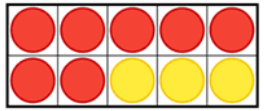
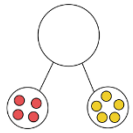
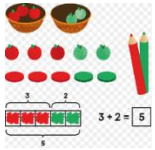
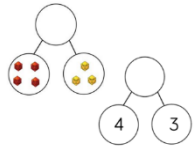
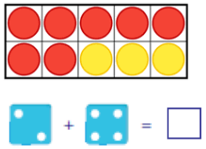
# Austwick C of E Primary School Calculation Policy

## Addition

### EYFS

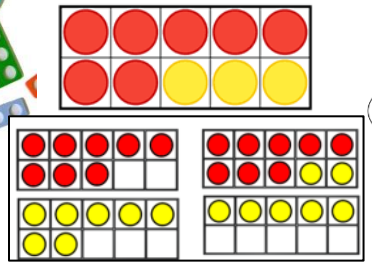
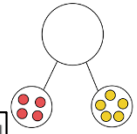
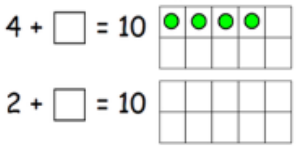
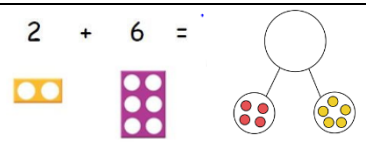
ELG
- Have a deep understanding of number to 10, including the composition of each number; 14
- Subitise (recognise quantities without counting) up to 5;
- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.

| Concrete | Visual | Abstract |
|---|---|---|
|     <br>• Counters with five & ten frames, pots and part whole model.<br>• Numicon.<br>• Combining two groups to make a whole (counting all), counting on and regrouping to make ten. |    <br>• Part whole model and five/ten frame – two parts joined together makes the whole.<br>• Counting all and counting on. | 4 + 3 = 7<br>7 = 4 + 3<br>I have four apples and I pick three more, how many have I got altogether?<br>• Children should have automatic recall of their addition bonds to 5 and some to 10.<br>• Children will have knowledge of the addition symbol. |

Key Vocabulary:
- add, more, and, make, altogether.

### Year 1

- read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including zero
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9.

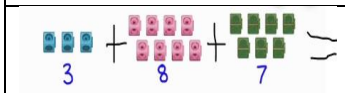
| Concrete | Visual | Abstract |
|---|---|---|
|     <br>• Counters with ten frames and part whole model.<br>• Numicon.<br>• Combining two groups to make a whole (counting all - aggregation) and counting on (augmentation).<br>• Children should learn all number bond facts up to and including 10. Concrete resources should be used to support this. |   <br>• The pictorial stage should expose children to a range of different representations to support the development of conceptual understanding of subtract numbers up to **20**. All children should be encouraged to use their number known facts to support mental strategies for addition. | 5 + 12 = 17<br>32 + 5 = ?<br>13 + ? = 15<br>• Encourage the use of known facts – 'I know 2 + 5 = 7 so I know 12 + 5 = 17 and I know 32 + 5 = 37…"<br>• Reinforce starting from the largest number when counting on (if needed).<br><br>7 + 3 = 10<br>10 = 8 + ?<br>Encourage recall of known number facts to develop fluency in mental calculations.<br><br>• Children should be able to **know**, **represent** and **RECOGNISE** number bonds to 10 and to 20 within written equations. |

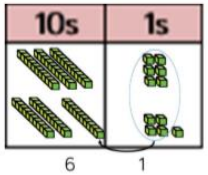
| | | |
|---|---|---|
| | | • Children should be using their knowledge of number bonds to 10 to learn the number bonds to 20 and beyond – encouraged to find the patterns. |

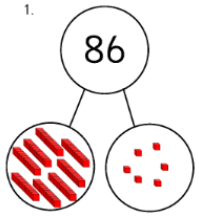
## Year 2

- solve problems with addition and subtraction:
- using concrete objects and 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:
- a two-digit number and ones
- a two-digit number and tens
- two two-digit numbers
- 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

