

Bishop William Ward Four Rules Policy

Bishop William Ward School

Four Rules Policy

(for methods of calculation of the four rules of number)



Rationale and aims

This policy is intended to aid staff, pupils and parents in their understanding of the four rules and to help provide progression in written calculations. It should be read in conjunction with our curriculum policy and the National Curriculum 2014. We recognise that pupils' mental number knowledge and skills are of prime importance. The content of this policy gives guidance regarding progression which the majority of pupils will make. It does not set out a system of progression that every child must go through.

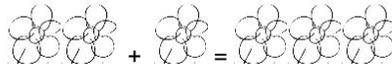
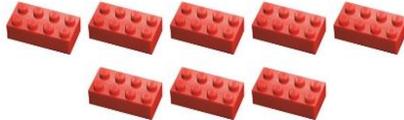
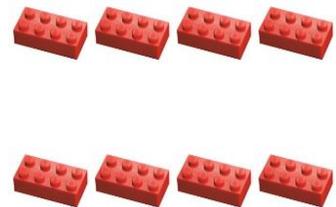
It is expected that addition/subtraction and multiplication/division be taught alongside each other so that pupils can see and use the relationship between them. Pupils should be taught to estimate their answers first and to check calculations with a variety of strategies including use of the inverse operation.

The skills of calculation may be taught discretely and every opportunity will be taken to apply these skills regularly within a rich problem solving context; children will learn to express their mathematical thinking across the curriculum and be given opportunities to reason/justify their responses.

Mental calculations as well as partitioning skills should be secure prior to using written methods. The children should learn to select the most efficient possible method. They should always be encouraged to use previous stages when appropriate. Apparatus such as 100 squares, counting sticks, Diennes, Numicon and number lines should be used to support children's conceptual understanding and aid fluency.

Bishop William Ward Four Rules Policy

Early Years Foundation Stage

Addition	Subtraction	Multiplication	Division
<p>Sorting Splitting groups of objects and finding common properties. Explaining the differences in each 'set'.</p> <p>Sequencing Identifying simple sequences and patterns in the environment blue/red/bl/rd; girl/girl/boy/g/g/b; recurring patterns in shapes and continuing these</p> <p>Experience of number and Counting Singing number rhymes, recognising numbers verbally and counting groups of objects around the classroom individually and then together verbally. eg.  'One two three four ...'</p> <p>Recognising numerals Following digits on a giant number line – hanging, on the floor, in outside area, jumping from one number to another (hopscotch style)</p> <p>One more than Starting by counting a set of objects. Add one more object to the group and work out new total. Jump from a number to the next</p> <p>Number problems Starting with objects:  Then pictures: eg.  Then moving on to using numbers: eg. $2 + 1 = \square$ All using numbers up to 20.</p> <p>Symbols and vocabulary More than; one more + (addition, plus, altogether) = (equals)</p>	<p>One less than Starting by counting a set of objects. Take one object from the group and work out new amount.</p> <p>Using counting Counting a group of objects, then removing one or more objects and recounting.  'One two three four five.'  'One two three.'</p> <p>Number problems Starting with objects:  Then pictures: eg.  Then moving on to using numbers: eg. $3 - 1 = \square$ or $3 - \square = 2$ All using numbers up to 20.</p> <p>Symbols and vocabulary Less/fewer than – (subtraction, take away, minus) = (equals)</p>	<p>Skip counting Counting in 2s <i>Using skip counting throughout the day – as children line up, getting toys out, sorting children into groups etc. Children use toys/dolls/teddies/animals to jump from one number to alternate numbers on giant number line doing 'super big jumps'</i></p> <p>Doubling to 10</p> <p>Symbols and vocabulary Groups of Sets of Doubling</p>	<p>Sharing Sharing out objects <i>eg. within a group of children playing a game or playing with toys.</i> <i>Halving objects between two children and understanding the concept of even/fair</i>  <i>eg. Eight lego bricks into two groups of four</i> </p> <p>Halving to 10</p> <p>Symbols and vocabulary Sharing Halving One for you; one for me</p>

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Year 1

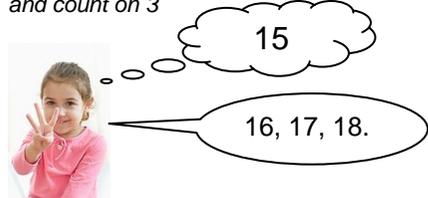
Addition

Continue to work very practically – counting objects using counters, toys, Numicon, Diennes.

