Bishop Perrin Church of England Primary School

Maths Calculation Policy

Non-Statutory Policy

Our school is a Church of England School and works in partnership with our two local parish churches, St Augustine's and St Philip & James'. We aim to reflect the values, traditions and beliefs of the Christian Faith and therefore our Spiritual Values underpin everything that we do.

Author	Maths Leader – Mary McAvoy
Date Ratified	May 2020
Ratification Level	Teaching Staff
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Policy Renewal Date	May 2023

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1 INTRODUCTION

Children are introduced to the processes of calculation through practical, oral and mental activities. As they begin to understand the underlying ideas, they develop ways of recording to support their thinking and calculation methods; use particular methods that apply to special cases; and learn to interpret and use the signs and symbols involved. Over time children learn how to use ~~models and images~~ concrete and pictorial representations, such as empty number lines, bar models, tens frames and the part-part-whole model to support their mental and informal written methods of calculation.

The overall aim is that when children leave primary school they:

- have a secure knowledge of number facts
- recall key number facts instantly – for example, all addition and subtraction facts for each number to at least 20 (Year 2), sums and differences of multiples of 10 (Year 3) and multiplication facts up to 12 × 12 (Year 4)
- have a good understanding of the four operations
- are able to use this knowledge and understanding to carry out calculations mentally and to apply general strategies when using one-digit and two-digit numbers and particular strategies for special cases involving bigger numbers
- make use of diagrams and informal notes to help record steps and part answers when using mental methods that generate more information than can be kept in their heads
- have an efficient, reliable, compact written method of calculation for each operation that children can apply with confidence when undertaking calculations that they cannot carry out mentally and to check mental calculations
- are able to use a calculator effectively, using their mental skills to monitor the process, check the steps involved and decide if the numbers displayed make sense

Children should be supported to be able to progress to the next stage of their learning. Small steps of learning and carefully designed and administered interventions should support children. They not progress to the next stage if:

1) they are not ready
2) they are not confident

Children should be encouraged to make an estimate and then approximate their answers before calculating.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

2 TEACHING CALCULATION AT BISHOP PERRIN SCHOOL

Specific strategies for calculation are identified in the appendices: Mental Strategies – Appendix 1 and Written Strategies – Appendix 2

Remember:

Every day is a mental mathematics day – ensure that children engage in sustained mental work each day ~~(at least 10–15 minutes)~~ to secure and develop knowledge, skills and understanding in mathematics. *Don't expect confidence in working mentally if practice, rehearsal and reasoning have not taken place*.

Hands-on learning is important – provide appropriate ~~practical equipment~~ manipulatives and representations for children to help them to explore how and why processes work and to learn to visualise, describe and represent what is in front of them. *Don't just talk about weighing scales, use one; using apparatus is better than imagining how it works*.

Seeing mathematics through models and images supports learning – help children to see how mathematics works and can be represented through physical objects, pictures or diagrams such as place-value cards, counters and charts, ~~number sticks~~, Base 10, number lines, representations of fractional parts. *Don't expect children to visualise and 'see' how something works if they have no models and images to draw from*.

Talking mathematics clarifies and refines thinking – give children the vocabulary and language of mathematics; provide activities and time for them to discuss mathematics, using this language. Teach children the precision of language, for example, using: prism, equals, factor and how to express their reasoning using language such as: if... then... because, cannot be, never, sometimes, always. Teach children to explain, reason, prove and justify. *Don't expect children to explain or provide reasons if they have no opportunity to use, develop and refine the language to do so*.

Mathematics is interesting and fascinating – share your interest in mathematics with the children. Give children mathematics that engages them, for example, estimating and finding out about the number of bricks in the school building, testing out ideas such as when the sum of three consecutive whole numbers is a multiple of six, answering intriguing questions such as how many times their heart beats in ten minutes compared with an elephant or a mouse. *Don't expect children to be interested in mathematics if you don't share an interest and all their mathematics is routine and dull*.

Learning from mistakes should build up children's confidence and resilience – look out for mistakes and encourage children to recognise that making mistakes is how to learn. Show children common errors and get them to identify and correct them. Encourage children to work with a partner and celebrate their work. Use deep pedagogical knowledge to identify possible misconceptions and common errors. *Don't just tell children something is wrong; help them to see what went right and to identify when it went wrong*. Encourage skills of meta-cognition so that children are able to reflect on their mistakes and successes to contribute to deep and embedded learning.

