine the 100s.  Exchange ten 100s  for a 1000 counter  Read final answer  Three thousand and  fifty-four. | Set out the calculation  In columns.  Find the sum of the ones.  4 ones + 6 ones = 10 ones  (or 1 ten and 0 ones)  so record 0 in the ones and  1 below the line in the tens.  Find the sum of the tens.  5 tens + 9 tens + 1 ten  = 15 tens (or 1 hundred  and 5 tens) so record a  5 in the tens and 1 below  the line in the hundreds.  Find the sum of the hundreds.  4 hundreds + 5 hundreds  + 1 hundred = 10 hundreds  (or 1 thousand and  0 hundreds) so record a  0 in the hundreds and a  1 in the thousands.  Find the sum of the thousands.  3 thousands + 1 thousand  = 4 thousands so record a  4 in the thousands column.  Find the sum of the ten thousands.  There are only 2 ten thousands  so record a 2 in the final column |
| **Just know it!** | Represent & use number bonds and related subtraction facts within 20  Add and subtract one-digit and two-digit numbers to 20, including zero | Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 |  |  |  |  |

**Addition**

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| **Foundations** | 1 more | 10 more  Number bonds: 20, 12, 13 | Add multiples of 10, 100 | Add multiples of 10s , 100s, 1000s | Add multiples of 10s , 100s, 1000s, tenths, | Add multiples of 10s , 100s, 1000s, tenths, hundredths |
| Number bonds: 5, 6 | Number bonds: 14,15  Add 1 digit to 2 digit by bridging. | Add single digit bridging through boundaries | Fluency of 2 digit + 2 digit | Fluency of 2 digit + 2 digit including with decimals | Fluency of 2 digit + 2 digit including with decimals |
| Largest number first.  Number bonds: 7, 8 | Partition second number, add tens then ones | Partition second number to add  Pairs of 100 | Partition second number to add  Decimal pairs of 10 and 1 | Partition second number to add | Partition second number to add |
| Add 10.  Number bonds: 9, 10 | Add 10 and multiples.  Number bonds: 16 and 17 | Use near doubles to add | Use near doubles to add | Use number facts, bridging and place value | Use number facts, bridging and place value |
| Ten plus ones.  Doubles up to 10 | Doubles up to 20 and multiples of 5  Add near multiples of 10. | Add near multiples of 10 and 100 by rounding and adjusting | Adjust both numbers before adding  Add near multiples | Adjust numbers to add | Adjust numbers to add |
| Use number bonds of 10 to derive bonds of 11 | Number bonds: 18, 19  Partition and recombine | Partition and recombine | Partition and recombine | Partition and recombine | Partition and recombine |

