Maths at Mylor Bridge CP School - Calculation Policy



September 2018

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***Introduction***

At Mylor Bridge School, we believe that all children should be the ***best they can be***. We try to ensure that all children have access to the same curriculum content by offering them opportunities to deepen their conceptual understanding by tackling challenging and varied problems. Similarly with calculation strategies, we aim for children to show case their fluency across all operations by use of concrete, pictorial and abstract representations. Therefore, this policy outlines the various strategies that should be taught and used from EYFS all the way through to Year 6, keeping in line with the 2014 Primary National Curriculum and the EYFS framework.

***Mathematical Language***

The 2014 National Curriculum is explicit in articulating the importance of children using the correct mathematical language as a central part of their learning (reasoning). It is essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate and precise mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers only accepting what is correct. **The school agreed list of terminology is located at Appendix A to this document.**

***Appendix A***

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| **Correct Terminology** |
| **Ones is to be used when referring to what used to be called units. For example, units, tens, hundreds etc.** |
| **Zero (0) is to be used rather than nought or ‘oh’.** |
| **Exchanging is to be used rather than borrowing in subtraction.** |
| **Equation, calculations, number sentence. Sum is only to be used when referring to addition calculations.** |
| **Commas or no commas – 23,421 or 23 421** |
| **Larger rather than bigger. ‘*Which is the larger number?’*** |

***Policy Guidelines***

Using various policies as a guide; staff discussion; the 2014 Primary National Curriculum; and the embedding of White Rose principles, the purpose of this policy is to encourage a consistent approach to teaching and learning at Mylor Bridge School. It is expected that teachers use their professional judgement as to when consolidation of existing skills is required and appropriate interventions are needed. The focus however, should remain on depth of understanding rather than moving up and accelerating through concepts. All teachers have been given the resources from the White Rose Maths Hub and are encouraged to base their planning around the objectives for their particular year group. Teachers can use any teaching resource that they wish and can use their professional judgement to determine which resources meet the needs of their class.

***Evidence***

Evidence of this approach can be found in children’s books; displays in classrooms and around the school; lesson observations; and pupil conferencing.

***Mastery Curriculum***

At Mylor Bridge School, we aim to offer children opportunities to ‘master’ key mathematical skills and concepts through their experiences in the classroom. The National Centre for Excellence in the Teaching of Mathematics (NCETM) suggest that mastery of mathematics means ‘acquiring a deep, long term understanding of the subject’. At Mylor Bridge School, children are able to demonstrate their understanding by using mathematical talk, reasoning skills and solving various types of problems.

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| **Number – Addition and Subtraction**  **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| * **Pupils should be taught to:**   read write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs   * represent and use number bonds and related subtraction facts within 20 * add and subtract one-digit and two-digit numbers to 20, including zero      * solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = – 9. | * **Pupils should be taught to:**   solve problems with addition and subtraction: using concrete objects  pictorial representations, including those involving numbers, quantities and measures   * applying their increasing knowledge of mental and written methods * recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 * add and subtract numbers using concrete objects, pictorial representations, and mentally, including:  1. a two-digit number and ones 2. a two-digit number and tens 3. two, two-digit numbers 4. adding three one-digit numbers  * show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot * recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems. | * **Pupils should be taught to**:   add and subtract numbers mentally, including:  a three-digit number and ones  a three-digit number and tens  a three-digit number and hundreds   * add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction * estimate the answer to a calculation and use inverse operations to check answers * solve problems including missing number problems, using number facts, place value, and more complex addition and subtraction. | **Pupils should be taught to:**   * add and subtract to 4 digits using the formal written methods of columnar addition and subtraction where appropriate * estimate and use inverse operations to check answers to a calculation * solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why. | **Pupils should be taught to:**   * add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) * add and subtract numbers mentally with increasingly large numbers * use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy * solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. | **Pupils should be taught to:**   |  | | --- | | * perform mental calculations including with mixed operations and large numbers |  |  | | --- | | * solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why | |

