



Delta Federation

Written Methods Policy

Updated September 2018

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Delta Federation

Delta Federation Vision for Mathematics

In lessons you will see:

- Children engaged and enthusiastic about their learning.
- Children using a range of resources to aid their understanding.
- Children developing their mathematical fluency, and applying this through reasoning and problem solving tasks.
- Children challenging themselves to move onto Greater Depth activities and open ended problems.
- Most children will 'master' the maths curriculum for their year group and a significant amount will work at a greater level for their year group.

Successful Schools:

- strong understanding of place value
- Number facts
- Fluency in mental calculation
- Skills in problem solving (focus in KS1)
- Visually rich learning environment
- Focus on understanding of maths (explanation/reasoning)
- Strong Mathematical Vocabulary

At Brooksward/Drayton Park Schools, we believe that all children should be given the appropriate amount of challenge or scaffold to ensure that they reach their potential in each lesson. Our approach to maths is to use practical resources to support children's mathematical understanding before moving onto formal written methods. It is important for children to see practical resources alongside the paper and pencil methods to ensure they understand the process. A clear progression in teaching written calculation methods will support the teaching and learning of maths for our children.

We believe that with this firm conceptual understanding that children will be able to achieve fluency in their methods, by making connections and will be able to apply their understanding to a variety of problems, using their reasoning skills.

We ensure that each child starts at the correct point for them and is challenged by providing Greater Depth and challenge activities, so that no child reaches a ceiling in their learning.

Our policy outlines the key methods and strategies for all our children from Foundation to Year 6.

= means 'is the same as'

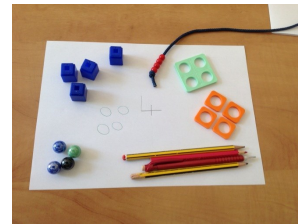
Addition and Subtraction

Early Years

Objectives:

- Count reliably with numbers from 1—20.
- Say which number is one more or one less.
- Add and subtract two single digit numbers.

Children to represent a number using a variety of resources.

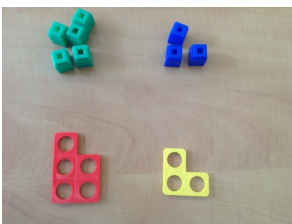


Children to count a number using 1:1 correspondence.

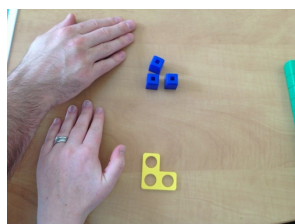
$$5 + 3 = 8$$

Children to count out 5 objects, then 3 objects. Then, combine both sets together and count them all (start at number 1). Start with cubes and move to numicon if ready.

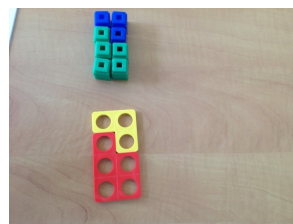
$$5 + 3 = 8$$



Children to count out 5 and 3 using counting resources.



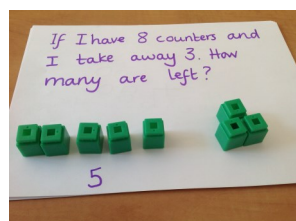
Children to cover/touch the largest number and say the



Children to count on to find the answer.

$$8 - 3 = 5$$

Children count out the total number of objects and then take smaller amount away.



Year 1

Objectives:

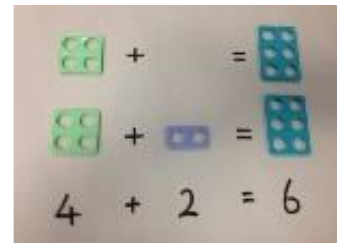
- To read, write and interpret +, - and = symbols.
- To represent and use number bonds and subtraction facts to 20.
- To add and subtract one and two digit numbers to 20 (including zero).

Addition



Develop understanding of counting on using resources and number line.

Begin to use resources alongside symbols to represent calculations.

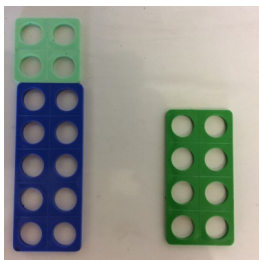


Record related number facts e.g different ways of making a total and commutatively of numbers ($4+5 = 9$, $5+4=9$, $9=4+5$, $9=5+4$)

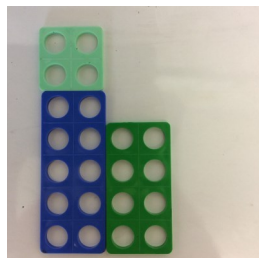


Add two numbers below 20.

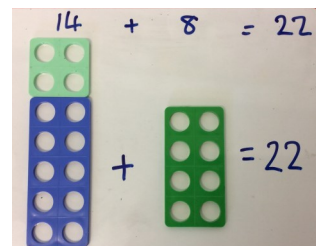
$$14 + 8 = 22$$



Children make both numbers using equipment.



Children join two numbers and count the total.



Record as number sentence as appropriate.

* With 2 two-digit numbers, begin to partition tens and units.

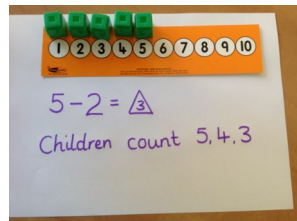
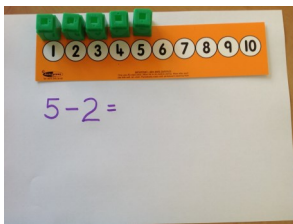
Subtraction

Understand the concept of counting back using resources such as number lines and hundred squares.



Subtract numbers up to 10/20

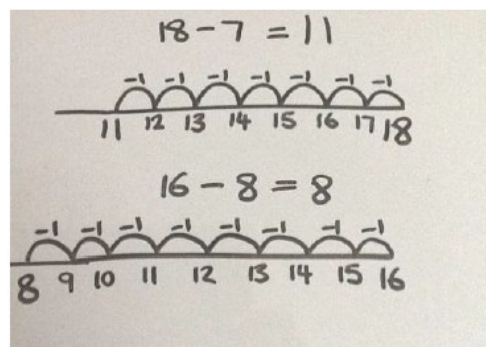
$$5 - 2 = 3$$



Develop subtraction facts to 10 and then 20, making links to addition facts, e.g $7 - 3 = 4$, $7 - 4 = 3$



Start to move to using blank number lines, with 1:1 correspondence, counting back.



Year 2

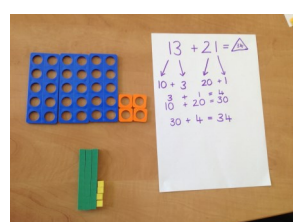
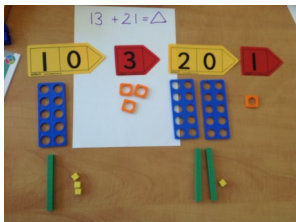
Objectives:

- Recall and use addition and subtraction facts to 20 fluently and derive and use related facts to 100.
- Add and subtract numbers using equipment, representations and mentally: a two-digit and ones, two-digit and tens, two two-digit numbers and three one-digit numbers.
- Know that addition is commutative and can be done in any order, but that subtraction cannot.

Addition

Develop an understanding of partitioning and place value to support addition.—move to using base 10 equipment.

$$13 + 21$$



Use knowledge of place value to put numbers into columns—base 10 to support this.

| Tens | Units |
|---------------------|--------------------|
| 1 ten rod, 3 units | 2 ten rods, 1 unit |
| 3 ten rods, 4 units | |

$$14 + 22 =$$

$$\begin{array}{r} 14 \\ + 22 \\ \hline 6 \text{ (4+2)} \\ 30 \text{ (10+20)} \\ \hline 36 \end{array}$$

| Tens | Units |
|----------------------|--------------------|
| 2 ten rods, 3 units | 1 ten rod, 9 units |
| 3 ten rods, 12 units | |
| 4 ten rods, 2 units | |

$$23 + 19 = 42$$

$$\begin{array}{r} 23 \\ + 19 \\ \hline 12 \text{ (3+9)} \\ + 30 \text{ (20+10)} \\ \hline 42 \end{array}$$

1. Begin with numbers that do not cross the tens boundary.

2. Begin to use numbers that will cross the tens boundary.

| Tens | Units |
|----------------------|--------------------|
| 7 ten rods, 2 units | 4 ten rods, 1 unit |
| 11 ten rods, 3 units | |

$$72 + 41 = 113$$

$$\begin{array}{r} 72 \\ + 41 \\ \hline 113 \end{array}$$



3. Introduce crossing the hundreds boundary.

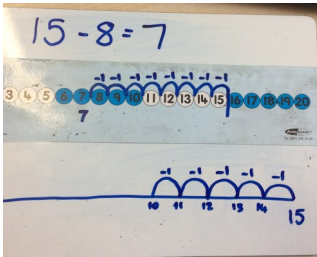
* Remove use of base 10 when children are confident with mental addition of numbers and column representation.

Subtraction

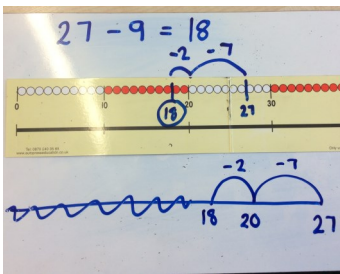
Subtraction

$$15 - 8$$

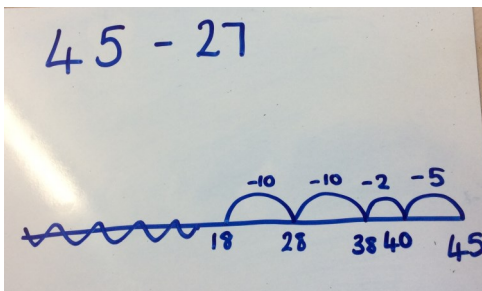
Subtract a single digit number through counting back with 1:1 correspondence and count the jumps to find the answer.



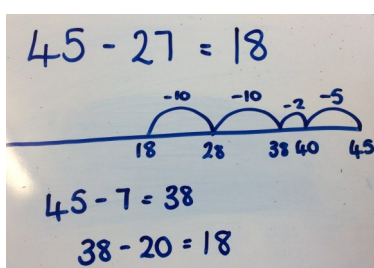
Subtract a single digit number by jumping back to the previous 10 and then subtracting the remaining amount.



Begin to subtract 2 digit numbers by subtracting the units (as above) and then subtracting the tens.



Move to recording these as number sentences:



*When children are confident subtracting units and tens mentally, move away from number line.

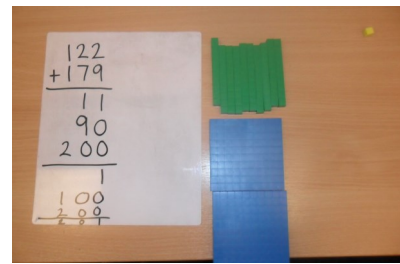
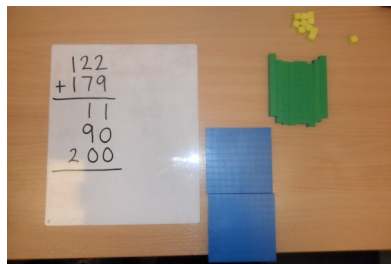
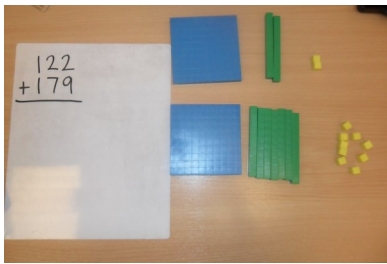
Year 3

Objectives:

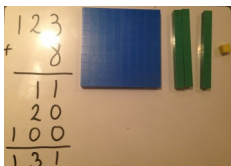
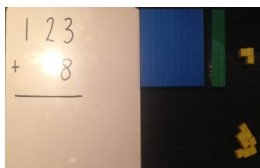
- Add and subtract numbers mentally: 3 digit and ones, 3 digit and tens, 3 digit and hundreds.
- Add and subtract numbers up to 3 digits using columnar addition and subtraction methods.

Addition

Use base 10 to support understanding of extended column addition techniques.



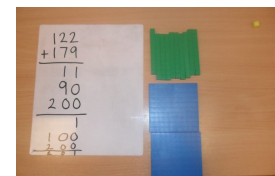
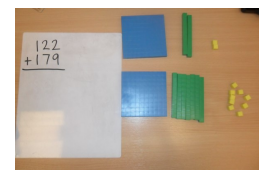
1. Build this up, starting with HTU + U



2. Then HTU + TU



3. Then HTU + HTU



Move from using Base 10 to column method alone when confident with method.

Subtraction

Begin to form subtraction calculations using the column method.

TU—TU (with no borrowing needed)

Subtract units first

Then subtract tens

$$\begin{array}{r} 28 \\ - 12 \\ \hline 16 \end{array}$$

TU—TU (borrowing needed)

Exchange 1 stick of 10 for 10 units

Subtract the units

Subtract the tens

$$\begin{array}{r} 33 \\ - 14 \\ \hline 19 \end{array}$$

* If needed, begin with TU—U before TU—TU.

HTU—TU (with no borrowing needed)

$$\begin{array}{r} 324 \\ - 12 \\ \hline 312 \end{array}$$

HTU—TU (borrowing needed)

$$\begin{array}{r} 136 \\ - 18 \\ \hline 118 \end{array}$$

* Support base 10 if necessary.

HTU—TU

(borrowing needed to cross tens boundary)

Subtract the units

Exchange 1 square of 100 for 10 sticks of 10.

Subtract the tens

$$\begin{array}{r} 236 \\ - 73 \\ \hline 163 \end{array}$$

HTU—HTU (borrowing needed to cross units and tens boundary)

$$\begin{array}{r} 341 \\ - 183 \\ \hline 158 \end{array}$$

Year 4

Objectives:

- Add and subtract numbers up to 4 digits, using the formal written columnar addition and subtraction.

Addition

Introduce the concept of carrying, with Base 10 to support.

HTU + TU (carrying across tens boundary)

$346 + 25 =$

| Hundreds | Tens | Units |
|---------------|----------------|--|
| 3 red squares | 4 green sticks | 6 yellow units |
| | 2 green sticks | 5 yellow units |
| | | Exchange 11 units for one stick of 10 and 1 unit. |
| | | Exchange 11 sticks of 10 for one 100 square and 1 stick of 10. |
| 3 red squares | 7 green sticks | 1 yellow unit |

Final result: 371

HTU + TU (carrying across hundreds and tens boundary)

$327 + 84 =$

| Hundreds | Tens | Units |
|---------------|----------------|--|
| 3 red squares | 2 green sticks | 7 yellow units |
| | 8 green sticks | 4 yellow units |
| | | Exchange 11 units for one stick of 10 and 1 unit. |
| | | Exchange 11 sticks of 10 for one 100 square and 1 stick of 10. |
| 4 red squares | 1 green stick | 1 yellow unit |

Final result: 411

When confident, remove the support of Base 10 and extend number ranges.

$$\begin{array}{r}
 362 \\
 + 179 \\
 \hline
 541 \\
 \hline
 \end{array}$$

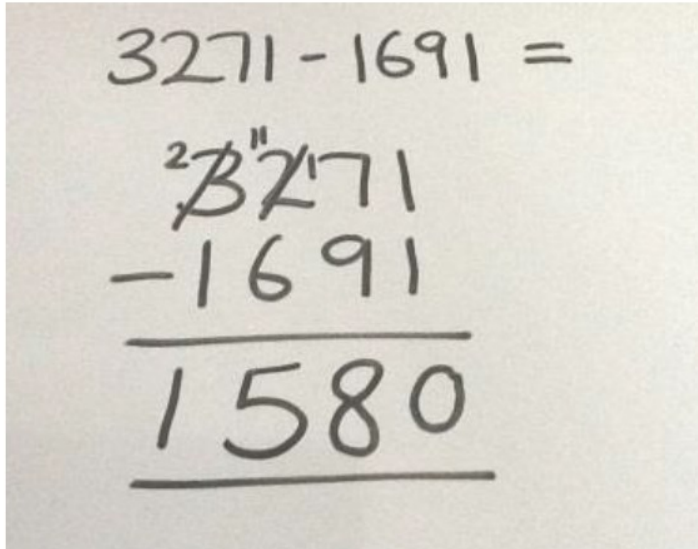
HTU = HTU

$$\begin{array}{r}
 2345 \\
 + 1792 \\
 \hline
 4137 \\
 \hline
 \end{array}$$

ThHTU = ThHTU

Subtraction

Continue to develop understanding of borrowing, moving to a non-expanded method.



A photograph of a handwritten subtraction problem on a piece of paper. The problem is $3271 - 1691 =$. The minuend 3271 has a '2' with a double prime symbol ($''$) above it, and the subtrahend 1691 is written below it. A horizontal line is drawn under the subtrahend. Below the line, the result 1580 is written. Another horizontal line is drawn under the result.

Use Base 10, to continue developing understanding of this if needed.

Year 5

Objectives:

- Add and subtract whole numbers with more than 4 digits, using columnar methods.
- Begin to add and subtract decimal numbers with tenths and hundredths.

Addition

$$\begin{array}{r} 45867 \\ + 32192 \\ \hline 78059 \\ \hline \end{array}$$

Add numbers with more than 4 digits

$$\begin{array}{r} 3.17 \\ + 4.25 \\ \hline 7.42 \\ \hline \end{array}$$

Add decimals with same numbers of decimal places.

$$\begin{array}{r} 3.460 \\ + 3.792 \\ \hline 7.252 \\ \hline \end{array}$$

Zero used as a place value holder.

Add decimals with different numbers of decimal places.

Subtraction

$$\begin{array}{r} 63719 - 32831 = \\ \begin{array}{r} \overset{2}{6}\overset{16}{3}\overset{16}{7}19 \\ - 32831 \\ \hline 30888 \end{array} \end{array}$$

Subtract whole numbers with more than 4 digits.

Include a mixture of different sized numbers.

$$\begin{array}{r} 4.63 - 2.91 = \\ \begin{array}{r} \overset{3}{4}.63 \\ - 2.91 \\ \hline 1.72 \end{array} \end{array}$$

Subtract decimal numbers with the same amount of decimal places.

Year 6

Objectives:

- Add and subtract increasingly large whole numbers.
- Add and subtract more than 2 numbers in the same calculation.

Addition

$$81,059 + 3,668 + 15,301 + 20,551 = 120,579$$

| | | | | | | |
|-------|--------------|--------------|--------------|--------------|---|---|
| | 8 | 1 | 0 | 5 | 9 | |
| | | 3 | 6 | 6 | 8 | |
| | 1 | 5 | 3 | 0 | 1 | |
| + | 2 | 0 | 5 | 5 | 1 | |
| <hr/> | | | | | | |
| | 1 | 2 | 0 | 5 | 7 | 9 |
| <hr/> | | | | | | |
| | + | + | + | + | | |

Add several numbers of increasing complexity.

$$23.361 + 9.08 + 59.77 + 1.3 = 93.511$$

| | | | | | | | |
|-------|--------------|--------------|--------------|---|---|---|--|
| | 2 | 3 | . | 3 | 6 | 1 | |
| | | 9 | . | 0 | 8 | 0 | |
| | 5 | 9 | . | 7 | 7 | 0 | |
| + | | 1 | . | 3 | 0 | 0 | |
| <hr/> | | | | | | | |
| | 9 | 3 | . | 5 | 1 | 1 | |
| <hr/> | | | | | | | |
| | 2 | + | 2 | | | | |

Zero used as a place value holder.

Add a range of several decimal numbers.

Subtraction

$$63719 - 2352 - 175 =$$
$$\begin{array}{r} 2352 \\ + 175 \\ \hline 2527 \\ \hline \end{array}$$
$$\begin{array}{r} 63719 \\ - 2527 \\ \hline 61192 \\ \hline \end{array}$$

Subtract several numbers of increasing complexity.

$$3.21 - 1.8 =$$
$$\begin{array}{r} 3.21 \\ - 1.80 \\ \hline 1.41 \\ \hline \end{array}$$

Zero used as place holder

Subtract decimals with different amounts of decimal places.

$$7.35 - 2.1 - 1.675 =$$
$$\begin{array}{r} 1.675 \\ + 2.100 \\ \hline 3.775 \\ \hline \end{array}$$
$$\begin{array}{r} 7.350 \\ - 3.775 \\ \hline 3.575 \\ \hline \end{array}$$

Zero used as place holder

Subtract several decimals with different amounts of decimal places.

Multiplication and Division

Early Years

Objectives:

- Solve problems involving doubling, halving and sharing.

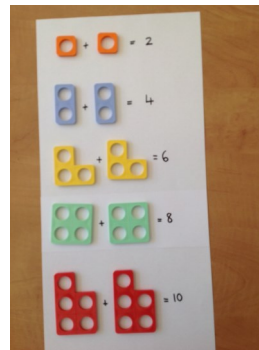
Multiplication

Children to find:

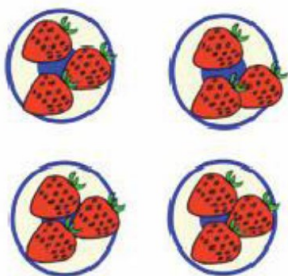
Doubles of numbers up to $5 + 5$

Doubles of numbers up to $10 + 10$

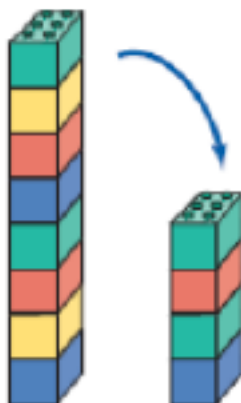
Say doubles rhyme using fingers.



Division



Share amounts into equal groups and count amount in each group—link to play.



Find half of an even number of objects to 10.

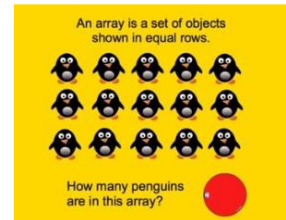
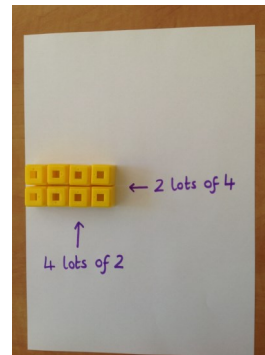
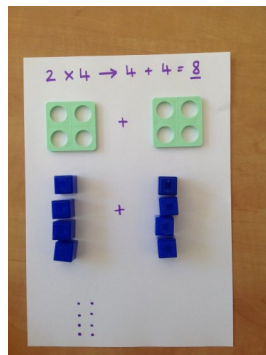
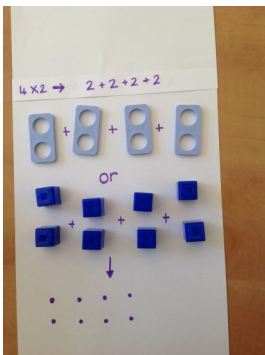
Year 1

Objectives:

- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays.

Multiplication

Children to use repeated addition to solve multiplication problems.



Begin to use an array as repeated addition.

Division

Sharing amounts to 20 into equal groups.



Share 12 cakes between 3 people equally:



Year 2

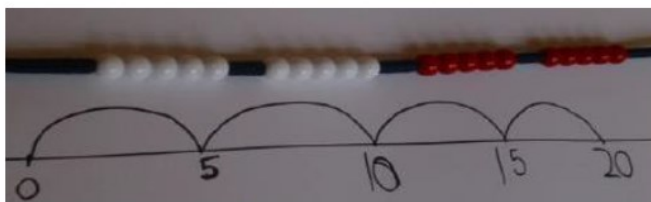
Objectives:

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables.
- Calculate mathematical statements and use \times , \div and $=$ symbols to represent them.
- To know that multiplication can be done in any order, but that subtraction cannot.

Multiplication

Children to use repeated addition on number lines and in arrays.

$$4 \times 5 = 15$$



$$3 \times 5 = 15$$

$$5 \times 3 = 15$$

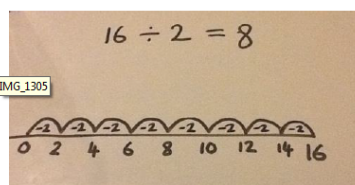
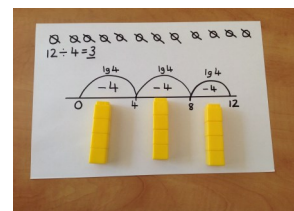
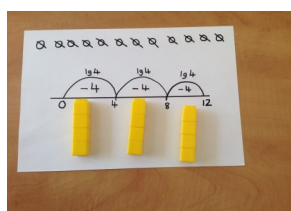
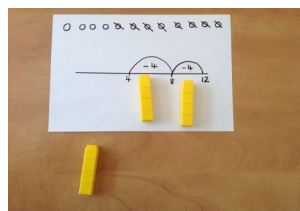
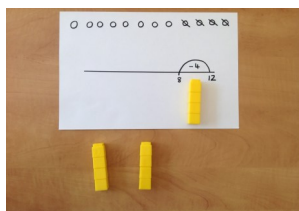
Use arrays to develop understanding of commutativity in multiplication,

Division

Children to use repeated subtraction on number lines and in arrays.

$$12 \div 4 =$$

How many groups of 4 in 12?



When confident, begin to use a blank number line and subtract same number each time.

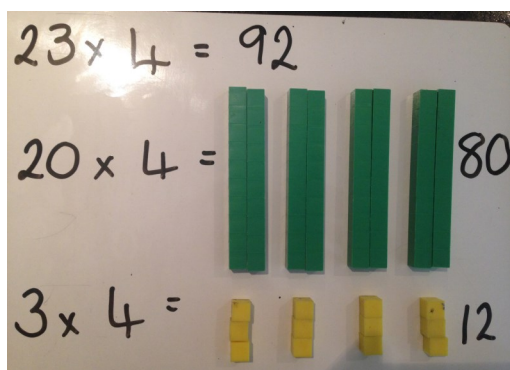
Year 3

Objectives:

- 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 facts that they know, including for two-digit x one-digit numbers, using formal methods and progressing to formal written methods.

Multiplication

Partition two-digit numbers and multiply as 2 separate calculations—use Base 10 to support understanding.



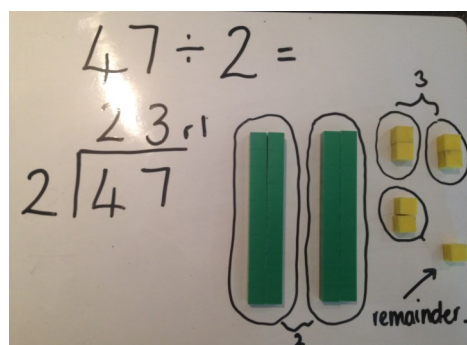
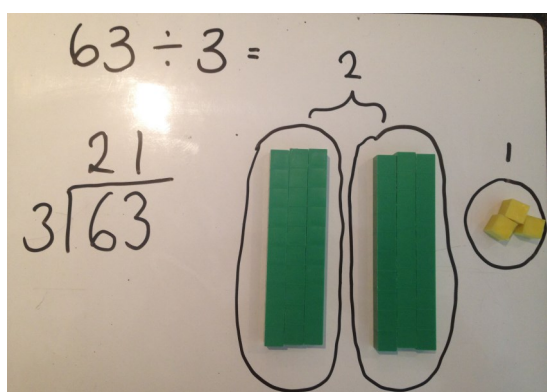
$$\begin{array}{r} 23 \\ \times 4 \\ \hline 12 \\ 80 \\ \hline 92 \end{array}$$

Progress to representing in Column Formation—link to previous partitioning.

Division

Use resources to represent the dividend and use grouping to divide - keep with multiples of the divisor.

$$\frac{\text{quotient}}{\text{divisor} \overline{) \text{dividend}}}$$



When confident introduce remainders.

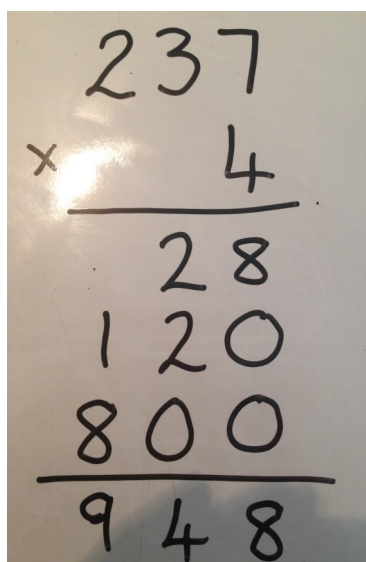
Year 4

Objectives:

- Recall and use multiplication and division facts up to 12×12
- Understand the effect of multiplying by 0 and 1
- Multiply and Divide two-digit and three-digit number by a one-digit number using formal written methods.

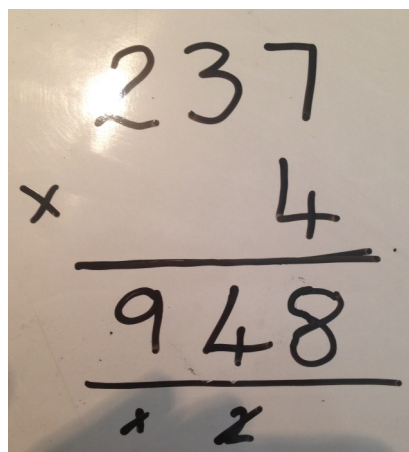
Multiplication

Use expanded column method—begin with units. Continue to use base 10 to support if needed.



A photograph of a whiteboard showing the multiplication of 237 by 4 using the expanded column method. The numbers are written in black marker. A horizontal line is drawn under the multiplier 4. Below it, the products are written in columns: 28 (from 7x4), 120 (from 30x4), and 800 (from 200x4). A final horizontal line is drawn under 800, and the final product 948 is written below it.

$$\begin{array}{r} 237 \\ \times 4 \\ \hline 28 \\ 120 \\ 800 \\ \hline 948 \end{array}$$



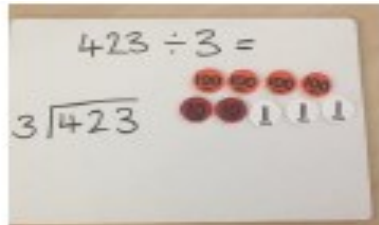
A photograph of a whiteboard showing the multiplication of 237 by 4 using the compact method. The numbers are written in black marker. A horizontal line is drawn under the multiplier 4. Below it, the product 948 is written. A horizontal line is drawn under 948, and the final product 948 is written below it.

$$\begin{array}{r} 237 \\ \times 4 \\ \hline 948 \\ \hline 948 \end{array}$$

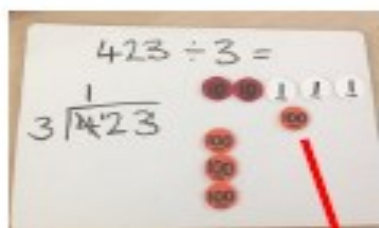
When children are confident working in columns, without resources, move to compact method and carrying.

Division

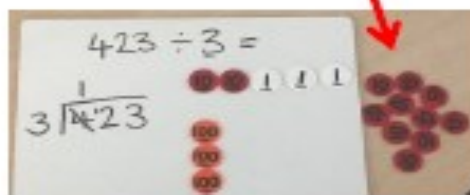
Continue using short division, using numbers that are not multiples of the divisor—Base 10 can be used, or place value counters for ease of space.



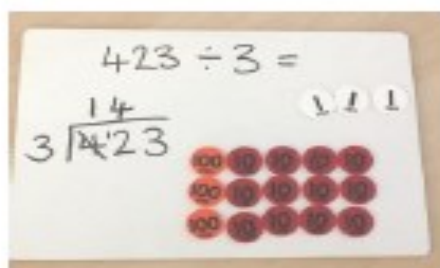
Create the dividend using Place Value counters.



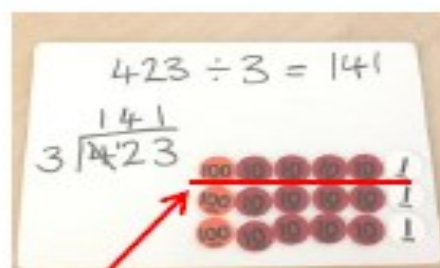
Group the hundreds counters according to the divisor. Write the number of groups above the line in the hundreds column.



Exchange the left over 100s counter for ten 10s counters and represent this beneath the line in the tens column.



Next, group the 10s counters according to the divisor and write the number of groups above the line in the tens column.

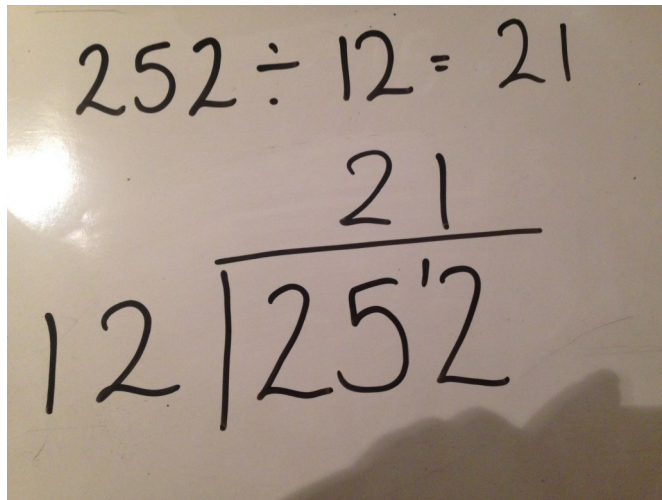


Group the units counters according to the divisor and write the number of groups above the line in the units column.

Division cont...

Introduce $HTU \div U$ where the digits are multiples of the divisor.

At this point, children should not have to move to long division.


$$252 \div 12 = 21$$
$$\begin{array}{r} 21 \\ \hline 12 \overline{)252} \end{array}$$

Year 5

Objectives:

- Multiply numbers up to 4 digits by a one-digit and two-digit number, using formal written methods.
- Divide numbers up to 4 digits by a one-digit number using a formal short division method, including with remainders.

Multiplication

Handwritten multiplication of 1423 by 6. The calculation shows the product 8538 with carry marks (2, +, +) under the digits 8, 5, and 3 respectively.

$$\begin{array}{r} 1423 \\ \times 6 \\ \hline 8538 \\ \hline \end{array}$$

Multiply by a one-digit number, using a carrying method.

Handwritten multiplication of 3216 by 17. The calculation shows the product 54672 with carry marks (2, 5, 1, 2) under the digits 2, 2, 1, and 6 respectively.

$$\begin{array}{r} 3216 \\ \times 17 \\ \hline 22512 \\ \hline 32160 \\ \hline 54672 \end{array}$$

Multiply by two digit number:

1. Multiply by units
2. Multiply by tens
3. Add together

Division

Handwritten short division of 9635 by 3. The quotient is 3211 with a remainder of 2. The calculation shows the long division process.

$$\begin{array}{r} 3211 \text{ r}2 \\ 3 \overline{)9635} \end{array}$$

Divide 4 digit number by one-digit using a short division method.

Handwritten short division of 353 by 15. The quotient is 23 with a remainder of 8. The calculation shows the long division process.

$$\begin{array}{r} 23 \text{ r}8 \\ 15 \overline{)353} \end{array}$$

Divide three and four-digit numbers by a two-digit number using short division method, including remainders.

Year 6

Objectives:

- Multiply multi-digit numbers up to 4 digits by a two-digit whole number, using the formal method of long multiplication.
- Divide numbers up to 4 digits by a two-digit number using the formal method of long division.
- Interpret remainders as whole numbers, decimals, fractions or round-

Multiplication

$$2439 \times 17 = 41463$$

Continue to use long division when multiplying by 2 digit numbers.

$$1.27 \times 3 = 3.81$$

Start multiplying decimal numbers by a single-digit whole number using short multiplication.

$$1.27 \times 15 = 19.05$$

Multiply decimals by a two-digit number using long multiplication method.

Division

$$1599 \div 13 = 123$$

Introduce long division method to divide by two-digit numbers.

$$27.32 \div 4$$

Divide decimals by a one-digit whole number using short division method.

$$16.12 \div 13 = 1.24$$

Divide decimals by a 2-digit whole number using long division method.

$$849 \div 4 = 212 \text{ r}1 \text{ or } 212\frac{1}{4} \text{ or } 212.25$$

Interpret remainders as a whole number, a fraction or a decimal depending on the situation.