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

National Curriculum, 2014

3 APPENDIX 1 – MENTAL CALCULATION STRATEGIES

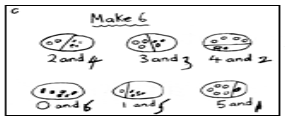
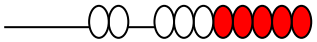
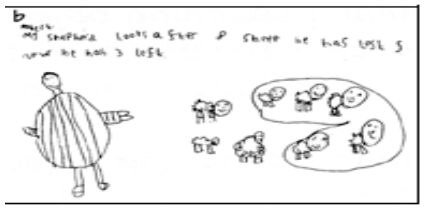
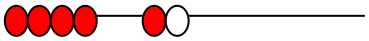
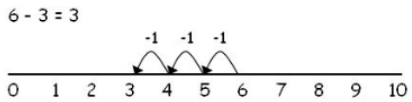
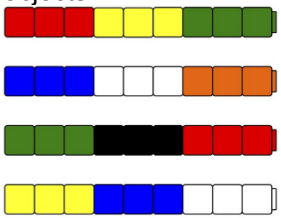
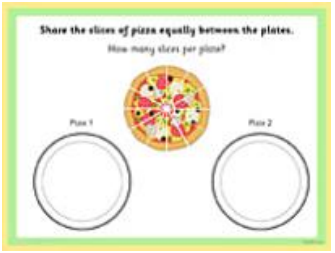
Mental calculation strategies for adding whole numbers	Mental calculation strategies for adding whole numbers
• Counting on in ones and then 10, 5 and 2 using a number line and without • Count on from the largest number ('put the number in your head…') • Addition facts for all pairs of numbers with a total of up to at least 5 and corresponding subtraction facts • Know by heart all pairs/number bonds of numbers with a total of 10 • Doubles of numbers to at least 5 • Identify near doubles, using doubles already known (5 + 6) • Begin to bridge 10 when adding a single-digit number • Know by heart all pairs/number bonds of numbers with a total of 20 • Know by heart all pairs/number bonds of multiples of ten with a total of 100 • Know all addition facts for all numbers up to 10 • Doubles of numbers to at least 10 and multiples of 10 to 100 • Identify near doubles, using doubles already known (40 + 41) • Derive quickly all pairs of multiples of 5 with a total of 100 • Partition any number in a variety of ways, including but not exclusively into tens and ones, then recombine • Doubles of all whole numbers to at least 20 • Doubles of multiples of 5 to 100 • Doubles of multiples of 50 to 500 • Identify near doubles, using doubles already known (80 + 79) • Bridge through a multiple of 10 and adjust • Add 2–digit and larger numbers using partitioning into tens and units/ones, adding tens first • Identify near doubles using doubles already known (150 + 160)	• Counting back in ones and then 10, 5 and 2 using a number line and without, from a multiple of 1, 10, 5 or 2 • Know by heart all pairs of numbers with a total of 5 and corresponding subtraction facts • Know addition facts for all pairs of numbers to 10 and corresponding subtraction facts • Partition any number in a variety of ways, including but not exclusively into tens and ones, then recombine • Use known number facts and place value to subtract mentally • Find a difference by counting up from the smaller number • Count back in repeated steps of 1, 10, 100 • Subtract 2-digit numbers using partitioning into tens and units/ones, subtracting tens first