**Subtraction**

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|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| **Written Methods** | Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs | *Add and subtract two two-digit numbers using concrete objects, pictorial representations progressing to formal written methods* 6 1  7 3  - 4 6  2 7 | Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction 2 3 1  3 4 4  - 1 8 7  1 5 7 | Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition where appropriate | Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) | Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why |
| **Developing conceptual understanding** | Number bonds    (Ten frame) Difference between  7 and 10  6 less than 10 is 4  Count out, then count how many are left.  7 – 4 = 3  Count back on a number track, then number line.  15 – 6 = 9      Difference between 13 and 8  13 – 8 = \_  8 + \_ = 13  Part-part/whole | Number track / Number line – jumps of 1 then efficient jumps using number bonds  23 – 5 = 18      Using a number line, 73 – 46 = 26          Difference between 73 – 58 by counting up, 58 + \_ = 73  No exchange 36-14    Exchanging, 73 – 46      *‘Where’s the Exchange to*  *‘forty and six?’ create ‘sixty thirteen’*      *‘Twenty seven’*  *‘Now take away*  *the forty and six’* | Taking away and exchanging, 344 – 187  Place value counters  *‘Where’s the one*  *hundred and*  *eighty and*  *seven?*  *Exchange to create*  *three hundred and*  *thirty and fourteen.*  *Now take away the*  *‘seven’*  *Exchange to create two hundred, thirteen tens and seven*  *Now take away*  *the ‘eighty’*    *Now take away*  *the ‘one hundred’* | Taking away and exchanging, 2344 – 187  Place value counters  *Where’s the one hundred and eighty-* *seven?*  *Exchange a 10 for ten 1s to create two thousand, three hundred and thirty and fourteen.*  *Now take away ‘seven’.*  *Exchange a 100 for ten 10s to create two thousand, two hundred, thirteen tens and seven.*    *Now take away ‘eighty’*  *Now take away ‘one hundred’*    *There are no thousands to take away.* | *Set out the calculation in columns*  *The 1s column: four subtract seven*  *Because seven is greater*  *than four, exchange a 10 for*  *ten 1s. So there are now*  *three 10s and fourteen 1s.*    *Fourteen 1s subtract seven 1s*  *makes seven 1s – record this.*  *The 10s column: three subtract eight. Because eight is greater*  *than three, exchange a 100 for*  *ten 10s. So there are now two*  *100s and thirteen 10s.*    *Thirteen 10s subtract eight 10s*  *makes five 10s – record this.*  *The 100s column: two subtract one. Two 100s subtract one 100*  *makes one 100 – record this.*    *The 1000s column: two subtract one. Two 1000s subtract one 1000 makes one 1000 – record this.*  *The 10,000s column: there are only five 10000s with nothing to subtract. So record 5.* |
| **Just know it!** | Represent and use number bonds and related subtraction facts within 20  Add and subtract one-digit and two-digit numbers to 20, including zero | Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 |  |  |  |  |
| **Foundations** | 1 less | 10 less Number bonds, subtraction: 20, 12, 13 | Subtract multiples of 10 and 100 | Subtract multiples of 10s , 100s, 1000s | Subtract multiples of 10s , 100s, 1000s, tenths, | Subtract multiples of 10s , 100s, 1000s, tenths, hundredths |
| Number bonds, subtraction: 5, 6 | Number bonds, subtraction: 14, 15 Subtract 1 digit from 2 digit by bridging | Subtract single digit by bridging through boundaries | Fluency of 2 digit subtract 2 digit | Fluency of 2 digit - 2 digit including with decimals | Fluency of 2 digit - 2 digit including with decimals |
| Count back  Number bonds, subtraction: 7, 8 | Partition second number, count back in 10s then 1s | Partition second number to subtract | Partition second number to subtract  Decimal subtraction from 10 or 1 | Partition second number to subtract | Partition second number to subtract |
| Subtract 10.  Number bonds, subtraction: 9, 10 | Subtract 10 and multiples of 10  Number bonds, subtraction: 16, 17 | Difference between | Difference between | Difference between | Use number facts bridging and place value |
| Teens subtract 10. | Subtract near multiples of 10 | Subtract near multiples of 10 and 100 by rounding and adjusting | Subtract near multiples by rounding and adjusting | Adjust numbers to subtract | Adjust numbers to subtract |
| Difference between | Difference between  Number bonds, subtraction: 18, 19 | Difference between | Difference between | Difference between | Difference between |

**Multiplication**



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|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** |  | **Year 5** |  | **Year 6** |
| **Written Methods** |  | Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs | Write and calculate mathematical statements for ÷ using the x tables they know progressing to formal written methods. | Multiply two-digit and three-digit numbers by a one-digit number using formal written layout | 243  x 6  2058  1 | Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers | 243  x 36  7290  1458  8748  1 | Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication  5172  x 38  155160  41376  196536  1  To multiply 5172 by 38 find the sum of 5172 x 30 & 5172 x 8.    5172 x 30: This is the same as 5172 x 3 x 10. Therefore, record a 0 in the 1s column to take care of the ‘ten times bigger’ and begin to calculate 5182 x 3.  Then calculate 5172 multiplied by 8 and record beneath:      Finally add the  two parts together: |
| **Developing conceptual understanding** | 2 frogs on each lily pad. | 5 frogs on each lily pad  5 x 3 = 15          5 x 2 = 2 x 5    Build tables on counting stick  Link to repeated addition | If I know 10 x 8 = 80 then …    So 13 x 4 = 10 x 4 + 3 x 4  12  40  Build tables on counting stick | 43 x 6 by partitioning  18  240  6  3  40  X  If I know 4 x 6 = 24 the 40 x 60 is ten times bigger.  40 x 6 = 240  3 x 6 = 18  43 x 6 = 258  13 x 16 by partitioning  10 3    10  6  100 + 30 + 60 + 18 = 208  Build tables on counting stick | | Grid method linked to formal written method        If I know 4 x 6 then 0.4 x 6 is ten times smaller  0.4 x 0.6 is ten times smaller again. | |
| **Just know it!** | Count in multiples of twos, fives and tens | Recall and use x and ÷ facts for the 2, 5 and 10 x tables, including recognising odd and even numbers. | Recall and use x and ÷ facts for the 3, 4 and 8 times tables. | Recall x and ÷ facts for x tables up to 12 x 12. | | Recall prime numbers up to 19  know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers  Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³) | |  |
| **Foundations** | Count in 2s | 2 x table | Review 2x, 5x and 10x | 4x, 8x tables  10 times bigger | | 4x, 8x tables  100, 1000 times bigger | | Multiplication facts up to 12 x 12 |
| Count in 10s | 10 x table | 4x table | 3x, 6x and 12x tables | | 3x, 6x and 12x tables  10, 100, 1000 times smaller | | Partition to multiply mentally |
| Doubles up to 10 | Doubles up to 20 and multiples of 5 | Double two digit numbers | Double larger numbers and decimals | | Double larger numbers and decimals | | Double larger numbers and decimals |
| Count in 5s | 5 x table | 8 x table | 3x, 9x tables | | 3x, 9x tables | | Multiplication facts up to 12 x 12 |
| Double multiples of 10 | Count in 3s | 3 x table | 11x, 7 x tables | | 11x , 7 x tables  Partition to multiply mentally | | Partition to multiply mentally |
| Count in 2s, 5s and 10s | 2 x, 5 x and 10 x tables | 6 x table or review others | 6x, 12 x tables | | 6x, 12 x tables | | Double larger numbers and decimals |

**Division**

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|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |  | **Year 6** |
| **Written Methods** |  | Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs | Write and calculate mathematical statements for ÷ using the x tables they know progressing to formal written methods. |  | Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context | 194 ÷ 6  3 2  6 1 9 12  192 ÷ 6  = 32 | Divide numbers up to 4-digits by a two-digit whole number using the formal written method of long division and interpret remainders where appropriate for the context  *Known multiplication facts:*  *13, 26, 39, 52, 65, …*  *10 x 13 = 130, 20 x 13 = 260 …*    564 ÷ 13  4 3 r 5  13 5 6 44  564 ÷ 13= 43 r 5 = 43  Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context  564 ÷ 13 4 3 . 3 8 …  13 5 6 4 . 0 0 …  5 2  4 4  - 3 9  5 0  - 3 9  1 1 0  - 1 0 4  6  = 43 r 5 = 43 = 43.4 (to 1dp)  **Long Division** |
| **Developing conceptual understanding** | 6 ÷2 = 3 by sharing into 2 groups and by grabbing groups of 2        How many 2s? | 15 ÷ 3 = 5 in each group (sharing)      Link to fractions  15 ÷ 3 = 5 groups of 3 (grouping)    10 ÷2 = 5    Use language of division linked to tables  How many 2s? | Grouping using partitioning  43÷ 3 If I know 10 x 3 …  Use language of division linked to tables    How many 3s?    **Division within arrays**    **Short Division** | Grouping using partitioning  196÷ 6 If I know 3 x 6 … then 30 x 6…  ‘Chunking up’ on a number line  196 ÷ 6 = 32 r 4    Use language of division linked to tables. | 192÷ 6 using place value counters to support written method    Exchange one  100 for ten 10s  19 tens into  groups of 6  3 groups so that is 30 x 6,  exchange remaining 10 for ten 1s      So 192 ÷ 6 = 32 | |
| **Just know it!** | Count in multiples of twos, fives and tens | Recall and use x and ÷ facts for the 2, 5 and 10 x tables, including recognising odd and even numbers. | Recall and use x and ÷ facts for the 3, 4 and 8 times tables | Recall x and ÷ facts for x tables up to 12 x 12. | Recall prime numbers up to 19  know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers | |  |
| **Year** | **1** | **2** | **3** | **4** | **5** | | **6** |
| **Foundations** | Count back in 2s | Division facts (2 x table) | Review division facts (2x, 5x, 10x table) | Division facts (4x, 8x tables)  10 times smaller | Division facts (4x, 8x tables)  100, 1000 times smaller | | Division facts (up to 12 x 12) |
| Count back in 10s | Division facts (10 x table) | Division facts (4 x table) | Division facts (3x, 6 x, 12x tables) | Division facts (3x, 6 x, 12x tables)  Partition to divide mentally | | Partition to divide mentally |
| Halves up to 10 | Halves up to 20 | Halve two digit numbers | Halve larger numbers and decimals | Halve larger numbers and decimals | | Halve larger numbers and decimals |
| Count back in 5s | Division facts (5 x table) | Division facts (8 x table) | Division facts (3x, 9x tables) | Division facts (3x, 9x tables)  100, 1000 times smaller | | Division facts (up to 12 x 12) |
| Halve multiples of 10 | Count back in 3s | Division facts (3 x table) | Division facts (11x, 7x tables) | Review division facts (11x, 7x tables)  Partition decimals to divide mentally | | Partition to divide mentally |
| How many 2s? 5s? 10s? | Review division facts (2x, 5x, 10x table) | Division facts (6 x table) or review others | Division facts (6x, 12x tables) | Review division facts (6x, 12x tables) Halve larger numbers and decimals | | Halve larger numbers and decimals |