**TABLE OF OBJECTIVES FOR ADDITION AND SUBTRACTION (EYFS – Y6)**

**National Curriculum 2014 Numeracy Objectives**

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| **EYFS Addition** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **To count one more or one less than a given number** | **Using cubes**  **Using number strings**  **beads** | **Variation of images to illustrate one more than or one less than.** | **What is one more than three?**  **3 + 1 = 4**  **Put the larger number in your head and count on.**  **4 = 3 + 1** |
| * **To add two single digit numbers** | **As above** | **Using images to add two single digit numbers.** | **Tom has 4 sweets he is given 2 more. How many does he have now?** |
| * **Counting on to find the answer** | Start with 3 beads and count on 4. How many beads do we have now?  Can we encourage to start with the largest number at this stage? | **Using number lines to count on.** | **What’s three more than five?**  **(Remember always to start with the largest number)** |

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| **Year 1 Addition** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **Read, write and interpret mathematical statements and understanding + and = signs.** * **Understanding the equals sign means ‘this is the same as this’** | Using cubes/base 10/physical apparatus to count on and record information from what they have done. | Use of number lines to identify numbers needed to form a number sentence. | 5 + 3 = 8  8 = 5 + 3  Moving the equals sign around to demonstrate understanding that equals means the same as. |
| * **Number bonds and related number facts within 20** | Use of bead strings, separating beads into these groups. | Use of number lines and images to count on. | Adding 3 numbers within 20. Identifying number bonds - eg.  7 + 3 + 2 = 12 |
| * **Adding one and two digit numbers up to 20, including zero** | Use of physical apparatus including bead strings to count on from the larger number up to 20.  IMAGE OF BEAD STRING EXAMPLE | Use of number lines.  Use of illustrations.  Making ten - 9 + 5 could be seen as 9 + 1 + 4 (use of number bonds) and this could be displayed on number lines. | Understanding that  11 + 3 = 3 + 11 (For more able)  “If John has 11 apples and Thomas has 5 apples, how many do they have together?” |
| * **Solving one step problems that involve addition** | As above. | As above. | Solving missing number problems (such as 8 + \_ = 11) |

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| **Year 2 Addition** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **Recall and use facts to 20 fluently, using related facts up to 100.** | **Digit cards**  **Bead strings** |  |  |
| * **Add numbers using concrete objects, pictorial representations and mentally, including:**   **-a two digit number and ones**   * **a two digit number and tens** * **two, two digit numbers** * **adding three one digit numbers** | **Using cubes and other concrete objects to represent and discuss each iteration, building up from one/two digit numbers with small additions to adding together two digit numbers.** | **Partitioning and using known facts to add numbers together.** | 23 + 11  20 + 10 = 30  3 + 1 = 4  23 + 11 = 34  ***Remember to add larger number first*** |
| * **Showing the addition of two numbers can be done in any order** | Groups of cubes, moving them round to show both ways of adding numbers together. | **Illustrations of two groups and how you could add either way.**  **Teaching point - which way would be quicker/easier?** | **Use of equals sign to demonstrate a balance on each side.**  **12 + 8 = 20 = 8 + 12** |
| * **Recognising and using the inverse to check calculations and solve missing number problems** | Using cubes to show that once added if you take them back away you get back to your original number.  100 square and numbers lines |  | **23 + 8 = 31 “How could you show that this calculation is correct?”** |