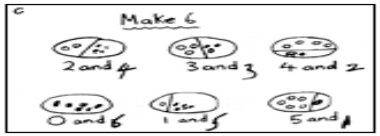
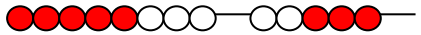
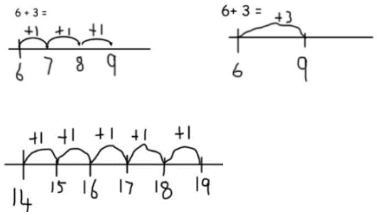
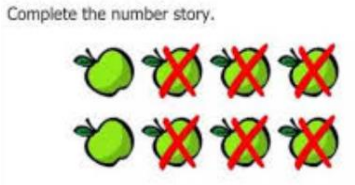
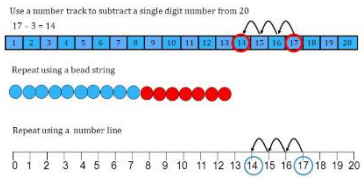
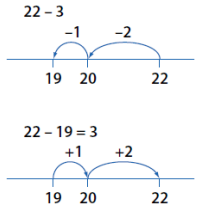
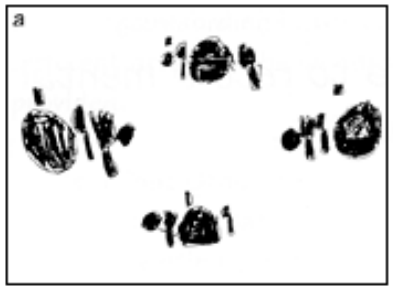
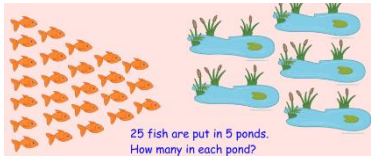
Mental calculation strategies for multiplying of whole numbers	Mental calculation strategies for dividing whole numbers
• Derive quickly: Year 1 - doubles of numbers to at least 5 Year 2 - doubles of numbers to 10 and multiples of 10 Year 3 – use doubling starting from known facts e.g. double any two-digit number by doubling tens first • Know by heart: Year 2 - multiplication facts for 2, 5 and 10 times tables Year 3 - multiplication facts for 2, 3, 4, 5, 6, 8 and 10 times tables Year 4 - all multiplication facts to 12 x 12 • Derive multiplication facts from known facts e.g.: To multiply by 4, double and double again To multiple by 5, multiple by ten and halve To multiply by 20, multiply by 10 and double Multiply by 25 by x 100 and finding a quarter Find x 16 facts by doubling x 8 Find x 12 facts by x10 + x2 Find x 17 facts by x10 + x2 Find sixths by halving thirds Use closely related facts e.g. x 19 by x 20 and adjust • To multiply by 10/100/1000, shift the digits one/two/three places to the left (including those with decimals) • Use factors e.g. 8 x 12 = 8 x 4 x 3 and recognise factor pairs • Use partitioning to multiply numbers to 20 by a one-digit number • Use and understand relationship between multiplication and division • Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers	• Derive quickly: Year 1 - doubles of numbers to at least 5 and corresponding halves Year 2 - doubles of numbers to 10 and multiples of 10 and corresponding halves Year 3 – 6; use halving/doubling starting from known facts e.g. double/halve any two-digit number by doubling/halving tens first • Know by heart: Year 2 - multiplication facts for 2, 5 and 10 times tables and corresponding division facts Year 3 - multiplication facts for 2, 3, 4, 5, 6, 8 and 10 times tables and corresponding division facts Year 4 - all multiplication facts to 12 x 12 and corresponding division facts • Use known facts and place value to multiply and divide mentally, e.g.: To divide by 4, halve and halve again (and for finding ¼) To divide by 5, divide by ten and double (and to 1/5) To divide by 20, divide by 10 and halve • To divide by 10/100/1000, shift the digits one/two/three places to the right (including those with decimals) • Understand that division can result in remainders and can be expressed in different forms

4 APPENDIX 2 – WRITTEN CALCULATION STRATEGIES

Our aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and at least one efficient written method of calculation for each of the four operations (addition, subtraction, multiplication and division), which they know they can rely on.

The tables below set out the ***expected*** models and images, and informal and formal methods of calculation for teachers to use, model and demonstrate to pupils at each stage of learning in addition to concrete and pictorial representations suggested in the White Rose Maths schemes of learning which inform our long-term and medium term planning.

Reception			
Addition	**Subtraction**	**Multiplication**	**Division**
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.   Bead strings and Numicon can be used to illustrate addition  8+2=10 They use the part-part-whole model, number lines and concrete resources to support calculation and teachers *demonstrate* the use of the numberline.  	Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.    Bead strings and Numicon can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2. **6-2=4**  They begin to use part-part-whole model, number lines and concrete resources to support calculation.  	Children will experience equal groups of objects.  They will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups. e.g. laying the table for the 3 bears and Goldilocks 	Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.   Count in 2's to find out how many socks are on the washing line: 

Year 1			
Addition	**Subtraction**	**Multiplication**	**Division**
Using pictures  Bead strings and Numicon can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.  They use number lines and concrete resources to support calculation and teachers *demonstrate* the use of the number line.  Children then begin to use numbered lines and then empty number lines to support their own calculations.  	Using pictures  Bead strings and Numicon can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2. Children then begin to use numbered and then empty number lines to support their own calculations.  The number line is also used to show that 6 - 3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.  	Children will experience equal groups of objects.  They will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups using concrete resources and pictorial representations.  	Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.   12 ÷ 4 = 3  Count in 2's to find out how many socks are on the washing line:  Children will begin to develop their understanding of division and use jottings to support calculation ✓ **Sharing equally**

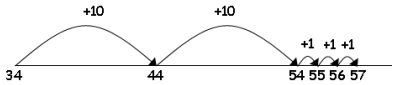
Year 2

Addition

Children will use empty number lines themselves starting with the larger number and counting on.

