# Version History

| Date: | Document Version | Document Revision History | Document Author/Reviewer |
|---|---|---|---|
| 13.2.2015 | 2.1 | Document drafted | H Moorcroft<br>S Wilson<br>J Mallinson |
| 25.2.2015 | 2.1 | Staff meeting to formulate addition and subtraction sections of policy | S Wilson<br>J Mallinson in conjunction with all staff |
| 11.3.2015 | 2.1 | Staff meeting to look at multiplication section and review the contents of the addition and subtraction sections | S Wilson<br>J Mallinson in conjunction with all teaching staff |
| 18.3.2015 | 2.1 | Division section discussed | S Wilson<br>J Mallinson in conjunction with all teaching staff |
| 20.5.2015 | 2.1 | Policy placed before teaching staff to check it and discuss ARE statements (Appendix B)for September 2015 | |

# Contents

# Policy Statement

This policy outlines approaches to **mental** and **written** calculations taught at Etchells School from Years 1-6. It is designed to ensure consistency and progression of learning when using and applying the four rules of number.

This policy has been formed with the staff of Etchells Primary, as a result of changes to the Maths National Curriculum2014. The three main aims of the curriculum are to develop pupils' **fluency, reasoning and problem solving**.

The calculation policy is organised according to Age related 'performance descriptors' as set out in the National Curriculum 2014, however all pupils will be taught according to the stage they are currently working at, moving on when they are secure.

Children should secure **mental strategies** and rapid recall of facts e.g. by Year 4 children are expected to accurately recall the multiplication facts up to 12 x 12.

The policy outlines **written methods** for addition, subtraction, multiplication and division that will be taught in each year group. Calculations that require a written method will be presented to the children with a wide variety of models and images, such as number lines, counters and interactive resources. There is an emphasis on children articulating, explaining and justifying methods and strategies they have used.

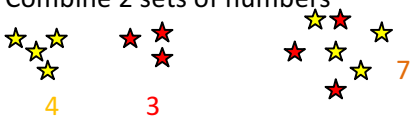
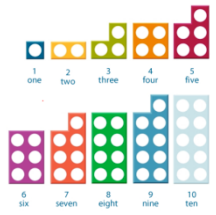
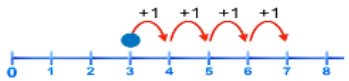
# Aims of the calculation policy

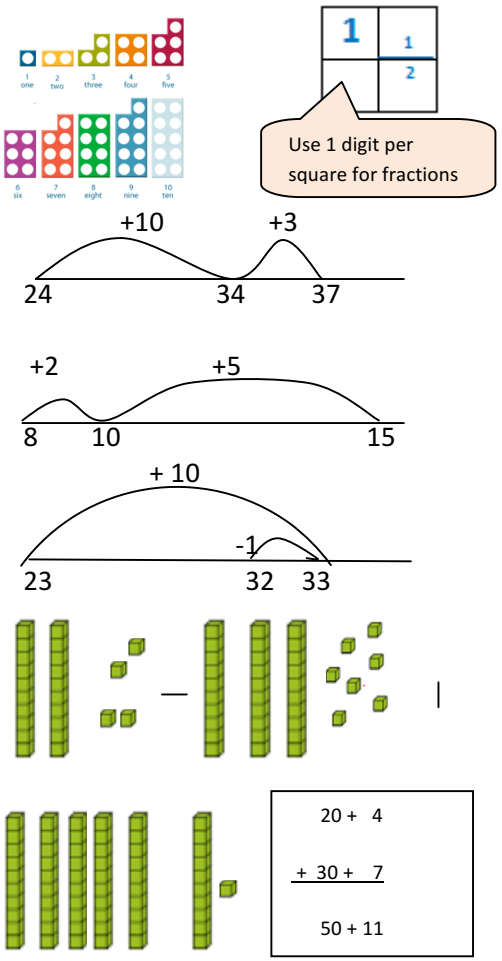
To ensure a consistent approach to the presentation, teaching and learning of mental and written calculations.

To strengthen progression in children's understanding and application of a range of methods.

To build on the use of models and images introduced, in order to promote conceptual understanding and fluency.

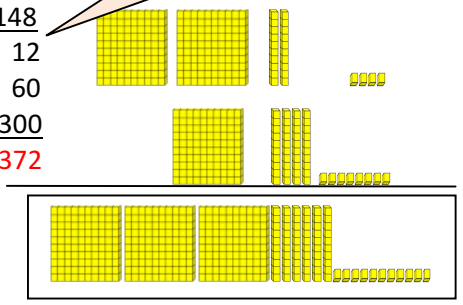
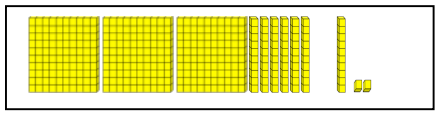
To provide guidance to teaching staff, teaching assistants and parents.

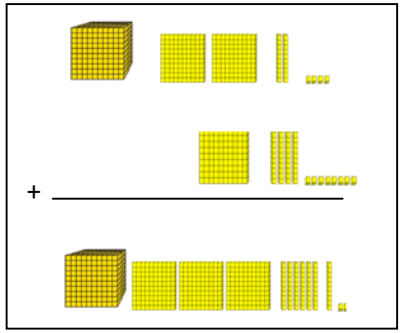
| **Year 1 Addition** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Examples** |
| Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs<br><br>Represent and use number bonds and related subtraction facts within 20<br><br>Add and subtract one-digit and two-digit numbers to 20, including zero<br><br>Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = – - 9. | **<u>Introduction to + = signs and missing number calculations</u>**<br>Pupils will learn the concept of equality before using the = sign.<br><br>Missing numbers will be presented to pupils in all possible places.<br>3 + 4 = __ __ = 3 + 4<br>3 + __ = 7 7 = __ + 3<br><br>**Pupils will be taught that addition is commutative*, so if we know<br>3 + 4 = 7 we also know 4 + 3 = 7<br><br>2 sets of objects will be combined (aggregation) before pupils progress to adding on from the larger number (augmentation).<br><br>**<u>Mental calculations</u>**<br>Children will be plenty of opportunities to embed knowledge of complements to 10 and doubles of numbers to 10.<br>They will be expected to count on and back to increasingly large numbers and know what one more/1 less than a given number is. | 1+2=3<br>3 =1+2<br>1+4 = 3+2<br>Combine 2 sets of numbers<br>  <br><br>Use numicon and visual images to support the visualisation of number facts<br>  <br>A number track will be used to help pupils to count on in sequence.<br>  <br>A number line (with models and images as necessary) will be used to develop the concept of augmentation.<br>3 + 4 = 7<br>  <br> |

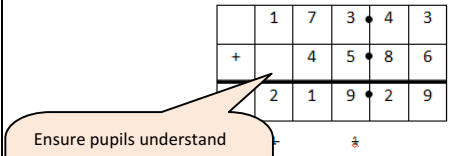
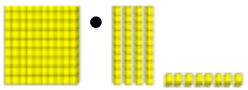
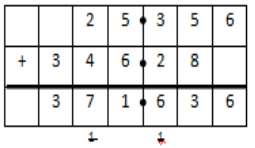
| **Year 2 Addition** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Examples** |
| Solve problems with addition and subtraction:<br>• using concrete objects and pictorial representations, including those involving numbers, quantities and measures<br>• applying their increasing knowledge of mental and written methods<br>Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100<br>Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:<br>• a two-digit number and ones<br>• a two-digit number and tens<br>• two two-digit numbers<br>• adding three one-digit numbers<br>Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot<br><br>Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. | **Missing number problems**<br>e.g. 13 + 6 = 10 + __<br>24 + __ + __ = 100<br>42 = __ + 12<br>Use base 10 and balance scales to ensure concept of equality is fully embedded.<br>**Count on in tens and ones**<br>24 + 13 = 24 +10 + 3<br>= 34 + 3<br>= 37<br>**Partitioning and bridging through tens**<br>Children should use their knowledge of the **complements to 10** to count on to the next tens number then add remaining ones. 8 + 7 = 15<br>**Adding 9 or 11 by adding 10 then adjusting by 1**<br>23 + 9 =32<br>23 + 10 = 33 then take away 1<br>**Towards a written method for TU plus TU**<br>24 + 37 =<br>Add the ones first then exchange the ten ones for a 10 stick.<br>**Expanded written method**<br>24 + 37 =<br>20 + 4 + 30 + 7=<br>20 + 30 + 7 + 4 =<br>50 + 11 = 61 | continue to use numicon, images and models to support the visualisation of number facts and calculations.<br>  |

KS1 Mastery/ exceeding performance descriptors

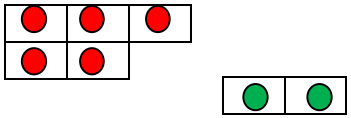
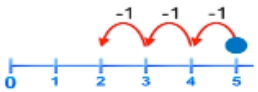
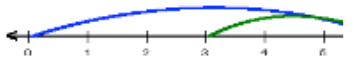
- All aspects of number - addition and subtraction at the national standard are embedded.
- Recall and use addition and subtraction facts to 20 fluently; derive and use related facts to 100 and beyond.
- Add and subtract numbers mentally using appropriate strategies, including:
  - 2 2-digit numbers
  - adding /subtracting several single-digit numbers.
- Add and subtract numbers using objects, pictorial representations and the written columnar method including:
  - adding several 2-digit numbers
  - subtracting 2-digit numbers
  - adding a 2-digit number to a 3-digit number
  - adding 3-digit numbers.
- Solve missing number problems involving a wider range of numbers.
- Use addition and subtraction facts to solve more complex problems, such as 3 step problems.

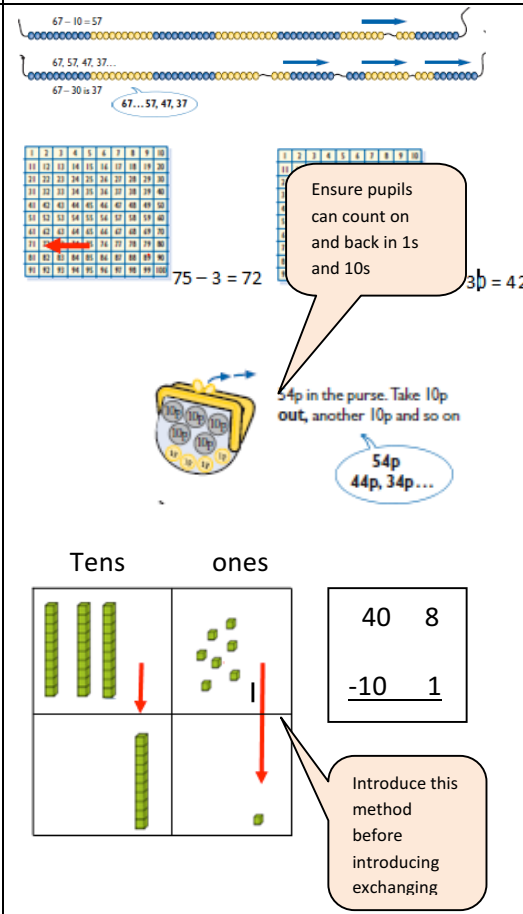
| **Year 3 Addition** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Examples** |
| Add and subtract numbers mentally, including:<br>a three-digit number and ones<br>a three-digit number and tens<br>a three-digit number and hundreds<br><br>Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction<br><br>Estimate the answer to a calculation and use inverse operations to check answers<br><br>Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. | **Missing number problems**<br>Continue to provide equations with 3 digit numbers, that feature missing digits in each possible location and introduce images to represent numbers. 35 + ☆ = 67<br><br>**Partitioning for addition**<br>Partition into hundreds, tens and ones then add each set and recombine.<br>Move on to retaining the first number and only partitioning the second number.<br><br>**Introducing a more formal written method**<br>Introduce expanded column addition modelled with base 10 apparatus. Model the exchange of 1s for tens and show this on a written sum. When children understand the exchange between tens and ones they may begin to form the columnar method shown, which should be discussed and recognised as a more efficient method than the first expanded calculation.<br>224<br>+148<br>372<br>1<br>The exchanged 10 should be carried below the sum and crossed through when it has been added. | 73 + 64 = 200 - □<br>210 + □ + □ = 340<br>42 = 76 - □<br><br>324 + 248 =<br>300 + 20 + 4<br>200 + 40 + 8<br>500 + 60 + 12 = 572<br>Children need to be secure in the addition of multiples of 10 and 100 to any number<br><br>324 + 200 + 40 + 8<br>= 524 + 40 + 8<br>= 564 + 8<br>= 572<br>Add the units first in preparation for the compact method.<br>224<br>+148<br>12<br>60<br>300<br>372<br>  <br>move on to<br>  |

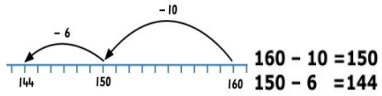
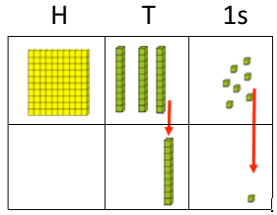
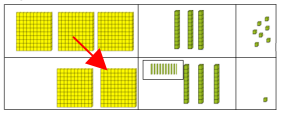
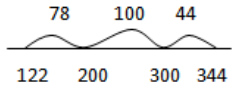
| **Year 4 Addition** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Examples** |
| Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate<br><br>Estimate and use inverse operations to check answers to a calculation<br><br>Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. | **Missing number problems**<br>Equations with larger numbers up to 4 digits , that feature missing digits in each possible location and expand on the use of balanced equations, where more than one type of calculation is used.<br><br>**Partitioning for addition**<br>Continue with the expanded form of addition modelled using base 10 cubes, introducing the thousands cube when pupils are ready.<br><br>**Compact (formal) written addition**<br>Children should be working with numbers up to 4 digits, but should be able to revert back to expanded addition if they are experiencing difficulty with the compact method.<br><br>Extend addition calculations to include numbers with up to 2 decimal places.<br><br>Use the written method with decimals in the context of money and measure to solve problems. | 73 + 64 = 200<br>210 + __ + __ = 340<br>64 ÷ 8 = 2 + __<br><br>1224<br>+148<br>12<br>60<br>300<br>1000<br>1372<br><br>  <br><br>3426<br>+1715<br>5141<br>1 1<br><br>The exchanged digits should be carried below the sum and crossed through when they have been added<br><br>Only use numbers with the same number of decimal places at this stage.<br><br>Decimal point on the line – not in a square of its own. |

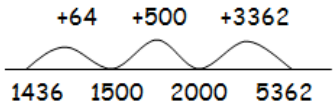
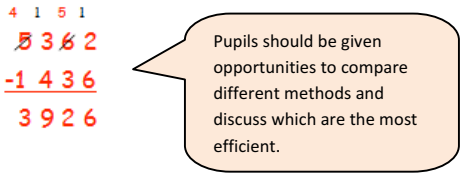
| Year 5 Addition | | |
|---|---|---|
| Objective | Method | Model/ Examples |
| Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)<br><br>Add and subtract numbers mentally with increasingly large numbers<br><br>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy<br><br>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. | **Missing number problems**<br>Equations with larger numbers up to 4 digits. Use of algebraic formulae may become more formal in appearance.<br>Example: 33 = 3N so what must N be?<br><br>**Mental Methods**<br>Children should continue to develop the use of different methods for addition. They should be given opportunities to explore and discuss 'which' are the most efficient strategies and 'why'- justifying their own points of view and explaining their reasoning.<br><br>**Formal written addition**<br>Children should now be secure in the use of the compact addition method for whole numbers, working beyond 4 digits.<br><br>Base 10 blocks can again be used alongside the columnar algorithm to support those pupils who need the visual representation of decimal numbers.<br><br>Children should be using rounding to support them in estimating an answer and should be encouraged to consider how sensible their answer is, particularly when solving problems. | **3464 + 1998 =**<br>3464 + 2000 = 5464<br>5464 – 2 = 5462<br><br>**14376 + 2400 =**<br>14367 + 2000 = 16367<br>16367 + 400 = 16767<br><br>  <br><br>Ensure pupils understand why and how to line up the decimal point when some numbers begin in a different column.<br><br>1.48 = 1 . 4 8<br>  <br><br>25.356 + 346.28 becomes an estimate of 25 + 350 = 375 and this is used to **check** whether the answer is sensible, once the calculation has been completed.<br><br>  <br> |

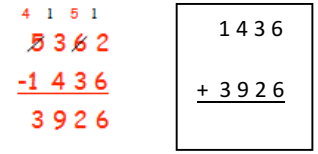
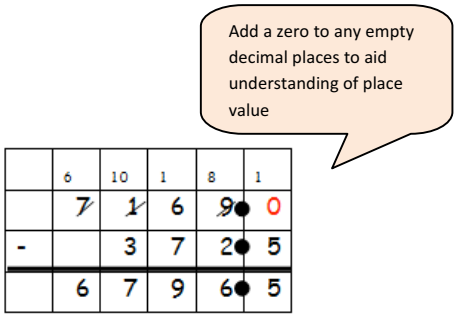
| **Year 6 Addition** | | |
|---|---|---|
| Objective | Method | Model/ Examples |
| Perform mental calculations, including with mixed operations and large numbers<br><br>Use their knowledge of the order of operations to carry out calculations involving the four operations<br><br>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why<br><br>Solve problems involving addition, subtraction, multiplication and division .<br><br>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | **Missing number problems**<br>Equations with larger numbers up to 4 digits. Use of algebraic formulae will be more formal in appearance.<br><br>**Mental methods**<br>Children should continue to develop methods, supported by a range of models and images. Calculations need to be presented in a wide variety of ways, with mixed operations and children should continue to reason and explain their choices of strategy, looking for efficiency.<br><br>**Formal written addition**<br>As in year 5 but progressing to larger numbers including those with up to three decimal places. The aim should be for conceptual understanding and procedural fluency with column addition secure with both whole numbers and decimal calculations. Integers should have different numbers of digits so that pupils secure their knowledge of place value when calculating.<br><br>Pupils should continue to have opportunities to apply their knowledge in a variety of contexts. Addition calculations should be provided with different numbers of decimal places (including money and measures) | 33 = 3N + 15 so what must N be?<br>( ☆ + ☆ ) x ☆ = 10 *(where the answer is no longer a whole number)*<br>149 + 137 – 158 = ⬡<br><br>12462 + 8456<br>Estimate: 12500 + 8500 = 21000<br><br>23.361 + 9.08 + 59.77 + 1.3<br><br>Empty decimal places should be filled with a zero to show that there is no value to add and to retain place value for all other digits. |

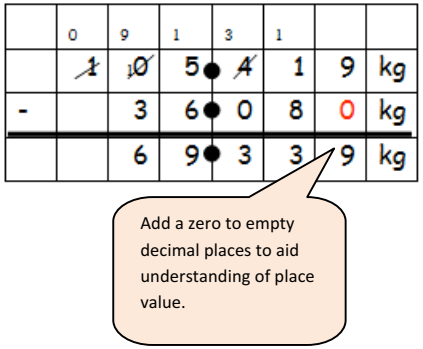
| Year 1 Subtraction | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Represent and use number bonds and related subtraction facts within 20<br><br>Add and subtract one-digit and two-digit numbers to 20, including zero<br><br>Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = – 9.<br><br>Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs | Images and practical apparatus, such as numicon, multilink cubes and Deins cubes among others, will be used to model the process of subtraction.<br><br>**Subtraction is the inverse of addition**<br>As pupils begin to build on their knowledge of number bonds to 10/20, they will be taught that this knowledge enables them to solve subtraction calculations too.<br>6 + 4 =10 so 10 – 6 = 4<br>They will be taught that subtraction is *not commutative*.<br>(10 – 6 = 4 but 6 – 10 is not 4)<br><br>**Missing number problems**<br>Pupils will be shown that they can work out missing numbers using knowledge of bonds.<br>10 - ___ = 3<br>10 – 7 = 3 because 7 + 3 = 10<br><br>Practical apparatus and, later, number lines, will be provided to enable pupils to 'count back'.<br><br>The language of 'find the difference' and 'how many more/less than' will be experienced in a range of practical contexts. |  <br>  <br>__ = 8 – 3 8 – 3 = __<br>5 = __ - 2 __- 2 = 8<br>Count back in 1s on a numbered line to take away with numbers up to 20<br>  <br><br>  <br>The difference between 7 And 3 is 4<br>  |

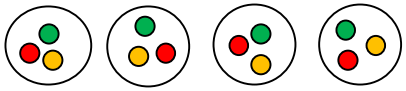
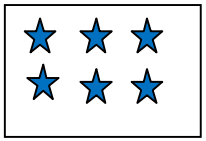
| Year 2 Subtraction | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Solve problems with addition and subtraction:<br>• using concrete objects and pictorial representations, including those involving numbers, quantities and measures<br>• applying their increasing knowledge of mental and written methods<br>•<br>Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100<br><br>Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:<br>• a two-digit number and ones<br>• a two-digit number and tens<br>• two two-digit numbers<br>• adding three one-digit numbers<br><br>Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot<br><br>Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. | Pupils will be taught first to count back in 1s, then in 10s, then in a combination of 10s and 1s, using practical apparatus e.g. Deins, the 100 number line or 100 square as a guide, before counting back in near 10s such as counting back 9 or 11 by using 'adjusting'.<br>A wider range of - vocabulary will be investigated.<br>**Subtraction is the inverse of addition**<br>The 2 rules will continue to be taught together, with children using practical apparatus to investigate related addition and subtraction facts. 4<br>4 + 6 =12 so 12 – 6 = 4<br>**The calculation can come both before and after the = symbol.*<br>12 – 4 = 6 so 6 = 12 – 4<br>**Subtraction is not commutative*<br>**Missing number problems**<br>Calculations will now be presented in different ways, using numbers up to, and beyond, 100 as appropriate.<br>45 = 56 - ____ 0r 48 - ___ = 23<br>**Towards written methods**<br>Expanded columns (initially without decomposition) will be used to support understanding of place value, in preparation for more efficient written calculations. |  |

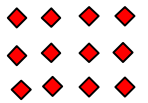
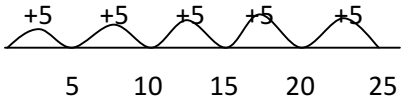
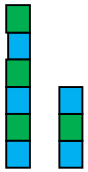
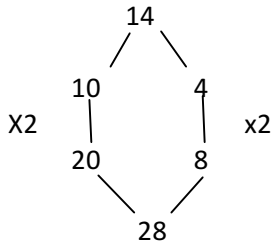
| Year 3 Subtraction | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Add and subtract numbers mentally, including:<br>a three-digit number and ones<br>a three-digit number and tens<br>a three-digit number and hundreds<br><br>Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction<br><br>Estimate the answer to a calculation and use inverse operations to check answers<br><br>Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. | **Subtraction is the inverse of addition**<br>Pupils will be taught +/- at the same time and will be encouraged to use addition to check the answers to their subtraction calculations.<br>**Mental calculations**<br>Pupils will be reminded to use partitioning to count back/on in hundreds, then tens, then in 1s or vice versa. Models and images will support their understanding. They may choose to use complimentary addition or counting back and should be given opportunities to discuss 'efficiency'.<br>**Missing number problems**<br>As for Year 2 but with progressing to larger numbers.<br>**Written methods (progressing to 3 digits)**<br>Pupils will revise expanded column addition (from Year 2) with no decomposition, then begin to investigate decomposition using Deins cubes.<br>When children are secure with the above method they should compare this with written method.<br>**Solving problems**<br>Children will practise the different methods learnt, in problem solving contexts, and discuss 'efficiency' by comparing their chosen methods. |  <br>160 – 10 =150<br>150 – 6 =144<br>  <br>100 40 8<br>– 10 1<br>100 30 7<br>When introducing 'exchange' ensure pupils explore different ways to partition so the value remains the same. 84 = 80 + 4 = 70 + 14 = 60 + 24 etc. emphasise the value doesn't change,<br>Model decomposition<br>  <br>300 30 7 becomes<br>200 130 7<br>6 1 2 1<br>7 2 – 3 3 7<br>- 3 4 1 4 2<br>3 8 1 9 5<br>The school has 344 children, 122 are on a trip<br>How many children are left in school?<br>  <br>122 + 222 = 344 or 334 – 122 = 222 |

| Year 4 Subtraction | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate<br><br>Estimate and use inverse operations to check answers to a calculation<br><br>Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. | **Subtraction is the inverse of addition**<br>Use addition to check the answers to subtraction calculations.<br><br>**Mental calculations**<br>Children should continue to develop methods for subtraction of larger numbers and use jottings to record parts of calculations. They may again choose to do complimentary addition or subtraction of near tens/hundreds among other methods and should be given opportunities to look at efficiency.<br><br>**Missing number calculations**<br>Problem solving, reasoning and fluency is developed through the continued use of these calculations. Children should now be confident in explaining the strategies they have used.<br><br>**Written methods (progressing to 4 digits)**<br>Column subtraction with decomposition should be secured in Year 4, modelled to begin with by the use of Deins cubes.<br>Children should estimate answers using their rounding knowledge. | Use 319 + 137 to check of the calculation 456 – 137 = 319 is correct.<br><br>947 – 198 is best completed by taking away 200, then adjusting rather than a formal calculation.<br><br>5362 – 1436 = 3926<br>  <br><br><br>563 + __ = 724 34 + 56 + __ = 243<br>450 – 30 – 65 - __ = 160<br>__ - 570 = 1000 458 – 56 = 540 - __<br><br>They should estimate answers before completing calculations.<br>(5300 – 1500 = 3800)<br>  <br> |

| Year 5 Subtraction | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)<br><br>Add and subtract numbers mentally with increasingly large numbers<br><br>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy<br><br>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. | **Subtraction is the inverse of addition**<br>Consistently use addition to check the answers to subtraction calculations.<br><br>**Mental calculations**<br>Use jottings as standard to record parts of mental calculations. They may again choose to do complimentary addition or subtraction of near tens/hundreds (with adjusting) among other methods and should explain their methods and the reasons for their choices.<br><br>**Missing number calculations**<br>Problem solving, reasoning and fluency is developed through the continued use of these calculations. Children should now be confident in explaining, and in justifying, the strategies they have used.<br><br>**Written methods (progressing to more than 4 digits)**<br>Calculations should now begin to include decimal numbers, including those with a mixture of integers. Pupils should align the decimal point, recognising it as a 'place holder'.<br>Children will be given lots of opportunities to subtract and find differences with money and a variety of measures. |  <br><br>1342 – 1290 =<br>could be completed by doing<br>1342 – 1300 = __then adjusting by 10 or by counting on from 1290 to 1342 – *which is the better method?*<br><br>6.45 = 6 + 0.4 + __<br>119 - __ = 86<br>100000 - __ = 99,999<br>12463 – 2300 = __<br>1345 – 274 = 1450 - __<br><br>*If we buy three items at £2.99 each how much change could we get from a £20 note?*<br>3 x £3 = £9.00 then adjust by taking away 3p £8.97 before calculating the change.<br><br>  <br> |

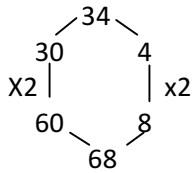
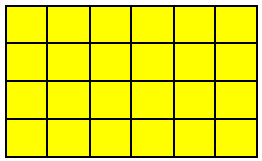
| Year 6 Subtraction | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Perform mental calculations, including with mixed operations and large numbers<br><br>Use their knowledge of the order of operations to carry out calculations involving the four operations<br><br>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why<br><br>Solve problems involving addition, subtraction, multiplication and division .<br><br>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | **Subtraction is the inverse of addition**<br>Consistently use addition to check the answers to subtraction calculations.<br><br>**Mental calculations**<br>Use jottings as standard to record parts of mental calculations. Explain their methods and fully justify the reasons for their choices.<br><br>**Missing number calculations/algebra**<br>Children in Year 6 should be using calculations with mixed operations.<br><br>**Written methods**<br>Calculations should continue to include decimal numbers, including those with a mixture of integers. Pupils should align the decimal point, recognising it as a 'place holder'. The aim should be for both conceptual understanding and procedural fluency.<br><br>**Solving problems**<br>Children should use estimation and use inverse calculations to check validity of answers. They will continue to be given lots of opportunities to subtract and find differences in multistep problems. | △ and ✧ each stand for a different number<br>△ = 42<br>△ + △ = ✧ + ✧ + △<br>What is the value of ✧ ?<br>What if △ = 74? Or △ = 126<br>What if △ is 57? (*where the answer will be a decimal number*)<br><br>10 000 000 = 9 000 100 + __<br>7 -2 x 3 = __<br>(7 – 2) x 3 = __<br>(__ - 2 )x 3 = 15<br><br>  <br> |

| **Year 1 Multiplication** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| 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. | **<u>Multiplication is the same as repeated addition</u>**<br>Use repeated addition to show how multiplication is related to doubling.<br><br>Count on in steps of the same size using practical resources such as washing line, numicon, bead strings, and later number lines.<br><br>**<u>Introduction to vocabulary</u>**<br>Learn the vocabulary of 'times' 'lots of' 'groups of' 'sets of' in very practical ways to develop conceptual understanding.<br><br>Begin to use arrays to understand that multiplication can be done in any order (commutative)<br><br>Pupils to practise counting on in 2s, 10s then begin to use 5s. | How many legs will three people have?<br>  2 + 2 + 2 = 6<br>  <br>There are three sweets on one plate, how many sweets would be on four plates. 3 + 3 + 3 + 3 = 12<br>  <br>2 lots of 3 = 6<br>or 3 sets of 2 = 6<br>or 6 = 2 groups of 3<br>or 6 = 3 x 2<br>  |

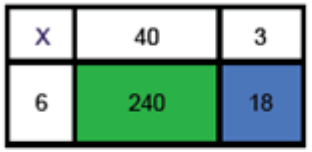
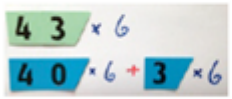
| Year 2 Multiplication | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers<br><br>Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs<br><br>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot<br><br>Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | **Arrays and number lines**<br>Develop understanding of multiplication, by making the links with repeated addition and discussing efficiency. Make use of visual images and practical apparatus. Later begin to include tables other than 2x, 5x and 10x. A range of vocabulary should be used to ensure pupils are familiar with common terms related to x. (pupils should know the 2x, 5x and 10x tables by the end of Year 2)<br><br>**Express multiplication using the symbol x**<br>Look at arrays and begin to record what they show, using simple written format. Record different ways of explaining the same array, noting that the calculation can come both before and after the = symbol (and investigate commutative law). Use this knowledge to solve missing number problems.<br><br>Pupils should be confidently counting on in steps of 2, 5 and 10 and be able to count on and continue patterns in steps of different sizes.<br><br>**Towards written methods**<br>They should use jottings to develop understanding of doubling by partitioning of 2 digit numbers.<br><br>Investigate and learn 2x 50 = 4 x 25 = 5 x 20 = 10 x 10 =100 | 5 x 2 = __ __ = 5 x 2<br>5 x __ = 10 10 = 2 x __<br>10 = __ x 5 2 x __ = 10<br><br>  4 x 3 = 12<br>3 x 4 = 12<br><br>3 x 4 = 4 + 4 + 4<br>4 x 3 = 3 + 3 + 3 + 3<br><br>  <br>  Double 3 is 6<br>2 x 3 = 6<br><br>  |

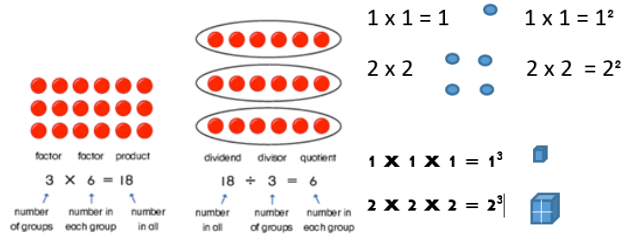
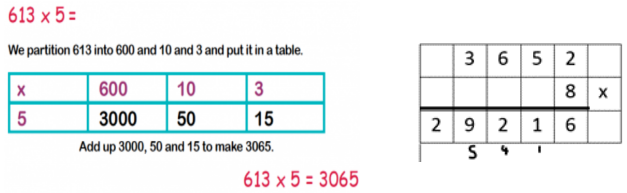
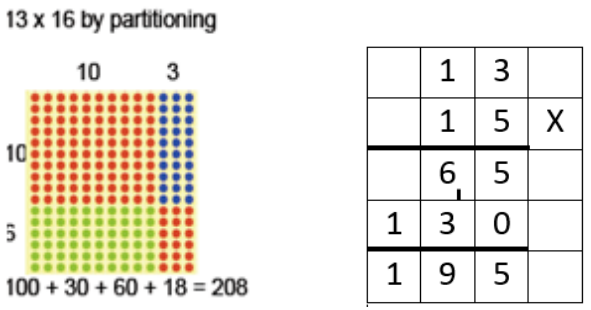
**Mastery/ exceeding in Number - multiplication and division**

• All aspects of number – multiplication and division at the national standard are embedded.
• Rapidly recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables and write mathematical statements using the multiplication (×), division (÷) and equals (=) signs.
• Count in 3s to solve multiplication and division problems for the 3 multiplication table.
• Solve more complex problems involving multiplication and division in a range of contexts including measures.
• Make connections between place value and multiplication/division by 10 and use known multiplication and division facts to derive others.

| Year 3 Multiplication | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables<br><br>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<br><br>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.<br><br>. | **Mental Methods**<br>Pupils should know and use 2x, 5x and 10x table in a range of contexts. Double TU by partitioning, recording the steps using jottings as necessary.<br>Initially they should use their knowledge of 2x tables to find 4x and 8x table quickly. (Pupils should have instant or rapid recall of 2x, 3x, 4x, 5x, 8x and 10 x tables by the end of Year 3).<br><br>**Missing number problems**<br>These should be used to develop pupils' fluency reasoning and problem solving skills.<br><br>**Written methods (TU x U)**<br>Develop understanding of written methods by using arrays to model the partitioning and multiplication of T then U.<br><br>Introduce the grid method alongside the array to represent the calculation. Children should discuss efficiency and recognise the link between the image and the grid written method. |  <br>5 set of 5 =25<br>  <br>  <br>6 x 4 = 24<br>4 x 6 = 24<br>Remind pupils that multiplication is commutative – the numbers in the calculation can be reversed.<br>So 13 x 4 = 10 x 4 + 3 x 4<br>  <br>  <br>40 + 12 = 52 |

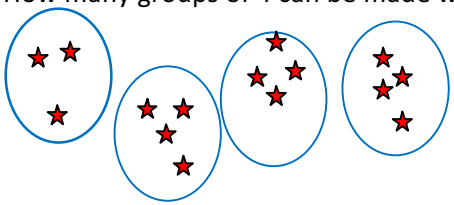
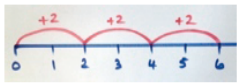
| × | 10 | 3 |
|---|---|---|
| 4 | 40 | 12 |

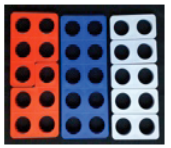
| **Year 4 Multiplication** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Recall multiplication and division facts for multiplication tables up to 12 × 12<br><br>Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers<br><br>Recognise and use factor pairs and commutativity in mental calculations<br><br>Multiply two-digit and three-digit numbers by a one-digit number using formal written layout<br><br>Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. | **Mental Methods**<br>Count on in steps of 6, 7, 9, 25 and 50. Use knowledge of 3x to find 6x by doubling. Solve practical problems using jottings of known number facts to find others. By the end of Year 4 pupils are expected to know all tables facts to 12 x 12. Investigate factors and multiples. Investigate and begin to explain what happens when numbers are x by 10/100/1000<br><br>**Missing number problems.**<br>Presented in a variety of different ways with pupils being encouraged to rearrange calculations so they can use known facts to find missing digits and integers.<br>**Written methods (progressing to TU and HTU x U)**<br>Children to continue to use grid method (with arrays to show visual representation if still needed). When ready children to move to expanded method multiplying unit first.<br>**Compact method**<br>When confident , move to the use of formal method for TU x U then HTU x U. Unit column also to be referred to as 'ones' column. | __ x 5 = 160 18 x __ = 72<br>120 = ___ x 20 120 = 20 x __<br>Use commutativity and other strategies.<br>4 x 6 = 6 x __<br>2 x 6 x 5 = 10 x __<br>__ x 7 = (30 x 7) + (9 x 7)<br><br>43 x 6 by partitioning<br>  <br><br>  <br><br>40 x 6 = 240<br>3 x 6 = 18<br>43 x 6 = 258<br><br>If I know 4 x 6 = 24<br>then 40 x 6 is ten times bigger,<br>40 x 60 is one hundred times bigger.<br><br>34<br>6 x<br>24 (6 x 4)<br>180 (6 x 30)<br>204<br><br>H T U<br>3 4<br>6 x<br>2 0 4<br>-2<br><br>Move to short multiplication when children confident with carrying |

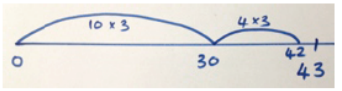
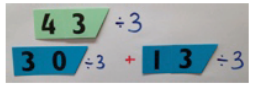
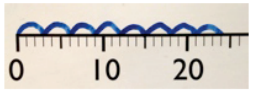
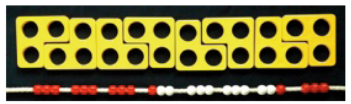
| Year 5 Multiplication | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers<br><br>Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br>Establish whether a number up to 100 is prime and recall prime numbers up to 19<br><br>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<br><br>Multiply and divide numbers mentally drawing upon known facts<br><br>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<br><br>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 | **Mental methods**<br>Pupils to solve problems involving scaling up/down. 'Class Discussions' to ensure pupils are relating each calculation to known number facts and making links. Pupils should : know prime numbers to 19 and be able to work out if another number o 100 is/is not prime; Know what happens to numbers when they are x by 10/100/1000.<br>Investigate and become familiar with square and cubed numbers.<br><br>**Written methods (beginning to calculate TU x TU)**<br>Continue to use grid method until pupils are ready to move to compact method.<br><br>**Missing number problems**<br>As for Year 4 but with increasingly large numbers.<br>**Long multiplication**<br>When children fully understand place value and are confident with carrying over in HTU x U calculations, they may move on to formal long multiplication. | 4 x 35 = 2 x 2 x 35, 8 x 35 = 2 x 2 x 2 x 35<br>  <br>  <br>  |

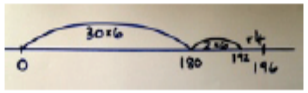
## Year 6 Multiplication

| Objective | Method | Model/ Example |
|---|---|---|
| Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br><br>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<br><br>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<br><br>Perform mental calculations, including with mixed operations and large numbers<br><br>Use their knowledge of the order of operations to carry out calculations involving the 4 operations.<br><br>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | **Mental Methods**<br>Children continue to solve practical problems involving scaling up or down. They explore the order of operations and the use of brackets, investigating whether the position affects the answer.<br><br>**Written methods**<br>Some pupils may continue to use grid method for calculation until confident. Others will continue to practise and refine skills of formal multiplication and long multiplication.<br><br>**Short multiplication for decimals**<br>Use short multiplication to x a decimal number with up to 3 DP by a single digit number. Complete problems involving units of measure. | A bag of 4 oranges cost 37 pence. How much do 12 orange cost?<br>A bag of four apples cost 36 pence how much would 6 apples be?<br><br>2 + 1 x 3 = 5 and (2 + 1) x 3 = 9 children to discuss and explain how both calculations could be correct.<br><br>x 1000 300 40 2<br>10 10000 3000 400 20<br>8 8000 2400 320 16<br><br>1 3 4 2<br>1 8 x<br>1 0 7 3 6<br>1 3 4 2 0<br>2 4 1 5 6<br><br>The decimal point does not have a value and therefore doesn't sit in a square on its own.<br><br>3 • 1 9<br>8 x<br>2 5 • 5 2 |

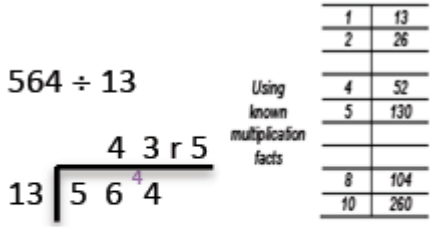
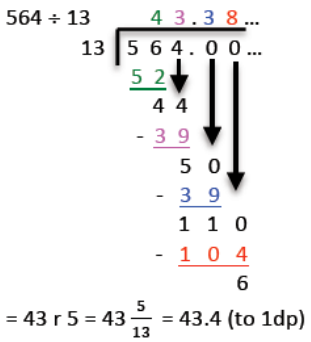
| **Year 1 Division** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. | Make direct links to multiplication when teaching division.<br>Introduction to grouping and sharing should involve practical activities using small numbers to support pupils in developing an understanding of the difference between the 2 concepts.<br><br>**Grouping**<br>Children should use practical apparatus and arrays as pictorial representations for division.<br>12 ÷ 2 = 6<br>So 12 ÷ 6 = 2<br>They should investigate halves and quarters finding simple fractions of objects, quantities and numbers.<br>Half of 10 is 5<br>10 ÷ 2 = 5<br>Pupils may have the ÷ symbol modelled and HA pupils may begin to use it in their recording of the results of practical activities.<br>**Sharing**<br>Use concrete apparatus to share items equally, developing the concept of 1:1 correspondence.<br>6 shared into 2s is 3<br>8 shared between 2 is 4 | How many groups of 4 can be made with 16 stars?<br>  <br>6 ÷2 = 3 by sharing into 2 groups and by grabbing groups of 2<br>  <br>  <br>  <br>  <br>  <br>  <br>How many 2s?<br>  |

| **Year 2 Division** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers<br><br>Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs<br><br>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot<br><br>Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | The direct link between x and ÷ should always be made with the two skills being taught in conjunction with one another. Investigate how x is commutative but ÷ is not.<br><br>**Introduction to the ÷ symbol**<br>Once children are confident in their understanding of sharing and grouping they may begin to use the ÷ symbol in formal written calculations.<br>Children should continue to use grouping and sharing for division using practical activities, arrays and pictorial representations.<br><br>**Arrays**<br>Support children to see how an array can give both x and ÷ facts and explore these related facts.<br><br>**Grouping using a number line**<br>Group from 0 in equal jumps of 2 or 5 or 10 using the divisor as a guide to the size of each group. Make links to visual representations (then begin to investigate groups of 3 and 4). | 6 ÷ 2 = __ __ = 6 ÷ 2<br>6 ÷ __ = 2 3 = 6 ÷ __<br>__ ÷ 2 = 3 3 = __ ÷ 2<br>__ ÷ __ = 3 3 = __ ÷ __<br><br>15 ÷ 3 = 5 in each group (sharing)<br>   <br>  Link to fractions<br>15 ÷ 3 = 5 groups of 3 (grouping)<br>  <br>10 ÷2 = 5<br>  <br>Use language of division linked to tables<br>  <br>How many 2s?<br>  |

| **Year 3 Division** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables<br><br>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<br><br>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.<br><br>. | **x÷ and = symbols and missing number problems**<br>Continue to present children with a range of equations so that they are developing their fluency and reasoning skills.<br>**Grouping**<br>Use small numbers initially. How many 4s are in 16? How can children work this out practically/visually? Show different ways to record their findings.<br>**Arrays leading to short division**<br>Look at an array and ask what it shows. Investigate the different horizontal calculations it can represent (both x and ÷).<br>Begin to investigate bigger numbers in the same way. Introduce the layout of short division alongside an array and show pupils the correct layout focussing on place value when recording answers.<br>**Remainders**<br>Use sharing to find the answer to increasingly large numbers. 49 ÷ 4 = 12 but 1 is left over. How do we record this? Use counters and arrays to support children to apply their knowledge of grouping. | Grouping using partitioning<br>43 ÷ 3 If I know 10 x 3 …<br>  <br>  <br>  <br>Use language of division linked to tables<br>  <br>How many 3s?<br>  <br>  <br>24÷6 = 4 (but not 6 ÷ 24 = 4)<br>Where does the dividend have to go in the calculation? (at the start because division is not commutative.)<br>32<br>3)96<br>Remind pupils of place value<br>1 8 r 2<br>4)7 3 5 |

| **Year 4 Division** | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Recall multiplication and division facts for multiplication tables up to 12 × 12<br><br>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<br><br>Recognise and use factor pairs and commutativity in mental calculations<br><br>Multiply two-digit and three-digit numbers by a one-digit number using formal written layout<br><br>Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. | **Missing number problems**<br>Continue to use a range of equations as in lower years but with appropriate numbers that challenge their knowledge of all tables facts. Introduce the concept of balanced equations to ensure the concept of equivalence is embedded.<br>**Chunking for division of larger numbers**<br>Continue to explore division as grouping and sharing. They will now be encouraged to scale up numbers to help them to solve more complex division calculations. They may record chunks for division in informal jottings and use these to support them in their calculations. They will need to be able to recognise what happens when a number is x/÷ by 10/100<br>**Formal written method of division**<br>Children should be shown how to record these 'chunks' in more formal column divisions so they become increasingly familiar with column layout. When ready, they should be shown how to complete formal division calculations progressing to HTU ÷ U.<br>Calculations should continue to include both those without remainders and those with. Explore rounding up/down after division through practical tasks. | __ = 60 ÷ 5  36 ÷ 9 = __  __ = 360 ÷ 90<br>12 = __ ÷ 5  __ ÷ 4 = 9  4 = __ ÷ 90<br><br>54 ÷ 9 = 3 x __<br>36 ÷ 9 = 63 ÷ __<br><br>Grouping using partitioning<br>196 ÷ 6 If I know 3 x 6 … then 30 x 6…<br><br>  <br><br><br>'Chunking up' on a number line<br>196 ÷ 6 = 32 r 4<br><br>  <br><br><br>86 ÷ 6 =<br>6)8 6<br>- 6 0 (10 x 6)<br>2 6<br>2 4 (4 x 6)<br>0 2<br>14 r 2<br><br>What you have x by goes on the left and is underlined, so the child knows what to add together at the end of the working out. |

| Year 5 Division | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers<br><br>Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers<br>Establish whether a number up to 100 is prime and recall prime numbers up to 19<br><br>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<br><br>Multiply and divide numbers mentally drawing upon known facts<br><br>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<br><br>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 | **÷ x and = signs and missing numbers**<br>Continue to provide a range of equations with appropriate numbers.<br>Formal written method for division<br>Continue as for Year 4 until pupils are efficient in their use of either chunking or more standard method. Pupils should be confident when x/÷ by 10/100/1000<br>**Remainders (quotient) expressed in different ways**<br>Provide calculations that have remainders and ask pupils to discuss the way in which the remainder is recorded. What does it mean? Show that it can also be written as a fraction or a decimal. Work through examples of each.<br>Through practical problems solving tasks look at how the remainder may lead to rounding up/down depending on the context of the question. Explore how the quotient could also be divided to give a decimal (and more accurate) answer.<br><br>**Division using chunking**<br>As children become more confident with HTU ÷ u they will be introduced to HTU ÷ TU for which they may again use chunking. | 630 ÷ __=9 __ ÷ 9 =0.7 __ ÷ __ = 63<br>__ ÷ 90 = 70 100 ÷ __=__÷ 2<br><br>5309 ÷ 8<br>0 6 6 3 r 5<br>8)5 3 0 9<br>The remainder could be expressed as five eighths , r5, as a decimal number, or rounded up or down as appropriate for the problem.<br><br>864 ÷ 36 = 24<br><br>2 4<br>36) 8 6 4<br>7 2 0 (20 x 36)<br>1 4 4<br>1 4 4 (4 x 36)<br>0 0 0<br>What you have x by goes on the left and is underlined, so the child knows what to add together at the end of the working out. |

| Year 6 Division | | |
|---|---|---|
| **Objective** | **Method** | **Model/ Example** |
| Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br><br>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<br><br>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<br><br>Perform mental calculations, including with mixed operations and large numbers<br><br>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | **<u>÷ x and = signs and missing numbers</u>**<br>Use a range of appropriate equations and begin to include those with decimal numbers. Multiplication should be used as a check for division accuracy.<br><br>**<u>Short division with remainders</u>**<br>Children should develop their confidence when expressing remainders as whole numbers, fractions, decimals or rounded numbers depending on the contexts.<br><br>**<u>Chunking leading to long division.</u>**<br>As children become increasingly confident with HTU ÷ TU they may move to Th HTU ÷ TU. They may then explore the link between chunking and long division and discuss the efficiency of each method.<br>At all times a range of calculations should be provided with remainders as well as those without. Remainders should be interpreted according to the context. | 630 ÷ 0.7 = 2.75 ÷5 = __ __ ÷ 0.4 = __ ÷ 0.25<br><br>  <br><br>$564 \div 13 = 43 \text{ r } 5 = 43\frac{5}{13} = 43.38...$<br><br>  <br>$= 43 \text{ r } 5 = 43\frac{5}{13} = 43.4$ (to 1dp) |