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| **Year 3 Addition** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **add and subtract numbers mentally, including:**   * a three-digit number and ones * a three-digit number and tens * a three-digit number and hundreds | Use cubes or base 10.  100 square | Show the jumps on a number line  When counting in units suggest number bonds and related facts to make bigger jumps. | What is 360 + 40?  If I add 345 to 5 what number do I get?  How could I solve 300 add 300? |
| * **add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction** | 24+ 15 = (9 and 30) = 39  When secure with two digits move to three digits but only up to 1000 Use base 10 blocks first.    Remember to add up the units and exchange 10 ones for 10. | Children to draw pictures to help them solve addition and subtraction problems.  Teacher to set pictorial calculations.  Draw place value grids and place value counters | H T U  **Remind children that they should use one number per square**  **And a ruler for lines.**  2 7 8   * 8 2   1 0     |  |  |  | | --- | --- | --- | | 1 | 5 | 0 | | 2 | 0 | 0 | |  |  |  | | 3 | 6 | 0 | |
| * **solve problems including missing number problems, using number facts, place value, and more complex addition and subtraction.** | Use equipment to help once calculation is established |  | **Always sometimes or never questions?** **Prove it questions**  e.g. When adding ones the only digit to change will be the ones column?  + 17 = 29 |

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| **Year 4 Addition** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **add and subtract to 4 digits using the formal written methods of columnar addition and subtraction where appropriate** | Use base 10 alongside formal method to demonstrate exchange of digits  Counters used as place value counters or cut out and stuck in. | Use bar models with inverse operations or whole part whole    Can you add the numbers above  3357 + 2434 | |  |  |  |  | | --- | --- | --- | --- | | Th | H | T | O | | 4 | 6 | 2 | 7 | | +3 | 9 | 1 | 4 | |  |  |  |  | | 8 | 5 | 4 | 1 | |  |  |  |  | | 1 |  | 1 |  | |  |  |  |  | | Th | H | T | O | | 4 | 6 | 2 | 7 | | +3 | ? | 1 | ? | |  |  |  |  | | ? | 5 | 4 | 1 | |  |  |  |  | |  |  | 1 |  |   Move on to missing numbers |
| * **estimate and use inverse operations to check answers to a calculation** | Base 10 | Number lines to count back  Bar models | Use the inverse in missing number sentences.  What’s my number - My answer is 465 and I added 256 to my original number? |

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| **Year 5/6 Addition** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **Add and subtract whole numbers with more than four digits, including using formal and written methods. (up to 1 million year 5)**   **(up to 10 million year 6)** | Base 10 | If needed use previous years  Bar model  What could the  numbers be? | **Single and multistep problems**  All the missing digits  Are the same. What are  they? |
| * **Add and subtract numbers to two decimal places. (3 in year 6)** | Use base 10 but change to decimals | Bar models  Number lines | **Problems involving money** |

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| **EYFS Subtraction** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Children will find one less than a given number** | Children will find one less from up to 5 progressing to 10 and 20. Understands subtraction as removing or hiding objects In practical activities and through discussion they will begin to use the vocabulary involved in subtraction.  **Numicon/base10/ beadstrings/ cubes** | You have five apples I have eaten one, how many kleft? | 5 – 1 = 4  Recorded alongside different pictures |
| **Children to subtract from 2 single digit numbers by counting back to find the answer** | Remove given amounts from sets of concrete objects. | Using pictures can subtract a single digit number.    5 – 3 = 2 –  Can do the same on a number line. | 5-3 =2  Different number problems to illustrate example. |

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| **Year 1 Subtraction** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals signs (=)** | Using cubes/ base 10/ physical apparatus to count back and record information from what they have done. | Use of number lines to identify numbers needed to form a number sentence. | 8-3=5  5=8-3  Moving the equals sign around to demonstrate understanding that = means the same as. |
| **Represent and use number bonds and related subtraction facts within 20** | Use of bead strings, bears, unifix, cars etc to demonstrate.  What is 10 take away 4/What is the difference between 10 and 6? | Use of number lines, drawing and crossing out. | Subtracting using 3 numbers eg. 10-1-3=6 |
| **Add and subtract one-digit and two-digit numbers to 20, including zero.** | Use of physical apparatus to count back from the bigger number from 20 | Use of number lines. Use of illustrations. | Understanding that subtraction is not commutative but8-3=5  and 8-5=3 |
| **Solve one-step problems that involve addition and subtraction, using concrete and pictorial representations and missing number problems.** | As above. | As above. | Solving missing number problems  Image result for year 1 missing number subtraction |