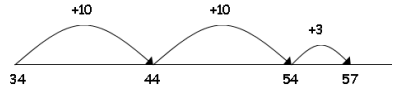
✓ First counting on in tens and ones.

34 + 23 = 57



✓ Then helping children to become more efficient by adding the ones in one jump (by using the known fact 4 + 3 = 7).

34 + 23 = 57

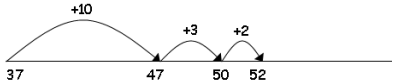


✓ Followed by adding the tens in one jump and the ones in one jump.

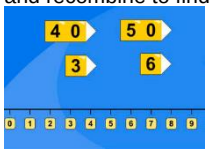
34 + 23 = 57

✓ Bridging through ten can help children become more efficient.

37 + 15 = 52



Children partition numbers into tens and ones and recombine to find the total



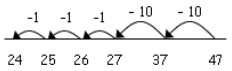
Subtraction

Children will use empty number lines to support calculations.

Counting back:

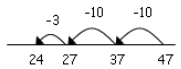
✓ First counting back in tens and ones.

47 – 23 = 24



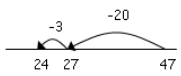
✓ Then helping children to become more efficient by subtracting the ones in one jump (by using the known fact 7 – 3 = 4).

47 – 23 = 24



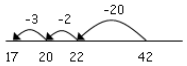
✓ Subtracting the tens in one jump and the ones in one jump.

47 – 23 = 24



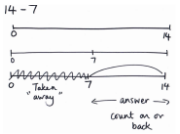
✓ Bridging through ten can help children become more efficient.

42 – 25 = 17



Counting on:

The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'.



✓ Begin to represent subtraction using the formal columnar method where no exchanging is required

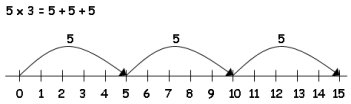
Multiplication

Children will develop their understanding of multiplication and use jottings to support calculation:

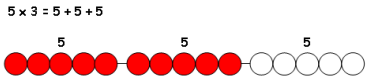
✓ **Repeated addition**

3 times 5 is 5 + 5 + 5 = 15
or 3 lots of 5 or 5 x 3

Repeated addition can be shown easily on a number line:

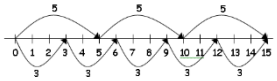


and on a bead string, or with Numicon:



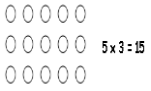
✓ **Commutativity**

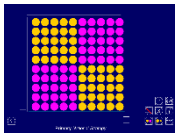
Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



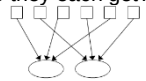


Division

Children will develop their understanding of division and use jottings to support calculation

✓ **Sharing equally**

6 sweets shared between 2 people, how many do they each get?



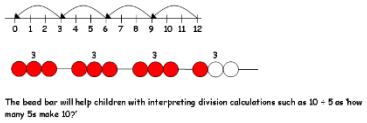
*Sharing is covered but the emphasis in Year 2 should be on **grouping.***

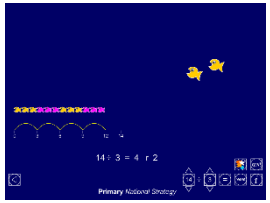
✓ **Grouping or repeated subtraction**

There are 6 sweets, how many people can have 2 sweets each?

✓ **Repeated subtraction using a number line or bead strings**

12 ÷ 3 = 4





✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

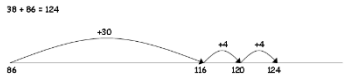
☐ ÷ 2 = 4 20 ÷ △ = 4 ☐ ÷ △ = 4

Year 3

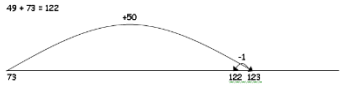
Addition

Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

Count on from the largest number irrespective of the order of the calculation.