Counting on

Counting on from the bigger number.

eg. if adding 3 and 15, start with 15 in your head and count on 3



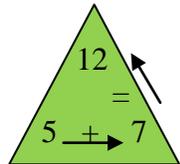
Number facts to 10

Understand that pairs of numbers total 10 – using practical resources to support initially (Numicon) Know pairs to 10 off by heart.

Missing box calculations

Understand the concept that addition is **commutative** (totals the same in any order) and that the two smaller integers total the largest Use triangle numbers/teams to illustrate this to children and corresponding number sentences

eg. $5 + 7 = 12$
 $7 + 5 = 12$
 $12 - 5 = 7$
 $12 - 7 = 5$



Work out the missing number:

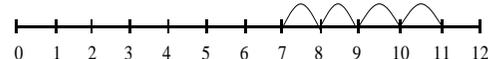
$7 + \square = 12$

Number line/100 square/Counting sticks

Use of number sticks to jump integers
 Giant number line for children to jump along initially (like an animal/frog/kangaroo)

Then solve problems, such as:

$$7 + 4 = 11$$



Recording by drawing jumps on prepared lines and draw own lines

Work with numbers up to 100 using 100 square

Subtraction

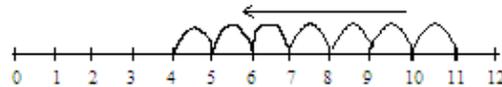
Continue to work very practically – counting/removing objects, use of Numicon, Diennes, counters, multi-link, objects

Number lines

Counting on and back using a number line

$$11 - 7 = 4$$

(Counting back)



Recording by drawing jumps on prepared lines and draw own lines

Multiplication

Skip counting

Counting in 2s, 5s, 10s.

eg. *Using a giant number line to miss a number (frog/lily pads) Children use toys/dolls/teddies/animals to jump from one number to alternate numbers on giant

number line doing 'super big jumps'

*use 100 square to identify and continue

number patterns

*counting on fingers:



'Two four six eight.'

Repeated addition

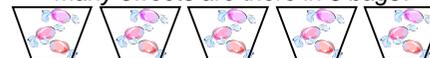
Solving a calculation such as 3×2 by thinking of it as:

$$2 + 2 + 2$$

Working practically to show multiplication in this way:



eg. there are 3 sweets in one bag. How many sweets are there in 5 bags?



Doubling

Learn to double numbers 1 to 20 and multiples of

Times Tables

Count up in 2s, 5s and 10s using 100 square and arrays (pictorial groups of)

New symbols and vocabulary

Times

Groups of

Division

Halving

Understand that halving is dividing into 2 groups (sharing Smarties between 2 people "one for you; one for me")

Odd/Even

Learn small sequence of even and odd numbers and that odd numbers cannot be shared fairly

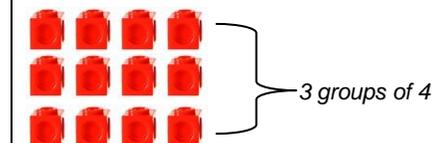


Repeated subtraction

Solving a calculation such as $12 \div 4$ by thinking of it as:

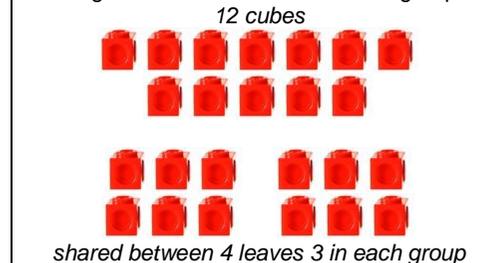
$$12 - 4 - 4 - 4$$

We can take 3 groups of four away from 12 Working practically to show division in this way, using arrays:



Sharing

Solving a calculation such as $12 \div 4$ by thinking of it as 12 shared between 4 groups



New symbols and vocabulary

Shared between

One for you; one for me

Fair/unfair

Bishop William Ward Four Rules Policy

Year 2

Addition

Continue using a range of equations as in Year 1 (including missing box calculations) but with appropriate, larger numbers, initially up to 100, then to 1000.

Visualise 100 square

Work with numbers up to 100 using 100 square and carry out mental calculations (i.e.: adding on multiples of 10, or adding or subtracting 9/11)

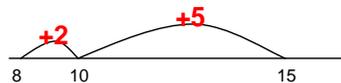
Counting stick/Number line

Count up/down in jumps of 2, 5, 10, 100 using number stick and then number lines

Bridging ten

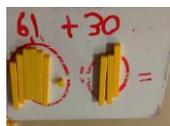
The steps in addition often bridge through a multiple of 10

Children should be able to partition the 7 to relate adding the 2 and then the 5. $8 + 7 = 15$



Partition into tens and ones and recombine

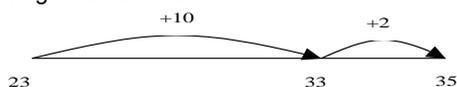
2 digit calculations are initially supported with 'Diennes' blocks



$$61 + 30 = 60 + 1 + 30 = 91$$

$$\begin{aligned} 23 + 12 &= 20 + 3 + 10 + 2 \\ &= 30 + 5 \\ &= 35 \end{aligned}$$

Using a numberline



Using a hundred square:

11	12	13	14	15	16
21	22	23	24	25	26
31	32	33	34	35	36

New symbols and vocabulary

total

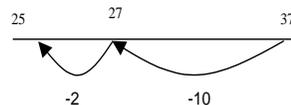
Subtraction

Continue using a range of equations as in Year 1 (including missing box calculations) but with appropriate, larger numbers, initially up to 100.

Use partitioning to subtract

$$\begin{aligned} 37 - 12 &= 37 - 10 - 2 \\ &= 27 - 2 \\ &= 25 \end{aligned}$$

Using a numberline



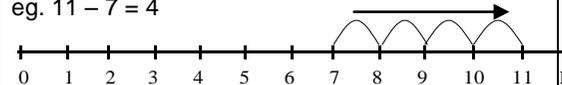
Using a hundred square:

14	15	16	17	18
24	25	26	27	28
34	35	36	37	38
44	45	46	47	48

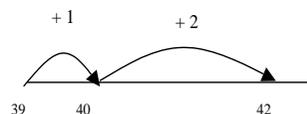
Find difference by counting up

Introduce counting on to find the difference as a method for subtraction

eg. $11 - 7 = 4$



$$42 - 39 = 3$$



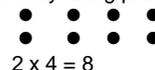
New symbols and vocabulary

Finding the difference

Multiplication

Continue to see multiplication as repeated addition (see Year 1), but with increasingly large numbers.

Use arrays to represent calculations pictorially/using practical equipment

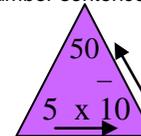


Missing box calculations

Understand the concept that multiplication is commutative (totals the same in any order) and that the two smaller integers total the largest

Use triangle numbers/teams to illustrate this to children and corresponding number sentences eg: $5 \times 10 = 50$

$$\begin{aligned} 10 \times 5 &= 50 \\ 50 \text{ divided by } 5 &= 10 \text{ each} \\ 50 \text{ divided by } 10 &= 5 \text{ each} \end{aligned}$$



Use this to solve:

$$\begin{aligned} 7 \times 2 &= \square & \square &= 2 \times 7 \\ 7 \times \square &= 14 & 14 &= \square \times 7 \\ \square \times 2 &= 14 & 14 &= 2 \times \square \\ \square \times \nabla &= 14 & 14 &= \square \times \nabla \end{aligned}$$

Doubling

Use of partitioning and addition when doubling two digit numbers (supported initially by work with Diennes blocks)

$$\begin{aligned} \text{Double } 26 &= 26 + 26 \\ &= 20 + 6 + 20 + 6 \end{aligned}$$

$$20 + 20 = 40 \quad 6 + 6 = 12$$

$$40 + 12 = 52$$

Times Tables

Know 2, 5, 10 x tables.

Start to learn 3, 4 x tables.

New symbols and vocabulary

X

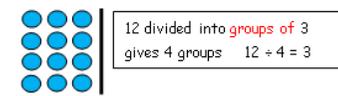
Multiply/multiplication

Array

Division

Continue to see division as repeated subtraction or sharing (see Year 1), but with increasingly large numbers.

Using arrays to represent calculations pictorially/using practical equipment



12 divided into groups of 4 gives 3 groups $12 \div 4 = 3$

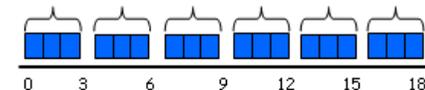
Missing box calculations

Use understanding of commutative rule to solve the following:

$$\begin{aligned} 16 \div 2 &= \square & \square &= 16 \div 2 \\ 16 \div \square &= 2 & 2 &= 16 \div \square \\ \square \div 2 &= 8 & 8 &= \square \div 2 \\ \square \div \nabla &= 2 & 2 &= \square \div \nabla \end{aligned}$$

Repeated subtraction

Using a number line alongside practical equipment



Halving

Halve all numbers 1 - 20, understanding that this is dividing by two.

New symbols and vocabulary

÷

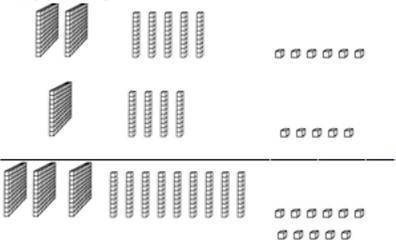
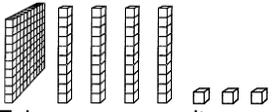
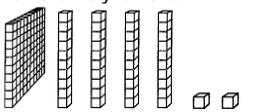
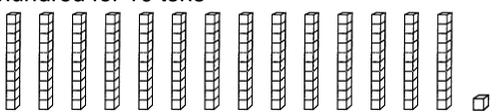
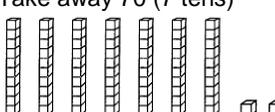
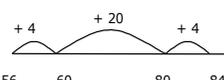
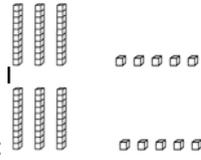
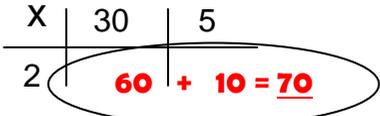
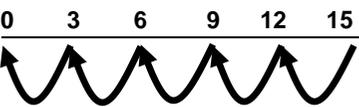
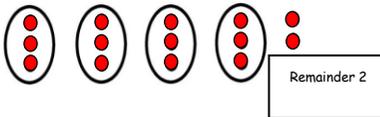
Divide/division

Halving

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Year 3

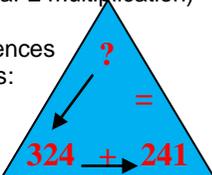
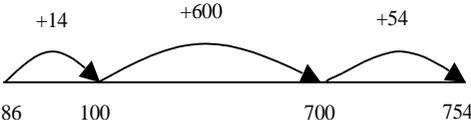
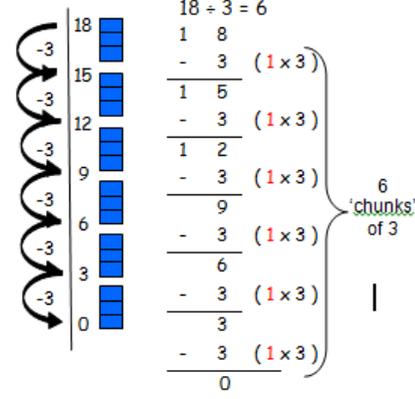
Please refer to National Curriculum Appendix 1 for acceptable examples of formal written methods for addition, subtraction, multiplication and division

Addition	Subtraction	Multiplication	Division
<p>Counting up/back along counting stick (as a blank number line) From a given number, children predict following sequence of numbers whilst teacher points Explore negative numbers this way eg: 0 in the middle – count forwards/backwards in 10s</p>  <p>Using partitioning to add Build on partitioning (using 'Diennes' equipment), using it to demonstrate addition of 2 and 3 digit numbers, moving towards vertical addition. eg. $256 + 145 =$</p>  <p>Written Methods eg. $84 + 37 =$</p> $\begin{array}{r} 80 + 4 \\ + 30 + 7 \\ \hline 110 + 11 = 121 \end{array}$ <p>Moving on to the formal vertical method, making explicit links between the practical and written work:</p> $\begin{array}{r} 84 \\ + 37 \\ \hline 121 \\ 1 \end{array}$	<p>Use partitioning to subtract Start to understand vertical subtraction through use of Diennes and exchanging. eg. $143 - 71$</p>  <p>Take away one unit</p>  <p>Can't take away 70 (7 tens), so exchange one hundred for 10 tens</p>  <p>Take away 70 (7 tens)</p>  <p>$143 - 71 = 72$</p> <p>Moving towards the formal vertical method:</p> $\begin{array}{r} 0 \ 1 \\ 1 \ 4 \ 3 \\ - \ 7 \ 1 \\ \hline 7 \ 2 \end{array}$ <p>Finding the difference Complementary addition $84 - 56 = 28$</p> 	<p>Use partitioning to multiply Working with U x TU Using grid method: when ready move from concrete – pictorial – abstract. eg.</p>  <p>$2 \times 35:$</p> <p>Recording multiplication</p> <ol style="list-style-type: none"> Record partitioned method as shown below. This should then facilitate mental ability to multiply larger numbers. $2 \times 35 = (2 \times 30) = 60 + (2 \times 5) = 10$ $\begin{array}{r} \times 35 \\ \times 30 = 60 \\ \times 5 = 10 \\ \hline 70 \end{array}$ <ol style="list-style-type: none"> Once children are confident with concept 1 above, written multiplication should be recorded as the 'grid' method, using laminated grids as a guide:  <p>So: $2 \times 35 = 70$</p> <p>Times Tables Know 2,3,4,5, 8, 10 x tables and related division facts. Utilize doubles (eg: that 4x is double 2x and that 8x is double 4x). Start to learn 6, 9 x tables.</p> <p>New symbols and vocabulary Product</p>	<p>Repeated subtraction Using a numberline, 100 square or practical equipment eg. $15 \div 3 =$</p>  <p>Division with remainders Practically, using cubes/counters to solve problems eg.</p> <p>Share 14 biscuits between 4 children</p>  <p>New symbols and vocabulary Remainder</p>

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Year 4

Please refer to National Curriculum Appendix 1 for acceptable examples of formal written methods for addition, subtraction, multiplication and division

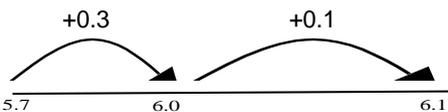
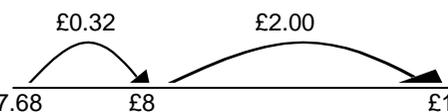
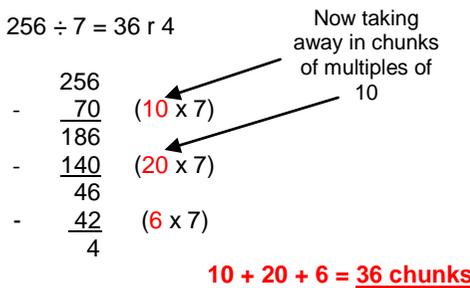
Addition	Subtraction	Multiplication	Division																
<p>Using partitioning to add Consolidate methods from Year 3 and extend to 4 digit numbers and decimals in the context of money (vertically) £ 2.50 + £ 1.75 = £ 4.25</p> $\begin{array}{r} \text{£ } 2.50 \\ + \text{£ } 1.75 \\ \hline \text{£ } 4.25 \end{array}$ <p>(Revert to expanded methods if the children experience difficulties)</p> <p>Using addition as the inverse of subtraction - Relate to <i>triangle teams/numbers</i> to illustrate relationship between numbers (as Year 1 addition/Year 2 multiplication)</p> <p>List four number facts/sentences derived from these numbers: * 324 + 241 = ? * 241 + 324 = ? * ? - 324 = 241 * ? - 241 = 324</p>  <p>Therefore: <input type="text"/> - 324 = 241</p> $\begin{array}{r} 324 \\ + 241 \\ \hline 565 \end{array}$ <p>Using rounding to estimate Rounding whole numbers eg. 523 + 887 = approx. 500 + 900 = 1400</p> <p>Problem solving Use addition as one operation in two step problems eg. James has two jars of coins. There are 342 in one jar and 534 in another. Sami has 903 coins altogether. How many more coins does Sami have than James?</p>	<p>Use partitioning to subtract Continue to work practically, with Diennes equipment, supporting the vertical method outlined in Year 3. Use increasingly more complex numbers, up to 3 digits.</p> <p>eg.</p> $\begin{array}{r} 5 13 1 \\ 6 4 5 \\ - 2 9 6 \\ \hline 3 4 9 \end{array}$ <p>Finding the difference (mental/informal written method) Complementary addition, using increasingly more complex numbers 754 - 86 = 668</p>  <p>Using subtraction as the inverse of addition Use understanding of triangle teams/number sentences/facts to support this</p> <p>eg. <input type="text"/> + 34 = 153</p> $\begin{array}{r} 4 1 \\ 1 8 3 \\ - 3 4 \\ \hline 1 1 9 \end{array}$ <p>New symbols and vocabulary Inverse Reverse operation</p>	<p>Times Tables Know all x tables and related division facts up to 12x12. Use counting stick to support. Understand that 6x is double 3x tables and that 20x is double 10x. This should then be used to solve more challenging mental tasks (i.e.: 22 x 7)</p> <p>Fluency when x10, x100, x1000 Understand that when x10 a number becomes ten times larger. Use this to solve problems like: 5 x 300 (know that: 5 x 3 = 15 Therefore: 5 x 30 = 150 And : 5 x 300 = 1,500)</p> <p>Use partitioning to multiply Working with TU x TU, moving on to working with 3 digit numbers with support of apparatus/equipment as necessary</p> <p>Using grid method: when ready move from concrete – pictorial – abstract.</p> <table border="1" data-bbox="1209 909 1500 1101"> <tr> <td>X</td> <td>30</td> <td>4</td> <td></td> </tr> <tr> <td>20</td> <td>600 + 80 = 680 +</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td>210 + 28 = 238</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td><u>918</u></td> </tr> </table> <p>Or:</p> $\begin{array}{r} 600+ \\ 210 \\ 80 \\ 28 \\ \hline 918 \\ 1 \end{array}$ <p>Begin preparation for short multiplication Only for U X TU and HTU. Make strong links between the partitioning used for the grid method and the partitioning within this method.</p> $\begin{array}{r} 63 \\ \times 7 \\ \hline 21 \quad (7 \times 3) \\ 420 \quad (7 \times 60) \\ \hline 441 \end{array}$	X	30	4		20	600 + 80 = 680 +			7	210 + 28 = 238						<u>918</u>	<p>Repeated subtraction <i>Introduce Chunking Method – chunking relates to groups of/grouping</i></p> <p>Using simple numbers, alongside practical methods used in Y2 and 3.</p>  <p>18 ÷ 3 = 6</p> $\begin{array}{r} 18 \\ - 3 \quad (1 \times 3) \\ \hline 15 \\ - 3 \quad (1 \times 3) \\ \hline 12 \\ - 3 \quad (1 \times 3) \\ \hline 9 \\ - 3 \quad (1 \times 3) \\ \hline 6 \\ - 3 \quad (1 \times 3) \\ \hline 3 \\ - 3 \quad (1 \times 3) \\ \hline 0 \end{array}$ <p>Move swiftly onto subtracting larger chunks, eg: (2 x 3) or (10 x 3)</p> <p>Remainders Use grid method with simple numbers, alongside practical methods used in Y3 eg. 20 ÷ 6 = 3 r 2</p> $\begin{array}{r} 20 \\ - 6 \quad (1 \times 6) \\ \hline 14 \\ - 6 \quad (1 \times 6) \\ \hline 8 \\ - 6 \quad (1 \times 6) \\ \hline 2 \end{array}$ <p>3 'chunks' of 6 Remainder 2</p> <p>New symbols and vocabulary Chunks/chunking</p>
X	30	4																	
20	600 + 80 = 680 +																		
7	210 + 28 = 238																		
			<u>918</u>																

Bishop William Ward Four Rules Policy

Year 5

Please refer to National Curriculum Appendix 1 for acceptable examples of formal written methods for addition, subtraction, multiplication and division

The National Curriculum states that "calculators should be introduced once pupils' written and mental arithmetic are secure... to facilitate conceptual understanding and the exploration of more complex number problems".

Addition	Subtraction	Multiplication	Division
<p>Using partitioning to add Continue to use vertical addition method with increasingly complex numbers (eg 5 or 6 digit numbers and numbers up to 2 decimal places)</p> <p>eg.</p> $\begin{array}{r} 3.7 \\ + 5.86 \\ \hline 9.56 \\ 1 \end{array}$ <p>Using rounding to estimate Rounding decimal numbers</p> <p>eg. $5.2 + 7.9 =$ approx. $5 + 8 = 13$</p> <p>Problem solving Use addition as one operation in multi-step problems involving decimals.</p> <p>eg. Stan builds three lego towers. They measure 1.4m, 0.4m and 2.5m. How far does he have to go to beat the world record of 20.6m?</p>	<p>Use partitioning to subtract Use column subtraction, with any whole integer and decimals up to 2 places.</p> <p>eg.</p> $\begin{array}{r} 24.6 \\ - 15.42 \\ \hline 9.18 \end{array}$ <p>Finding the difference Use a numberline to find the difference between two numbers.</p> <p>eg.</p> $6.1 - 5.7 = 0.4$  <p>Problem solving Choose most appropriate method of subtraction to solve problems.</p> <p>eg. Using numberline to find change from £10 is easier, because there is a lot of cancelling involved when subtracting from £10.00</p> $£10 - £7.68 = £2.32$ 	<p>Fluency when x10, x100, x1000 – See Year 4 multiplication above and record as <i>jottings</i></p> <p>Times tables: as Year 4</p> <p>Short method for multiplication Move from the expanded method used in Year 5 to:</p> $\begin{array}{r} 63 \\ \times 7 \\ \hline 441 \end{array}$ <p>Work with numbers up to ThHTU x U</p> <p>Expanded method for TU X TU</p> $\begin{array}{r} 84 \\ \times 26 \\ \hline 24 \quad (6 \times 4) \\ 480 \quad (6 \times 80) \\ 80 \quad (20 \times 4) \\ \hline 1600 \quad (20 \times 80) \\ \hline 2184 \\ 11 \end{array}$ <p>Extend to simple decimals with one decimal place.</p> $\begin{array}{r} 12.6 \\ \times 2 \\ \hline 1.2 \quad (2 \times 0.6) \\ 4.0 \quad (2 \times 2) \\ \hline 20.0 \quad (2 \times 10) \\ 25.2 \end{array}$ <p>Using multiplication as the inverse of division – use <i>triangle teams/numbers</i> (see Year 4 addition) Using multiplication to work out missing box calculations</p> <p>eg. $\square \div 7 = 68$</p>	<p>Repeated subtraction Expand simple chunking method, using numbers up to HTU</p> <p>eg.</p> $256 \div 7 = 36 \text{ r } 4$  <p>We took away <u>36 chunks of 7</u> altogether and have <u>4 left over/remaining</u>.</p> <p>Remainders Quotients expressed as fractions or decimal fractions</p> $676 \div 8 = 84 \frac{1}{2} = 84.5$ <p>Short Division Introduce short division (bus stop method) for TU÷U to children who have a secure understanding of place value and are confident with multiplication and division facts. eg.</p> $\begin{array}{r} \text{T U} \\ 27 \\ 3 \overline{) 821} \end{array}$ <p>New symbols and vocabulary Quotient</p>

Bishop William Ward Four Rules Policy

Year 6

Please refer to National Curriculum Appendix 1 for acceptable examples of formal written methods for addition, subtraction, multiplication and division

The National Curriculum states that “calculators should be introduced once pupils’ written and mental arithmetic are secure... to facilitate conceptual understanding and the exploration of more complex number problems”.

Addition	Subtraction	Multiplication	Division
<p>Consolidate and apply vertical method of addition, using more complex numbers and applied to a wider range of problem solving activities and investigations.</p>	<p>Consolidate and apply vertical method of subtraction and numberline to find the difference, using more complex numbers and applied to a wider range of problem solving activities and investigations.</p>	<p>Long multiplication</p> <p>Build on expanded method when multiplying by a two digit number</p> <p>eg.</p> $24 \times 32 =$ $\begin{array}{r} & & 1 & & \\ & & 2 & 4 & \\ \times & 3 & 2 & & \\ \hline & 4 & 8 & & \\ & 7 & 2 & 0 & \\ \hline & 7 & 6 & 8 & \end{array}$ <p>Answer: 768</p>	<p>Short Division</p> <p>Including answers with remainders</p> <p>eg.</p> $\begin{array}{r} & & \text{H} & \text{T} & \text{U} & & \\ & & 0 & 3 & 6 & \text{r}5 & \\ 7 \overline{) 22547} & & & & & & \end{array}$ <p>With decimals up to two places</p> <p>eg.</p> $\begin{array}{r} & & 0 & 3 & 9 & . & 7 & 4 & \\ 6 \overline{) 22358.4424} & & & & & & & & \end{array}$ <p>Consolidate and apply chunking method and short method for division, using more complex numbers and applied to a wider range of problem solving activities and investigations</p>