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| **Year 2 Subtraction** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **add and subtract numbers using concrete objects, pictorial representations, and mentally, including:**   * **a two-digit number and ones** * **a two-digit number and tens two, two-digit numbers** * **adding three one-digit numbers** * **Solve problems from the above.** | Use counters to add the numbers 2,4 and 6. Can you use number bonds to make the calculation easier? | 22 – 7 represented as number line  Can we use number bonds to be more efficient? | 78 minus 34 =  8 ones − 4 ones =  7 tens − 3 tens =  We have ….. tens and ….. ones  Find the missing number    Partitioning in to tens and ones |
| **Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100** | Digit cards ,Cubes, Base 10, Bead strings |  |  |
| **Using inverse operations to check and solve missing number problems** | 100 square, number lines and base 10 | Place value cards to show 13+2=15  15-13=2 |  |

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| **Year 3 Subtraction** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Add and subtract numbers mentally**  **Three-digit and ones**  **Three-digit and tens**  **Three-digit and hundreds** | Use of unifix cubes  Use base 10 to solve **: 321 -4** (showing exchange)  Numicon  All 4’ grid | * Use of number lines * Part-whole models * Place value grids * ‘All 4’ grid – Build and draw, calculation, explanation, word problem | Red Team had 672 team points this year and won the House Cup.  Blue Team finished second with 7 less points than the red team.  How many points did the Blue team finish on?  ‘All 4’ grid |
| **Add and subtract numbers up to three digits, using formal written methods of columnar addition and subtraction** | Represent calculations using base 10 or counters | Use of number lines  • Part-whole models  • Place value grids | Subtraction without exchanging for Autumn term moving into exchanging in Summer term. To record as a expanded calculation. See below  Mary thinks 352-89 =337  Why is she wrong?  wrong?  400+20+3 \_  300+40+1  \_\_\_\_\_\_\_\_  eventually lead to exchange. |
| **Estimate the answer to a calculation and use the inverse to check answers** | Use of unifix cubes  Base 10  Numicon | Use the ‘near/nice number to make an estimate before undertaking the calculation. How can we use the inverse to check? | 34 + 45 = 79    Use a subtraction to check the answer to the addition  Or  Hannah has baked 45 cakes for a bun sale. She sells 18 cakes. How many does she have left?    Show your answer using a bar model and check your answer by using an addition |
| **Solve problems, including missing number problems, using number facts, place value and more complex addition and subtraction.** | Use of unifix cubes  Base 10  Numicon | There is 556 represented in counters. Blob is covering some. How many different ways can you make the amount? |  |

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| **Year 4 Subtraction** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Add and subtract numbers with up to 4 digits using formal written methods of columnar addition and subtraction where appropriate** | Use base 10 alongside formal method to demonstrate exchange of digits  Counters used as place value counters or cut out and stuck in. | V:\Class 4 2017-2018\Maths\IMG_3464.JPG | |  |  |  |  | | --- | --- | --- | --- | | Th | H | T | O | | 4 | 9 | 2 | 7 | | -3 | 6 | 1 | 4 | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  | | Th | H | T | O | | 4 | 6 | 2 | 2 | | - 3 | ? | 4 | ? | |  |  |  |  | |  | ? | ? | 1 | |  |  |  |  | |  |  |  |  |   Move on to missing numbers |
| **Estimate and use the inverse to check answers to a calculation.** | Base 10 | Number lines to count back  Bar models |  |
| **Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.** | Use glass beads, base 10 alongside the formal method to demonstrate exchange of digits. |  |  |

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| **Year 5/6 Subtraction** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Add and subtract whole numbers wth more than four digits, including using formal written methods (columnar addition and subtraction)** | Base 10  Place value counters/ coloured counters/ coins or money.  **Use base 10 to show exchange including decimals** | Draw place value counters and show exchange | At this stage the formal operation  Should be used to solve calculations.  Encorage children to decide if a mental method is more appropriate or to draw on mental strategies.    This calculation has been completed incorrectly – explain the mistake. |
| **Add and subtract numbers mentally with increasingly large numbers**  **(**Remember strategies – near doubles, near multiples of 10 etc) | As above | Number lines (vertical and horizontal) |  |
| **Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy** | | Show the process on a number line – round and adjust. | True or false - I do not need to use a written method to work this out? Explain – 49999 – 19999= 50000 - 20000 |
| **Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why** | Use equipment to demonstrate and support calculations | Draw their calculations using bar models, number lines or another visual interpretation. | On Monday George was paid £114, on Tuesday, he was paid £27 more than Monday. On Wednesday, he was paid £27 less than on Monday. **How much was he paid in total? How many calculations did you do? Is there a better way of solving the problem?** |

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| **Year 1**  **Multiplication and division** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** |
| Pupils should be taught to:   * 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.   *By the end of Year 1, the children should know their 2, 5 and 10 times tables.* | Pupils should be taught to:   * Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers * Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs * Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot * Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.   *By the end of Year 2, the children should know their 2, 5 and 10 times tables.* | Pupils should be taught to:  Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables   * Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods * Solve problems including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.   *By the end of Year 3, the children should know 2, 3, 4, 5, 8 and 10 times tables.* | Pupils should be taught to:   * Recall multiplication and division facts for multiplication tables up to 12 × 12 * Use place value known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers * Recognise and use factor pairs commutatively in mental calculations * Multiply two-digit and three-digit numbers by a one-digit number using formal written layout * Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.   *By the end of Year 4, the children should know all their times tables up to 12 x 12.* | Pupils should be taught to:   * Identify multiples and factors including finding all factor pairs of a number, and common factors of two numbers * Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers * Establish whether a prime number up to a 100 is prime and recall prime numbers up to 19      * 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      * Multiply and divide numbers mentally drawing upon known facts      * Divide numbers up to four digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context   and those involving decimals by 10, 100 and 1000     * Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3) * Solve problems involving multiplication and division including using their knowledge of the above including understanding of the equals sign | Pupils should be taught to:   * Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication * Divide numbers up to four digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context * Divide numbers up to four digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context * Perform mental calculations including with mixed operations and large numbers * Identify common factors; common multiples and prime numbers * Use their knowledge of the order of operations to carry out calculations involving the four operations * Solve problems involving multiplication and division * Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. |

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| **EYFS Multiplication** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Children solve problems including doubling, halving and sharing.**  (**Make clear that doubling is adding the same number)** | six and six is twelve **(6 + 6 = 12)** | Doubling machines  Lady birds with spots  Symmetry  Draw pictures to show double the number. | Introduce children to the signs. |

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| **Year 1 Multiplication** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **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.** | Numicon  Beads  Teddies  Bead strings  Pencils  **Ensure children have experience to contextualise questions.** | Image result for owlsImage result for owlsImage result for owls  One owl has two eyes. How many eyes do 3 owls have?  2+2+2=? | Worded problems that are accessible to the children  There are two fish in one tank, how many fish in four tanks  (show image to support) |
| Teaching Point – Please ensure children have a secure understanding of doubling numbers before attempting further multiplication. | | | |