Compensation – add more and then 'compensate' by taking away:

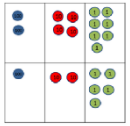


Children will use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

Adding the least significant digits first (different to mental strategies and therefore requires modelling)

```
  67          267
+ 24        + 85
  11 ( 7+ 4)   12 ( 7 + 5)
  80 (60+20)  140 (60+80)
  91          200
              352
```

Formal columnar addition of numbers with up to three digits including with exchanging using place value counters.



200 + 40 + 7
100 + 20 + 5
300 + 60 +12 = 372

```
 247
+125
  12
  60
 300
 372
```

Subtraction

Children will continue to use empty number lines with increasingly large numbers.

Children will continue to use informal pencil and paper methods (jottings).

Partitioning and decomposition

- Partitioning – demonstrated using arrow cards and place value counters
- Decomposition - base 10 materials

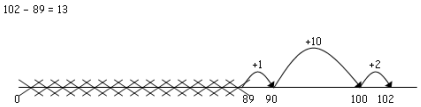
NOTE: When solving the calculation 89 – 57, children should know that 57 **does NOT EXIST AS AN AMOUNT,** it is what is being subtracted from the other number. Therefore, children would need to count out only the 89, then 'remove' 57

```
  89   =   80 + 9
- 57       50 + 7
              30 + 2 = 32
```

Begin to exchange with numbers up to 3 digits.

```
  754  =
- 86

Step 1   700 + 50 + 4
       -      80 + 6

Step 2   700 + 40 + 14   (adjust from T to U)
       -      80 + 6

Step 3   600 + 140 + 14  (adjust from H to T)
       -      80 + 6
         600 + 60 +  8 = 668

This would be recorded by the children as
  600  140
  700 + 50 + 14
-          80 + 6
  600 + 60 +  8 = 668
```

NB: Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc. counting on using a number line should be used.



Formal columnar subtraction of numbers with up to three digits

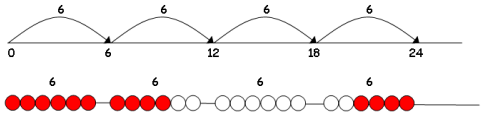
Multiplication

Children will continue to use:

Repeated addition

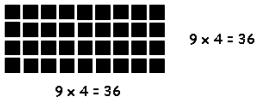
4 times 6 is 6 + 6 + 6 + 6 = 24
or 4 lots of 6 or 6 x 4

Children should use number lines, bead strings or Numicon to support their understanding.



Arrays

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



Scaling

e.g. Find a ribbon that is 4 times as long as the blue ribbon

Using symbols to stand for unknown numbers to complete equations using inverse operations

☐ x 5 = 20 3 x △ = 18 ☐ x O = 32

Partitioning

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

Grid Method

Children begin to use the grid method for TU x U

×	20	3
8	160	24

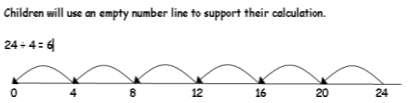
```
  160
+  24
  184
```

Division

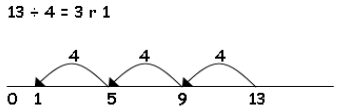
Ensure that the emphasis in Year 3 is on grouping rather than sharing.

Children will continue to use:

✓ **Repeated subtraction using a number line**



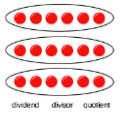
Children should also move onto calculations involving remainders.



✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

26 ÷ 2 = ☐ 24 ÷ △ = 12 ☐ ÷ 10 = 8

In some cases, children will use partitioning to divide:



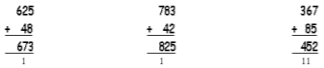
84 ÷ 7

```
   84
70 +  14
↓      ↓   ÷ 7
10 +   2   = 12
```

Year 4

Addition

✓ Formal columnar addition (carry below the line)



Using similar methods, children will:

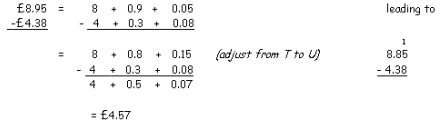
- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*

Subtraction

✓ **Decomposition**

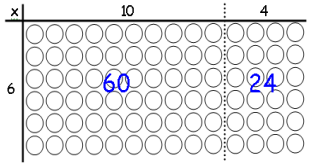
Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
- ✓ *know that decimal points should line up under each other.*



Multiplication

Children will continue to use arrays where appropriate leading into the grid method of multiplication.