### Concrete



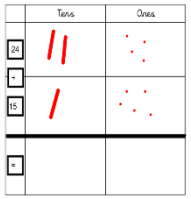



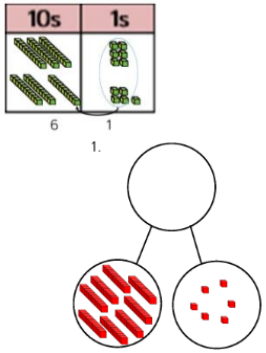




- Children should use dienes/base ten and place value counters to support concrete addition for larger 2-digit numbers (within 20 please see Year 1).
- When adding three 1-digit numbers, encourage the use of number bonds.
- Children to continue to use addition by making the next ten when adding 2-digit and 1-digit numbers where exchanging is required.
- Children to use place value charts to build understanding of adding tens and ones and moving them down into the = row to make the whole number.
- This model will also support understanding of grouping 10 and exchanging it for another ten.
- Children should continue to be encouraged to use known facts to support mental and efficient strategies – 'I know 3 + 2 = 5 so I know that 30 + 20 = 50…'.

### Visual

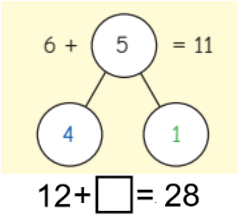
- For numbers up to 20, please see Year 1.

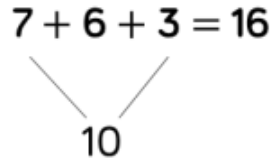


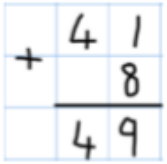

- Representations the same as when using concrete resources.
- Children are able to draw tens and ones using a place value grid for support.

### Abstract



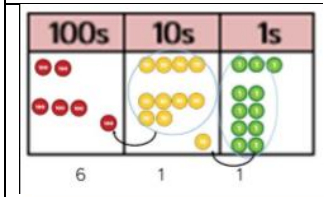
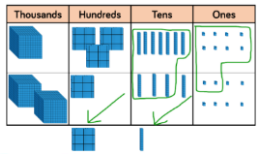
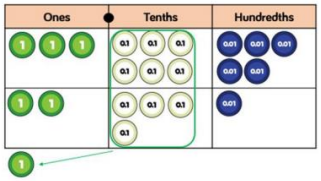
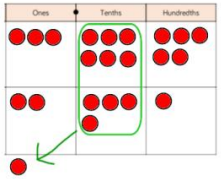
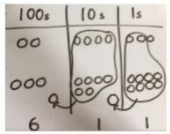
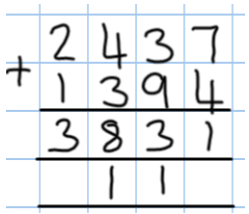



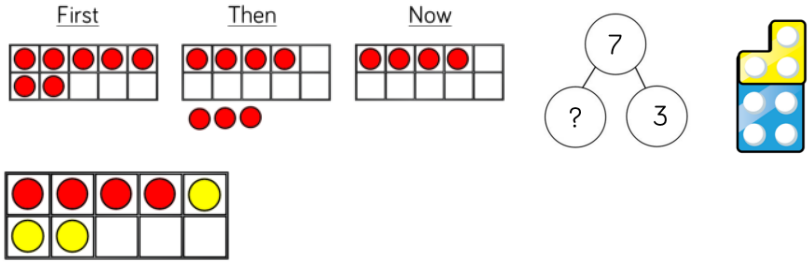
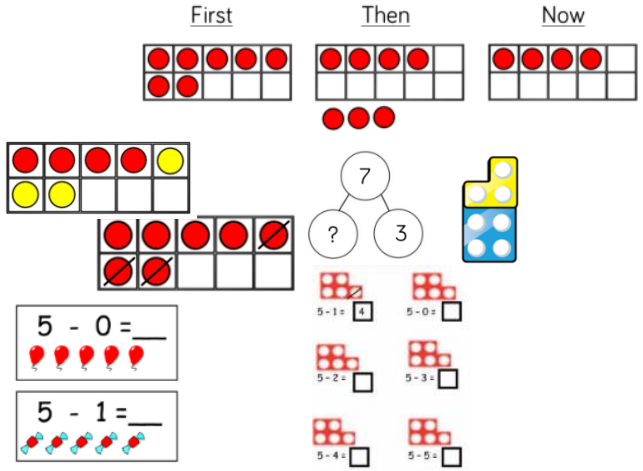

- At all times, children should be encouraged to use the most efficient methods (mental strategies using known facts) for addition.
- The column method is the most efficient written method for all to use. For those using mental strategies, this can be used to check their answers.



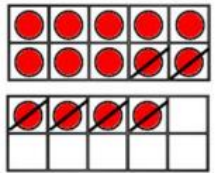
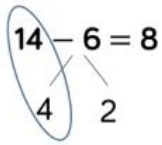
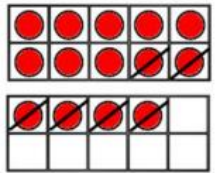
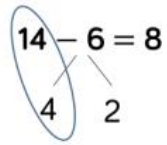
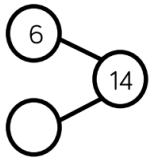
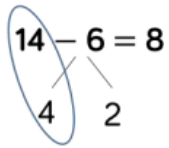
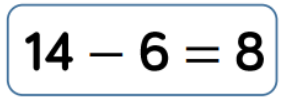

## KS2

- Add numbers with increasing value up to 8 digit numbers (by the end of Yr6), including decimals.

| Concrete | Visual | Abstract |
|---|---|---|
|  <br>  <br>  <br>  <br>• Dienes/base ten and place value counters are used with a place value grid. These are the most effective and efficient manipulative to use. |  <br>• Children are encouraged to draw place value counters or dienes in a place value chart for support. Other visual representations may be used.<br>• Where possible, all children should be encouraged to work in the abstract, using the column method and known facts to add larger numbers efficiently. | • Where possible, all children should be encouraged to work in the abstract, using the column method and known facts to add larger numbers efficiently.<br>  |

| Subtraction | | |
|---|---|---|
| EYFS | | |
| ELG<br>- Have a deep understanding of number to 10, including the composition of each number; 14<br>- Subitise (recognise quantities without counting) up to 5;<br>- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts. | | |
| Concrete | Visual | Abstract |
|  <br>• Using real world objects in the classroom, tens frames and counters and Numicon to subtract.<br>• Children can take counters/objects away, turn them over or partition to show subtraction. |  | 5 – 2 = 3<br>3 = 5 – 2<br>There are 5 cakes in a shop. One cake is eaten, how many are left?<br>• Children should have a solid knowledge of number bond facts and be encouraged to use this to support/derive subtraction facts. |
| Year 1 | | |

- read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including zero
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9.

| Concrete | Visual | Abstract |
|---|---|---|
| See EYFS concrete.<br><br>• When subtracting 1-digit numbers that cross 10, it is important to highlight that one ten equals ten ones.<br>• Encourage children to find a number bond to 10 when partitioning the subtracted number – ten frames support this.<br><br>  <br>  | See EYFS visual.<br><br>• When subtracting 1-digit numbers that cross 10, it is important to highlight that one ten equals ten ones.<br>• Encourage children to find a number bond to 10 when partitioning the subtracted number – ten frames support this.<br><br>  <br>  |  <br>  <br>  <br><br>• Children should be able to **know**, **represent** and **RECOGNISE** number bonds to 10 and to 20 within written equations.<br>• Children should be using their knowledge of number bonds to 10 to learn the number bonds to 20 and applying this knowledge to subtraction. |

## Year 2

- solve problems with addition and subtraction:
- using concrete objects and 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:
- a two-digit number and ones
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- 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

| Concrete | Visual | Abstract |
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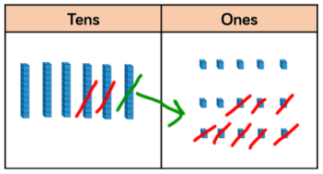
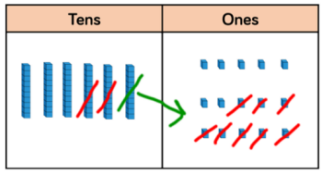
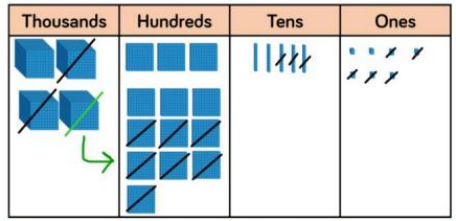
|  |  <br><br>• Children are able to draw dienes/base ten or place value counters if needed. | 65 – 28 = 37<br><br>5 1<br>65<br>– 28<br>37<br><br>• Children are encouraged to use known facts to support mental strategies. |

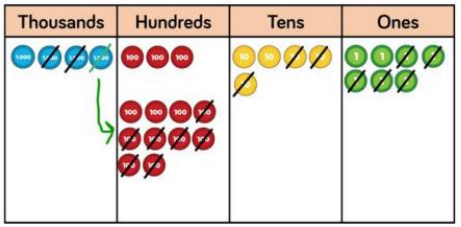
| | | |
|---|---|---|
| • Children use dienes or place value counters in place value frames – this is especially useful when exchanging is required.<br>• Children are encouraged to use the most efficient methods - known facts for subtraction or the use of column subtraction. | • Children use dienes or place value counters in place value frames – this is especially useful when exchanging is required.<br>• Children are encouraged to use the most efficient methods - known facts for subtraction or the use of column subtraction. | • Column subtraction is the most efficient written method and all children are encouraged to use it, especially when exchanging is needed. |

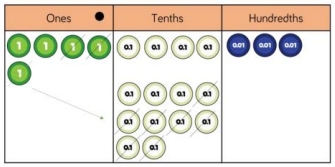
## KS2

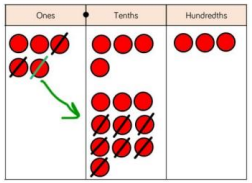
- Add numbers with increasing value up to 8 digit numbers (by the end of Yr6), including decimals.

### Concrete



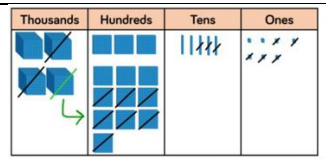



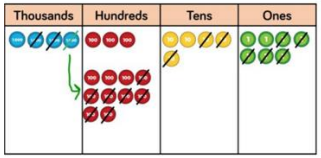



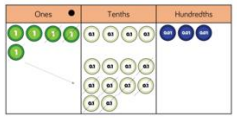



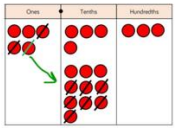

- The use of dienes/base ten, place value counter and place value frames used to support.
- Children should be encouraged to write the column subtraction with any concrete resource used to make clear links between the two.

### Visual




- Children able to use blank place value charts and draw base ten/counters if needed.

### Abstract

$$\begin{array}{r} {}^{3}\cancel{4}\,{}^{1}3\,5\,7 \\ -\;2\,7\,3\,5 \\ \hline 1\,6\,2\,2 \end{array}$$

| | | | | | | |
|---|---|---|---|---|---|---|
| | 2 | 9 | $^{3}\cancel{4}$ | $^{1}3$ | 8 | 2 |
| – | 1 | 8 | 2 | 5 | 0 | 1 |
| | 1 | 1 | 1 | 8 | 8 | 1 |

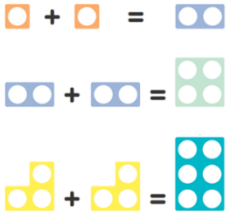
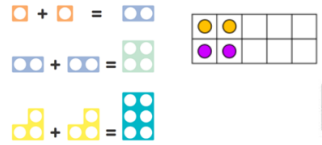
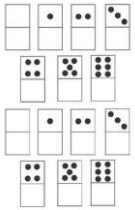
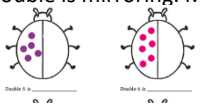
$$\begin{array}{r} {}^{4}\cancel{5}\,{}^{1}.\,4\,3 \\ -\;2.7 \\ \hline 2.7\,3 \end{array}$$

- Column subtraction is the most efficient written method for subtraction and should be used by all children.
- Mental strategies should still be encouraged when appropriate – if the numbers are close together or if numbers are close to a multiple of X making the calculation easily solvable mentally.

# Multiplication

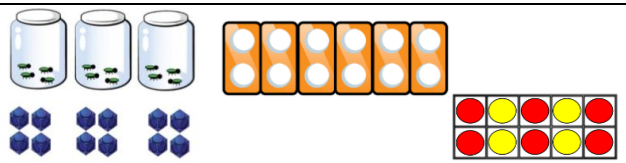
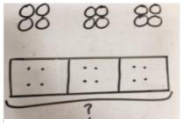
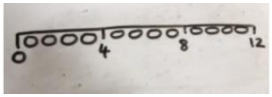
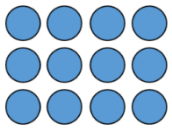
## EYFS

- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.

| Concrete | Visual | Abstract |
|---|---|---|
|    |   Double is mirroring. Making and .  | 1 + 1 =<br>2 + 2 =<br>3 + 3 =<br>4 + 4 =<br>5 + 5 =<br>Double 4 is?<br>I doubled a number and the answer is 6. What number did I double? |
| • Real objects, Numicon and counters should be used to support doubling numbers. | | |

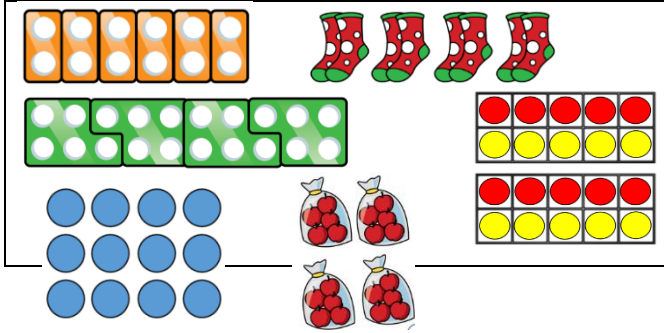
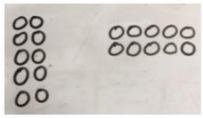
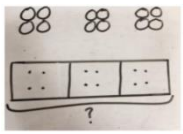
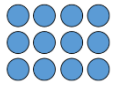
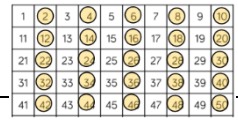
## Year 1

- Know how 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.

| Concrete | Visual | Abstract |
|---|---|---|
|  - Using objects, counters and Numicon to make equal groups. |     - Using knowledge of equal groups to support counting in 2's, 5's and 10's. | - Using knowledge of equal groups to support counting in 2's, 5's and 10's.<br>3 lots of 5 is _____<br>I had 4 bags of apples. Each nag had 2 apples inside. How many apples did I have altogether? |

## Year 2

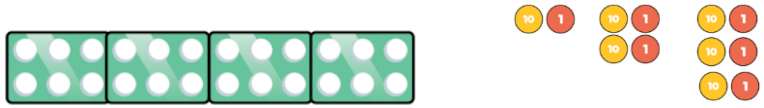
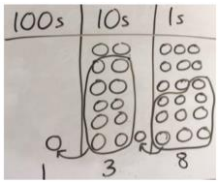
- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) 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

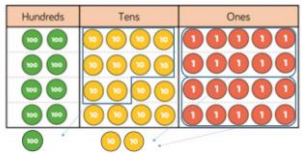
| Concrete | Visual | Abstract |
|---|---|---|
|  |    _____ equal groups of _____ = _____<br>_____ X _____ = _____ | $10 = 2 \times 5$<br>$5 \times 2 = 10$<br>$2 + 2 + 2 + 2 + 2 = 10$<br>$10 = 5 + 5$<br>_____ equal groups of _____ = _____<br>_____ X _____ = _____  |

| | | |
|---|---|---|
| - Children will use real world objects, Numicon and counters to support counting in multiples of 2, 5 and 10 as well as making equal groups.<br>- Children can use counters to make arrays to show equal groups. | - Children should be fluent in counting in their multiples of 2, 5 and 10. Arrays are an effective and efficient method for teaching the commutative law. | - All children should be able to confidently count in multiples of 2, 5 and 10 and use this knowledge to solve multiplication problems.<br>- Children should have confident knowledge of the link between repeated addition and multiplication. |
| | | |

## Lower KS2

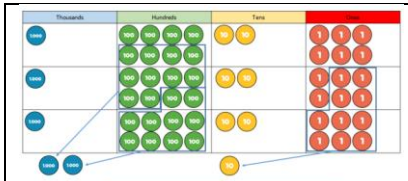
- recall multiplication and division facts for multiplication tables up to 12 × 12
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- use 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 and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

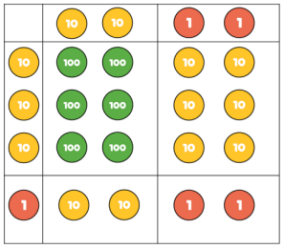
| Concrete | Visual | Abstract |
|---|---|---|
|  | 23 x 6 =<br>  | 23<br>x 6<br>138 |

| | | |
|---|---|---|
| $245 \times 4 = 980$<br>  <br><br>- Continue to use Numicon, counters, base ten/dienes to support learning multiples up to 12x12.<br>- Use place value counters and dienes/base ten to support multiplying 2/3-digit numbers by a 1-digit number. | | |
| | | |

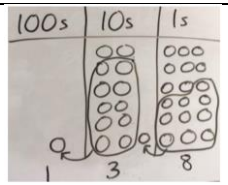
| Upper KS2 |
|---|
| • identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers<br>• know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers<br>• establish whether a number up to 100 is prime and recall prime numbers up to 19<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>• multiply and divide numbers mentally drawing upon known facts<br>• divide numbers up to 4 digits by a one- or two-digit number using the formal written method of short division and interpret remainders appropriately for the context<br>• multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 |

| Concrete | Visual | Abstract |
|---|---|---|



- Place value counters are the most effective manipulative to use with larger multiplication questions.
- Place value grids or multiplication grids can be used with place value counters.




| | Th | H | T | O |
|---|---|---|---|---|
| | 1 | 8 | 2 | 6 |
| × | | | | 3 |
| | 5 | 4 | 7 | 8 |

2 1

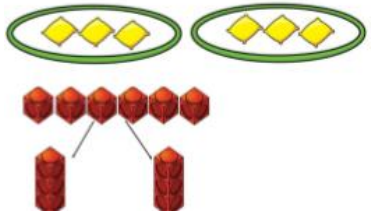
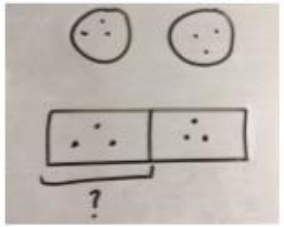
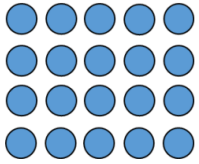
| | H | T | O |
|---|---|---|---|
| | | 2 | 2 |
| × | | 3 | 1 |
| | | 2 | 2 |
| | 6 | 6 | 0 |
| | 6 | 8 | 2 |

| TTh | Th | H | T | O |
|---|---|---|---|---|
| | 2 | 7 | 3 | 9 |
| × | | | 2 | 8 |
| 2 2 | 1 5 | 9 3 | 1 7 | 2 |
| 1 5 | 4 | 1 7 | 8 | 0 |
| 7 | 6 | 6 | 9 | 2 |

1

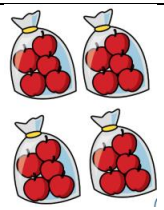
- All children should be encouraged to use the most efficient abstract (written) method for multiplication.
- Be sure to provide multiplication tables support for any children who need this.

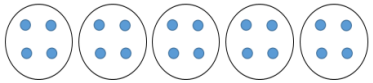
| Division | | |
|---|---|---|
| EYFS | | |
| • Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. | | |
| Concrete | Visual | Abstract |

| | | |
|---|---|---|
|  <br>• Halving and sharing. |  <br>Represent half of 6 pictorially. | Half of 6 is ____<br>I have halved a number. Half of my number is 3. What number did I start with? |
| Year 1 | | |
| • Know how 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. | | |
| Concrete | Visual | Abstract |
| 20 shared by 5 =<br>  <br>  <br>• Children use real world objects, Numicon or counters to share amounts equally and to make equal groups. |  <br>  <br>• Children see equal groups represented as groups and also as an array. | • Children will continue to use manipulatives or draw groups to support abstract learning – 20 shared by 5 is ____.<br>• Children may begin to use their knowledge of 2, 5 and 10 times tables to support their knowledge of grouping. |
| | | |
| Year 2 | | |
| Concrete | Visual | Abstract |

20 shared by 5 =

Children use real world objects, Numicon or counters to share amounts equally and to make equal groups.





20 ÷ 5 = 4

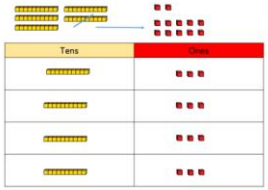
20 ÷ 5 = 4

- To be able to interpret and complete independently using arrays methods or using multiplication and division facts known.

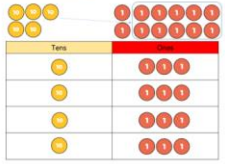
## Lower KS2

- recall multiplication and division facts for multiplication tables up to 12 × 12
- 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 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 and commutativity in mental calculations
- multiply two-digit and three-digit numbers by a one-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

### Concrete

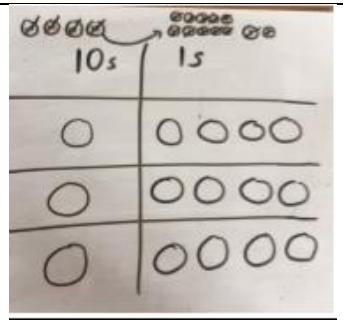



52 ÷ 4 = 13



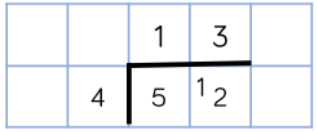

- Children will use dienes/base ten & place value counters in place value charts to support understanding and knowledge of both sharing and grouping, including with remainders.

### Visual




### Abstract

52 ÷ 4 = 13



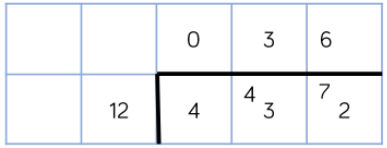
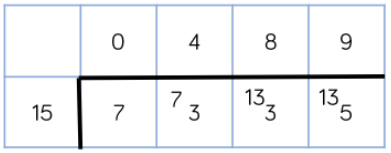

53 ÷ 4 = 13 r1

- Children will be encouraged to used the short division method as their most efficient method. This will include when working with remainders.

## Upper KS2

- 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 (nonprime) numbers

- establish whether a number up to 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 4 digits by a one- or two-digit number using the formal written method of short division and interpret remainders appropriately for the context
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

| Concrete | Visual | Abstract |
|---|---|---|
| See LKS2 for concrete and visual support where appropriate and necessary.<br><br>All children accessing this new learning should be confidently able to use the abstract methods. | |  <br><br>$432 \div 12 = 36$<br><br>$7{,}335 \div 15 = 489$<br>  <br><br>15 30 45 60 75 90 105 120 135 150<br><br>- When children begin to divide 4 digit by 2-digit numbers, written methods more accurate and concrete/visual representations become less effective and lack efficiency.<br>- Children can write multiples out to support their calculations when working with larger remainders. |

| | | |
|---|---|---|
| | | |

| | | 0 | 3 | 6 |
|---|---|---|---|---|
| 1 | 2 | 4 | 3 | 2 |
| | – | 3 | 6 | 0 |
| | | | 7 | 2 |
| | – | | 7 | 2 |
| | | | | 0 |

(×30)

(×6)

12 × 1 = 12
12 × 2 = 24
12 × 3 = 36
12 × 4 = 48
12 × 5 = 60
12 × 6 = 72
12 × 7 = 84
12 × 8 = 96
12 × 7 = 108
12 × 10 = 120

**432 ÷ 12 = 36**

**7,335 ÷ 15 = 489**

| | | 0 | 4 | 8 | 9 | |
|---|---|---|---|---|---|---|
| 15 | | 7 | 3 | 3 | 5 | |
| – | | 6 | 0 | 0 | 0 | (×400) |
| | | 1 | 3 | 3 | 5 | |
| – | | 1 | 2 | 0 | 0 | (×80) |
| | | | 1 | 3 | 5 | |
| – | | | 1 | 3 | 5 | (×9) |
| | | | | | 0 | |

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150

**372 ÷ 15 = 24 r12**

| | | | 2 | 4 | r | 1 | 2 |
|---|---|---|---|---|---|---|---|
| 1 | 5 | 3 | 7 | 2 | | | |
| | – | 3 | 0 | 0 | | | |
| | | | 7 | 2 | | | |
| | – | | 6 | 0 | | | |
| | | | 1 | 2 | | | |

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150