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| **Year 2 Multiplication** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers** | Look at objects which are arranged in 2s 5s 10s  Bricks, lego, bears, pens, spoons….  Count in 2s 5s 10s |  | Write multiplication facts  1x2=2  2x2=4  3x2=6 |
| * **Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs** | Show groups/sets of objects.  Tell real life stories.  Eg 5 pots. 5p in each pot. Total is 25p |  | Inverse operations.  Show four number stories:  2x10=20  10x2=20  20÷2=10  20÷10=2 |
| * **Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot** | Play with objects/rearrange to show commutative rule | Use arrays | Write 3x5=15  5x3=15      But although 15÷3=5  3÷15 is not 5 |
| **• Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.** | Use sets/groups of equipment to answer questions  Eg : put out 6 ponds . use 5 frogs in each pond How many frogs alltogether? | Draw pictures and arrays.  Sove problems eg how many more 3s on this array to make 21?   |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  | |  |  |  |  | |  |  |  |  | | Word problems.  How many frogs in each pond? 3 ponds.  Total number of frogs is 15.  Close procedure:  7x ? = 35  (lots of inverse operation opportunities) |

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| **Year 3 Multiplication** | | | | |
| **Objectives** | **Concrete** | **Pictorial** | | **Abstract** |
| * **Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables** | Use of unifix cubes, counters, other concrete objects |  | |  |
| • **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** | Use of unifix cubes, counters, other concrete objects | | There are five towers of 3 cubes. How many cubes are there altogether?    \_\_ + \_\_ + \_\_ + \_\_ + \_\_ =    \_\_ × \_\_ =  Stage one **expanded**  Stage two **formal**  T O  Start by introducing expanded method. By the end of term 3, move to formal method alongside equipment  3 4  X 3  9 0 (30 X)   1. 2 (4 X 3)   1 0 2  To do abstract methods alongside pictorial | |
| * **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** | Build towers or use concrete objects to answer questions such as below | Scaling    Correspondence | | Scaling    Correspondence  William has 3 t-shirts and 4 pairs of trousers. How many different outfits can he make?  Missing number  Complete the missing information: 30 is \_\_\_\_\_ times bigger than 5. \_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_\_ |

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| **Year 4 Multiplication** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| • **Recall multiplication and division facts for multiplication tables up to 12 × 12** | Using objects, such as beads, base ten and real life objects.  Tables grids. | Tables grids  Arrays | Word problems  Calculations using inverse |
| * **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** | Number fans  Beads | Using pictures of real life objects. |  |
| * **Recognise and use factor pairs commutatively in mental calculations** | Supported by counters.  “How many ways can you arrange these 12 counters?” | Pictorially drawing different ways of showing factors. |  |
| * **Multiply two-digit and three-digit numbers by a one-digit number using formal written layout** | Use of base 10 to support multiplication strategies. | Grid method and arrays.  **Scanned example from a book?** |  |
| * **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.** | Use of glass beads **(TW photo?)**  Base 10  Cuisenaire rods |  |  |

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| **Year 5 Multiplication** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **Identify multiples and factors including finding all factor pairs of a number, and common factors of two numbers** |  | Drawing different ways to representing factors including Venn diagrams | Children to be able to list factor pairs from finding all possible factors, using known facts, doubles and multiples to help them.  *“Find all the factors of 6 and 10 between 20 and 80?”* |
| * **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** | Children to use counters, beads and physical resources to represent numbers and work with smaller multiples (x 2 and x 3) before moving onto larger numbers. |  | Use of formal multiplication method, moving into multiplying by a 2 digit number:    **Multiply the 10s first!** |
| * **Multiply and divide numbers mentally drawing upon known facts** | Using a range of strategies to support known facts, near doubles, derivative decimals problems (4.8 divided by 6, 0.8 x 7), knowledge of square numbers up to 12 x 12 and knowledge of cube numbers.  Concrete materials can be used to demonstrate these strategies physically, before moving into illustrations and pictures and further abstract methods. | | |
| * **Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes including understanding of the equals sign** | As above. | As above. |  |
| In Year 5, children also learn how to find square, cube and prime numbers. They should also be consolidating their understanding of their times tables up 12 x 12 and working on their rapid recall. | | | |

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| **Year 6 Multiplication** | | | | | |
| **Objectives** | **Concrete** | | **Pictorial** | **Abstract** | |
| * **Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication** | Use place value counters to show calculation | |  | C:\Users\amartin\Downloads\IMG_20180312_170816 (1).jpg  **Use the formal method of long multiplication when multiplying by 10,100 etc (multiply the bigger number first)**    **explain when multiplying by tens, the numbers will be 10 times bigger, digits move to the left by one place as a result. 0 is a place holder.**  **When using decimal numbers, take the decimal points out first. Write how many decimal places you have taken out and put them back in at the end. Cross out DP. .marker.** | |
| * **Perform mental calculations including with mixed operations and large numbers** | **Show using arrays if needed.** | | **Use a variety of mental strategies including varied fluency 3X6 = 18 so 30 X 6 =180 0.3 X 6 = 1.8 etc**  **Multiply by a near multiple of 10 the adjust** | | |
| * **Use their knowledge of the order of operations to carry out calculations involving the four operations** | ***Does it make a difference if we change the order in a calculation?*** Use equipment to test question. | | Use BODMAS-  1.Brackets 2.Orders, 3.Multiplication OR Division (which ever is to the left of the calculation)  4 Addition or Subtraction (which ever is to the left of the calculation.) | |  |
| * **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.** | | See previous example (year 5/6 addition and subtraction) of using rounding and estimation to check for accuracy | | | |
| * **Solve problems involving multiplication and division** | Ensure children have access to relevant equipment in order to help them solve problems. Number lines, concrete objects, base 10. | |  |  | |

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| **Year 1 Division** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| Pupils should be taught to:  •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 | Teddy bears  Coins  Bead strings  Number lines  Beads  Numicon | Image result for mars barImage result for mars barImage result for mars barImage result for mars bar  Sarah and Tom want to share the Mars bars EQUALLY. How many will they get each?  Image result for ladybird spotsWhat is half of 4? |  |

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| **Year 2 Division** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| * **Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers** | Share out objects into sets using quantities that are multiples of 2 5 10  Bricks, lego, bears, pens, spoons….  Count how many in each set.    **How many towers of five cubes can I make from 20 cubes?**    Use active maths’ techniques to share beanbags in to hoops. | Draw pictures to show how many birds in each tree if 20 birds were sitting equally amongst 2 trees.    Bar models | Write multiplication facts  1x2=2  2x2=4  3x2=6  Write the equivalent division facts 6÷3=2  4÷2=2  How many different ways can we make the number sentences? |
| * **Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs** | Use objects and real life stories to demonstrate understanding of division problems.  Sort 18 socks between 2 children. How many socks each? | 14 buns .draw them shared out on to 7 plates. | Inverse operations.  Show four number stories:  2x10=20  10x2=20  20÷2=10  20÷10=2 |
| * **Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot** | Play/arrange objects into sets to show that: 3x2=2x3  but: 3÷2 is not equal to  2÷3 | Use arrays | Write number sentences to show that: 3x2=2x3  but: 3÷2 is not equal to  2÷3 |
| **•Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.** | Use sorting sets and objects to answer questions such as: | Here is a number line to introduce how many equal groups of two you can make from 12    Use a number line to find out how many equal group of 5 we can make from 30. |  |
| **Use the two times table facts to double and halve numbers** | Ensure that halving a number is secure and that children understand that if a number is odd there will always be one left over. Us concrete materials to prove questions like the one on the right. |  | |

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| **Year 3 Division** | | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** | |
| **Recall and use multiplication and division facts for the 3, 4, 8 and 2, 5, 10 multiplication tables**  **Finding half of a given number.** | Use of unifix cubes, counters  Using a place value slider, children gain an understanding of how digits value change when being divided by 10  Using partitioning and recombining children to find half of given numbers | **Partition and recombine** | | Apples come in packs of 3. If there are 21 apples altogether, how many pack are there |
| **Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know.**  **I can mentally calculate two-digit number by a one-digit number using my times table facts and jottings to support also by using my knowledge of 10x to support me.** | Perform jumps of numbers on a number line | | Use short method but only for known times table facts to get used to setting it out in preparation for year 4  Perform chunking with appropriate numbers. | |
| **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** |  | | | |

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| **Year 4 Division** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Use place value known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; and multiplying together three numbers.** | |  |  | | --- | --- | | |  | | --- | | Continue to practise recalling and using multiplication tables and related **division** facts to aid fluency.  Use objects to go alongside facts if needed. | | | Times table squares  Posters/ visual aids  My-Maths games  Find factor pairs and draw diagrams e.g. factor bugs | ? ÷ 8 = 6  If I have multiplied my number by 12 and my answer is 48, what was my original number? |
| **I can divide a whole number by 10 and 100 with a whole number answer, explaining what is happening and why**  **(*Ensure children know that the digits shift not the decimal point)*** | Use of concrete objects to divide numbers by ten/hundred.  “Can you share these cubes into groups of 10? How many groups do you have?”  Use a place value slider to explore how the values of digits change when dividing by 10 and 100. | Drawing counters in columns and using these to show the division that has taken place. | Using a secure knowledge of division to solve missing number problems. |
| **Solve problems including dividing a three-digit number by a one-digit number using short division.** | Use of concrete resources to help children find **lots of/groups of** a number. Use place value counters or glass beads to solve divisions of two-digit and three-digit numbers with a one-digit divisor.  Use place value counter/glass beads alongside short division | Drawing pictures to show how each part of the number is divided. | Secure use of the short division method and moving into problems involving division, including answers involving remainders.    Present calculation in ‘***bus stop’***  Remind children that 20 ‘***3s’*** divide in to 60 not ***‘2’!*** |
| **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** |  | | |

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| **Year 5 Division** | | | |
| **Objectives** | **Concrete** | **Pictorial** | **Abstract** |
| **Multiply and divide mentally drawing upon known facts** | Use of times tables and mental methods. For example:  “What is 4.2 divided by 7?” | | |
| **Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders for the context** | Use of multilink cubes and other concrete resources to reinforce principles of sharing and dividing from previous year groups. |  | C:\Users\amartin\Downloads\IMG_20180503_114920.jpgSolving problems including proving answers wrong and giving reasoning for answers. |
| **Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000** | PHOTO OF CUBES ON LAMINATED TEMPLATE | Drawing counters in books to represent the value of each number. | A fluent understanding of how to multiply and divide by 10, 100 and 1000 and solve problems associated with them. |
| **Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates** | Use of physical objects to show a relationship between one number and another.  “If one person has 3 cubes, how many would 10 people have?” | Drawing pictures to demonstrate this relationship. |  |

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| **Year 6 Division** | | | |
| **Objectives** | **Concrete/Pictorial** |  | **Abstract** |
| **Divide numbers up to four digits by up to 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** | Alongside the formal methods, show how we could model with equipment  Mainly using base 10 or place value counters. Show how remainders are left because they can’t share in to equal groups and then exchanged. | As a fraction show the remainder over the divisor and simplify e.g.  As a decimal remainder up to 2dp.  Note a few facts eg 1 X is 15 so 2 X is 30 etc 4 X = 60 | |
| **Divide numbers up to four digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context** |  | C:\Users\amartin\Downloads\IMG_20180503_113912.jpg  Explain to children the importance, in problem solving when to use an integer remainder, when to use a fraction remainder or a decimal depending on the context of the question.  Short division with remainders | |
| **Solve problems involving multiplication and division** | Use equipment to help suggest whether any remainder is better as a fraction, whole number or decimal.  Use concrete resources to model number problems and for children to solve them.  Sweets/ cubes/ any items that could be relevant. | Relate questions to converting ubnits of measure |  |