✓ **Grid method**

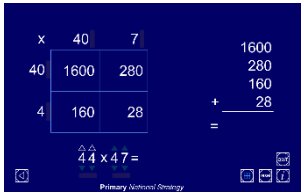
TU x U

(Short multiplication – multiplication by a single digit)

23 x 8

Children will approximate first

23 x 8 is approximately 25 x 8 = 200



✓ **Compact method**

Children will transfer their understanding of the grid method to formal methods for multiplying TU x U and HTU x U

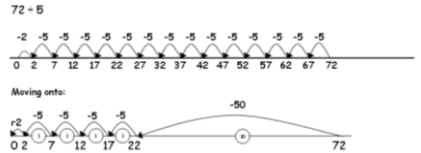
Multiply the ones first.	Then multiply the tens and place the result underneath. Remember, the 3 in 34 is signifying 30.	Then add.
34 × 5 = 20	34 × 5 = 150	34 × 5 = 20 + 150 = 170

5 × 4 = 20

5 × 30 = 150

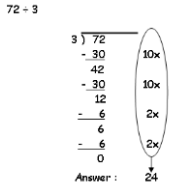
Division

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

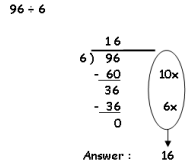


Then onto the vertical method:

Short division TU ÷ U



Leading to subtraction of other multiples.



Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division.

Year 5

Addition

Children should extend the carrying method to numbers with at least four digits.

```
  3587        587
+  675      + 475
  4262      1062
  1 1 1       1 1
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.*

Subtraction

Partitioning

```
Step 1    754  =  700  +  50  +  4
              - 286    - 200  +  80  +  6

Step 2              700  +  40  +  14    (adjust from T to U)
                  - 200  +  80  +  6

Step 3              600  + 140  +  14    (adjust from H to T)
                  - 200  +  80  +  6
                    400  +  60  +  8  =  468
```

This would be recorded by the children as

```
                   600   140   14
                   700 + 50  + 4
                 - 200 + 80  + 6
                   400 + 60  + 8  =  468
```

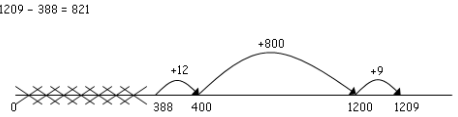
Decomposition

```
  614 1
  7 5 4
- 2 8 6
  4 6 8
```

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other*

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc. counting on using a number line should be used.



Multiplication

Grid method leading to formal methods for long multiplication

TU x TU

(Long multiplication – multiplication by more than a single digit)

```
 32
x 24
  8   (4 x 2)
120   (4 x 30)
 40   (20 x 2)
600   (20 x 30)
768
```

```
   5 2 1
     2 2
 1 0 4 2
1 0 4 2 0
1 1 4 6 2
```

Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first.

e.g. 4.9 x 3

Children will approximate first

4.9 x 3 is approximately 5 x 3 = 15

```
x |  4  | 0.9
3 | 12  | 2.7
```

```
  12
+ 2.7
 14.7
```

They will use knowledge of multiplying and dividing by 10/100 and 1000 to adjust calculations with decimals:

```
  5
  2.8        2.8 x 7          196
x   7        ↑   ↑ none       19.6
 19.6        (1)              (1)
```

So, 2.8 x 7 = 19.6

ThHTU x TU

Children will be introduced to methods for long multiplication

124 × 26 becomes

```
      1 2
      1 2 4
    x   2 6
    -------
      7 4 4
  2 4 8 0
  -------
  3 2 2 4
  1 1
```

Answer: 3224

Division

Children will continue to use written methods to solve short division TU ÷ U.

Children can start to subtract larger multiples of the divisor, e.g. 30x

Short division HTU ÷ U

196 ÷ 6

```
      32 r 4
6 ) 196
  - 180      30x
    16
  -  12      2x
     4
```

Answer : 32 remainder 4 or 32 r 4

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division.

Long division HTU ÷ TU

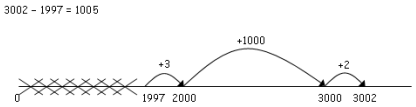
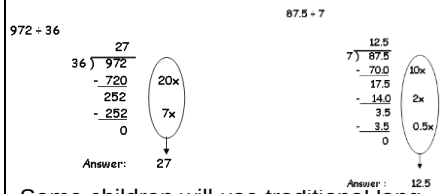
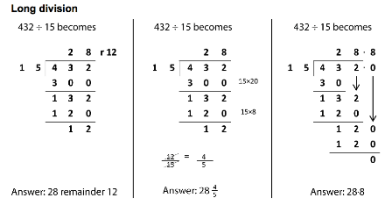
(Division with more than a single digit divisor)

972 ÷ 36

```
      27
36 ) 972
  - 720      20x
    252
  - 252      7x
      0
```

Answer: 27

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10 the answer should be shown as 32/10 which could then be written as 3 $^{1}/_{5}$ in its lowest terms.

Year 6			
Addition	**Subtraction**	**Multiplication**	**Division**
Children should extend the carrying method to number with any number of digits. 6584 + 5848 = 12432 (1 1 1) 7648 + 1486 = 9134 (1 1 1) Most significant quantities should be written first. *Using similar methods, children will* ✓ *add several numbers with different numbers of digits;* ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;* ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71.*	**Decomposition** 3 13 1 ~~4~~ ~~0~~ 67 - 2684 3783 *Children should:* ✓ *be able to subtract numbers with different numbers of digits;* ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;* ✓ *know that decimal points should line up under each other.* Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc. counting on using a number line should be used. 	**ThHTU x U** (Short multiplication – multiplication by a single digit) 4346 x 8 Children will approximate first 4346 x 8 is approximately4346x10=43460 × 4000 300 40 6 8 32000 2400 320 48 32000 + 2400 + 320 + 48 = 34768 **HTU x TU** (Long multiplication – multiplication by more than a single digit) 372 x 24 Children will approximate first 372 x 24 is approximately 400x25=10000 × 300 70 2 20 6000 1400 40 4 1200 280 8 6000 + 1400 + 1200 + 280 + 40 + 8 = 8928 *Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.* *For example:* 4.92 x 3 Children will approximate first 4.92 x 3 is approximately 5 x 3 = 15 × 4 0.9 0.02 3 12 2.7 0.06 12 + 0.7 + 0.06 = 12.76 Alternative method for long multiplication is continued for HTU x TU. Children will first approximate answer. HTU is multiplied by U HTU multiplied by T (0 is added) Total is found 	Children will continue to use written methods to solve **short division** TU ÷ U and HTU ÷ U moving on to compact method when ready. Extend to decimals with up to one decimal place. Children should know that decimal points line up under each other. Children should make sensible decisions about the interpretation of the remainder. 19 remainder 5 (5)945 23.5 (4)9142.0 **Long Division** Children continue to use written methods to solve HTU ÷ TU Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.  Some children will use traditional long division. 

5 APPENDIX 3 – CALCULATION OBJECTIVES: YEARS 1-6

Calculating objectives for Year 1
• read, write and interpret mathematical statements involving addition (+), subtraction (−) and equals (=) signs • represent and use number bonds and related subtraction facts within 20 • add and subtract one-digit and two-digit numbers to 20, including 0 • solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9 • solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher
Calculating objectives for Year 2
• solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures and applying their increasing knowledge of mental and written methods • 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 1s; a two-digit number and 10s; 2 two-digit numbers and adding 3 one-digit numbers • show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot • recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems • recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot
Calculating Objectives for Year 3
• Add and subtract numbers mentally, including: a three-digit number and one, a three-digit number and tens, a three-digit number and hundreds • Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction • Estimate the answer to a calculation and use inverse operations to check answers • Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction • Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods • Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods • Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects
Calculating objectives for Year 4
• Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate • Estimate and use inverse operations to check answers to a calculation

- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why
- Recall multiplication and division facts for multiplication tables up to 12 × 12
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers
- Recognise and use factor pairs and commutativity in mental calculations
- Multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

Calculating Objectives for Year 5

- Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- Add and subtract numbers mentally with increasingly large numbers
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- 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
- 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
- Multiply and divide numbers mentally, drawing upon known facts
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000

Calculating Objectives for Year 6

- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- 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
- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- Perform mental calculations, including with mixed operations and large numbers
- Use their knowledge of the order of operations to carry out calculations involving the 4 operations
- 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

Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy