Old Buckenham Primary School

Calculation Policy

The policy has been written according to the National Curriculum 2014 and the written calculations for all four **operations**

Date	January 2017
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Review body	Teaching Staff
Approved by	Julia Humphrey, Head Teacher
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This policy outlines the progression in the four **operations** (+, -, x and ÷). We believe that addition and subtraction should be taught in succession to allow children to see the links between them and the **inverse** (opposite) nature of them, along with multiplication and division.

Children should secure **mental strategies**. Counting forwards and backwards is essential, along with the recall of **number facts**, including number compliments to 10/20 and times tables. Children are taught to look carefully at a calculation, before deciding how to solve it. Children should explain why they have chosen a strategy and whether it is the most efficient.

Written methods are based on **mental strategies**. Each of the four **operations** builds on mental skills which provide the foundations for **jottings** and **written methods**. Skills need to be taught and practised constantly. These skills lead on to more **formal methods** (e.g. column addition/subtraction). This policy outlines the **written methods** as suggested in the appendices of the 2014 Curriculum, and suggests that children:

- Look at a calculation and decide whether it can be done mentally, mentally with a jotting or whether it needs a written method.
- When introducing **written methods**, use **place value** apparatus, to ensure children are clear about the actual value of the numbers that they are calculating with and the numbers do not just become single 'digits'. Continue to use apparatus so that children can build a deep understanding.
- Estimate, calculate and check that the answer they generate is realistic.

Teachers should use every relevant subject to develop pupils' mathematical **fluency**:

***"Teachers should develop pupils' numeracy and mathematical** explaining **in all subjects so that they understand and appreciate the importance of mathematics. Pupils should be taught to apply arithmetic fluently to problems, understand and use measures, make estimates and sense check their work. Pupils should apply their geometric and algebraic understanding, and relate their understanding of probability to the notions of risk and uncertainty. They should also understand the cycle of collecting, presenting and analysing data. They should be taught to apply their mathematics to both routine and non-routine problems, including breaking down more complex problems into a series of simpler steps."* NC 2014.**

For pupils to achieve the above, we believe that a clear calculation policy is owned and followed by all teaching staff in our school. Children should be taught through the **Concrete, Pictorial, Abstract (CPA)** sequence to ensure pupils master an understanding of a mathematical concept/skill, make links and apply that skill to a new situation or problem.

The 2014 National Curriculum for Mathematics aims to ensure that all pupils:

***"Become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately. Reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language. Can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions."* NC 2014.**

Each concept/skill is first modelled with concrete apparatus. Students have many opportunities to practise and show they have mastered it using these concrete materials. The concept/skill is next modelled at the pictorial level (i.e. drawing pictures that represent the concrete objects). Pupils have many opportunities to practice and demonstrate mastery by drawing pictures. The concept/skill is finally modelled at the abstract level using only numbers and mathematical symbols. Pupils have many opportunities to practise and demonstrate mastery at the abstract level before moving to a new concept/skill. The abstract level should be used in conjunction with the apparatus and representational drawings, promoting the association of abstract symbols with concrete and pictorial understanding, and thus **fluency**.

When teaching a new method to solve a calculation, we begin with numbers that the children can easily manipulate to support their understanding. Previous stages may be revisited to consolidate understanding before progressing through an **operation**.

Transitioning from informal **written methods** to formal **written methods** should be introduced with caution and should not be hurried. Children should be secure with their **place value**, and be working efficiently in their **informal methods**, before moving on to **formal methods** of recording.

At Old Buckenham Community Primary School, we promote:

- A love of Mathematics in classrooms and throughout the school.
- Having real and creative opportunities to 'do' Maths.
- A strong emphasis on the use of apparatus for all children, across the school.
- Teaching and learning involving **models and images**.
- Teachers modelling **jottings** and drawings in problem solving.
- Children being encouraged to look at the numbers in a calculation, estimate answers and then check their answers are sensible.
- Children having regular opportunities to apply their learning to solve problems.
- Children being **fluent** in their number sense and **place value**, and recalling known **number facts,** including **number bonds** and times tables.
- The use of the number line, with efficiency being essential as the children progress.

- Children learning, understanding and using new vocabulary and using this in full sentences to explain within their Mathematics.
- Learning being **mastered** through a deeper understanding, children making links, explaining and problem solving, not through calculating with larger numbers.

Progression of Addition

- **Counting with apparatus, games, models and images and role play; recognising numbers around home and school**

> E.g. Hannah … listed how many girls and how many boys were outside. [She] was able to say that "There are 5 girls and 4 boys. That's 9 altogether". When playing in the shop, Christopher used his shopping list to add 2 amounts. He said "the beans are 5 pence and the bananas are 3 pence, altogether that is 8 pence." (EYFS Profile exemplifications, STA)

- **Drawings and objects to support addition**

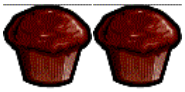
3 and 2

make 5 altogether

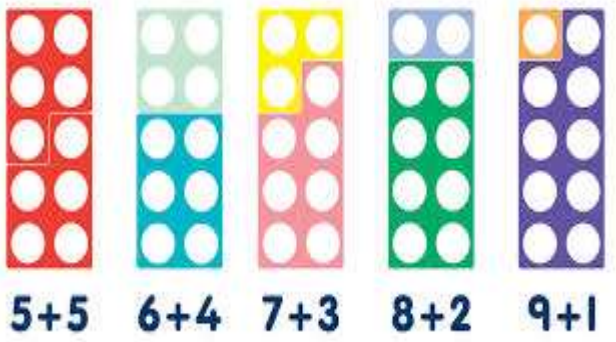
Numicon:

- **Understanding simple symbols with objects and jottings**

I eat 2 cakes and my friend eats 3. How many cakes did we eat altogether?
2 + 3 = 5



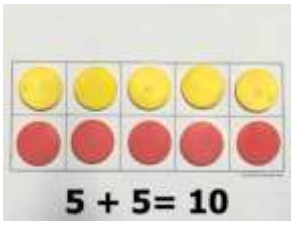
- **Understanding and recognition of number bonds to 10 and 20 using apparatus e.g. Numicon, ten frames (below), beadstrings etc.**



What number can I add to 7 to make 10? How many ways can I make the number 10 by adding 2 numbers? What number can be added to 14 to make 20? How many number bonds to

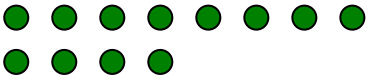
20 are there? If I know 5 + 5 = 10, what else can I say?

6 + 4 =10

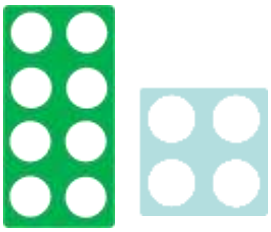


- **Using apparatus, number tracks and jottings to add 1-digit numbers that cross over ('bridge') 10**

e.g. 8 + 4 =
8 people are on the bus. 4 more get on at the next stop.
How many people are on the bus now?



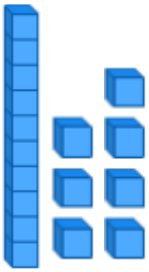
or:
|||||||| ||||



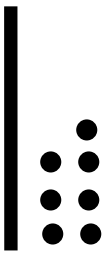
- **Using apparatus (e.g. Numicon, beadstrings, dienes (below)) and jottings to add TO + O (2-digit + 1-digit numbers)**

Begin with numbers that do not **bridge** a 10, then progress to using knowledge of number bonds to 10, to cross over a 10s boundary

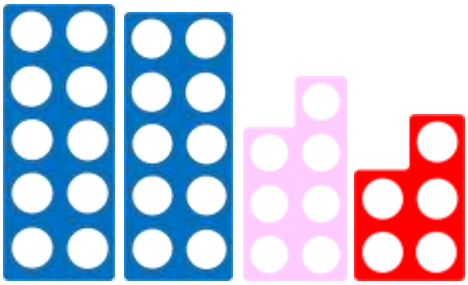
e.g. 13 + 4 = 17



13 + 4 = 17

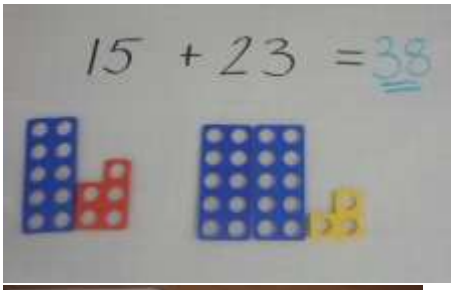


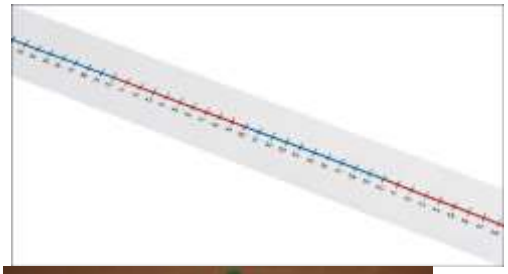
27 + 5 = 32

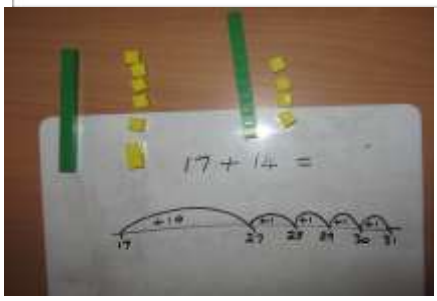


- **Using number lines, dienes, beadstrings and Numicon to partition**
Begin with dry-wipe number lines, progressing on to using empty number lines, then children drawing their own.

Children should be using their knowledge of 'adding 10 to any number' to firstly add the tens and then the ones.

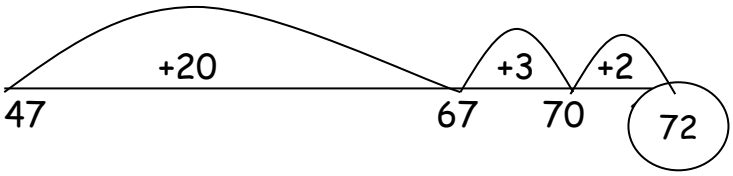




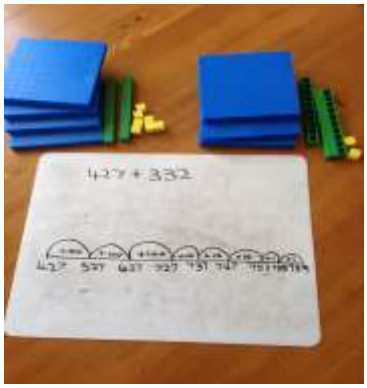


Children should also begin using their knowledge of number compliments to make more efficient jumps on their number lines.

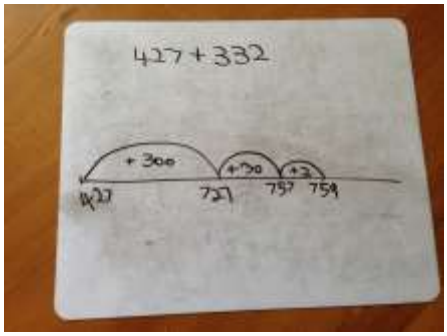
e.g. 47 + 25 =
My sunflower is 47cm tall. It grows another 25cm. How tall is it now?



It is useful to use place value cards (below left) and **dienes** (below right) to **partition** the numbers when beginning to work with larger numbers. This gives children a secure understanding of the value of each digit. When secure, you may want to remove the place value cards.



When children are secure with the value of the digits, they can begin to make more efficient jumps with their larger numbers.



- **Partitioning (informally), continue to use apparatus to support understanding (e.g. Numicon, dienes)**

e.g.

23 + 65

20 + 60 = 80 3 + 5 = 8

80 + 8 = 88

- **Partitioning (formal method)**

  If the children are using a **number line** efficiently, at the <u>end of Year 3 or during Year 4</u>, pupils may begin to record their addition calculations vertically. (Nb. It is important to use whole number **place value** vocabulary, so 54 would always be 50 and 4).

  A useful transition from number line and **partitioning** to **column addition** would be to vertically **partition** numbers, using arrow cards and **dienes** (see below), progressing on to **bridging** the 100s.

e.g. 281 + 164 = 445

200 + 80 + 1
100 + 60 + 4
300 + 140 + 5
400 + 40 + 5

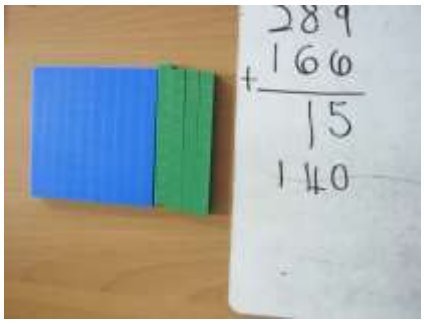
- **Expanded column addition (continue to use concrete apparatus)**

  When the children are secure, they can record purely vertically. Children should <u>begin with the ones</u>.

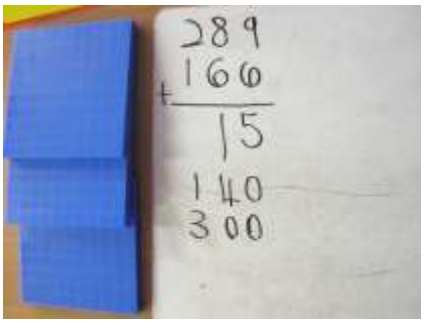
Again, when pupils are very confident, they can extend to 3, then 4- digit numbers, continuing to use concrete apparatus alongside.

Children collect their **dienes** for both numbers.

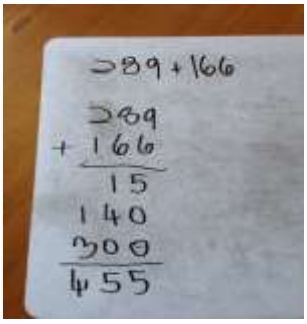
Ones. Children may find it easier to **compensate** 10 ones for a tens stick.



Then the tens.



Then the hundreds.



Add it altogether.

32487 + 8546 =

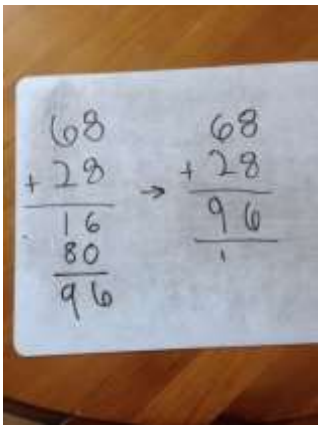
There are 32487 boys and 8546 girls in a school. How many are there altogether?

```
  32487
+  8546
------
     13
    120
    900
  10000
  30000
------
  41033
------
  1
```

Children must understand that adding and multiplication are commutative; i.e. they can be added in any order.

- **Compact column addition**

Formal written method can only be taught after a high amount of support has been given and the children have demonstrated a high level of **conceptual** understanding. It would not be used before the end of Year 5 and even then there is no hurry. It is more important that children are confident and using a method accurately and efficiently, and the correct language of **place value**.



When confident and consistently accurate, pupils can then use either the expanded or compact with larger numbers and decimals.

12786 + 2568 =

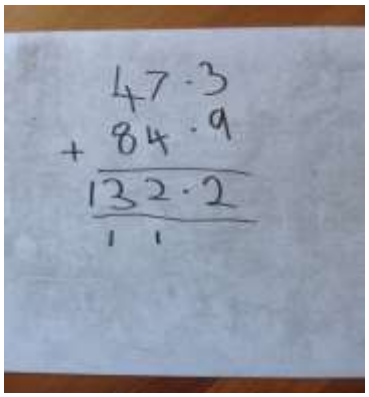
12786 people visited the museum last year. The numbers increased by 2568 this year. How many people altogether visited this year?

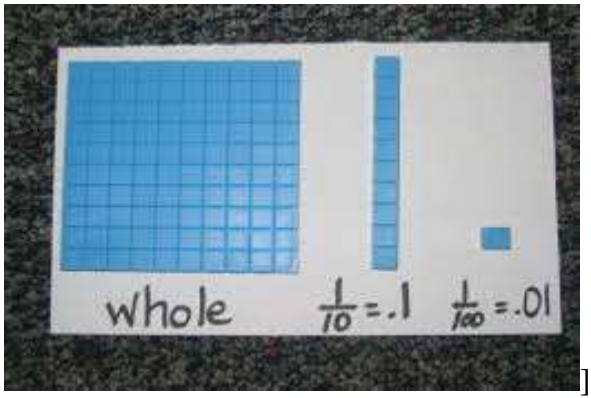
```
  12786
+  2568
  15354
  1 1 1
```

58567 + 123675

```
  123675
+ 58567
  182242
  1 1 1 1
```

Dienes are useful for decimals in understanding the ten parts of the whole (e.g. 0.3 parts of a whole + 0.9 parts of a whole = 1 whole and 2 parts of a whole).





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Subtraction

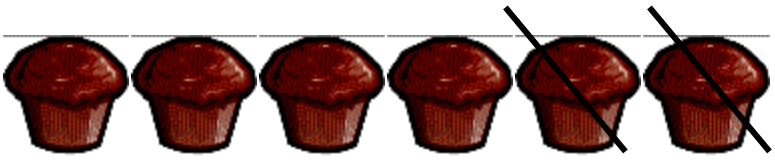
- **Counting with apparatus, games, models and images and role play; recognising numbers around home and school**

> Chloe was playing in the maths area. "I need three more," she said as she added some cubes to the circle. She then realised she had more than her friend. "Oh, I have too many." She removed one. "Now we have the same." [EYFS Profile exemplifications, STA]

- **Using counting apparatus to take an amount away and count how many are left; begin to look at the inverse (opposite) relationship between addition and subtraction**

Children need to understand that 5-3 is not the same as 3-5

- **Making drawings to support subtraction**

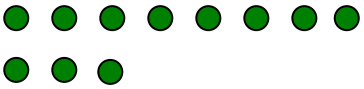


- **Finding the difference between 2 numbers using cubes and pictorially (the ITP is useful for showing the difference between two amounts on a beadstring)**

A teddy bear costs £5 and a doll costs £2.
How much more does the bear cost? Find the difference

- **Finding the difference with jottings**

Lisa has 8 felt tip pens and Tim has 3.
How many more does Lisa have?

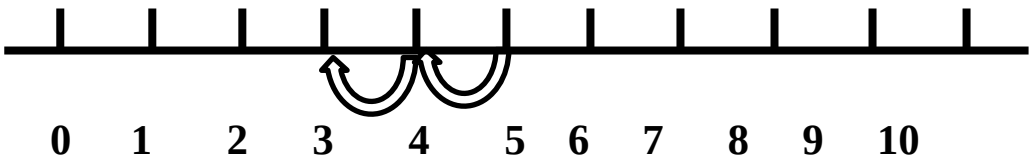


Find the difference

- **Understanding simple symbols for subtraction using apparatus and pictures (Numicon (below right), dienes, cubes, bears, number tracks (below)**

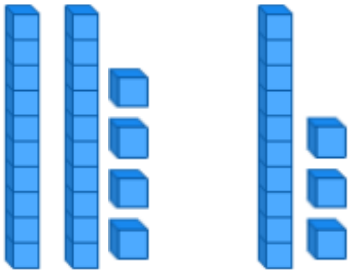
5 – 2 = I had 5 balloons. 2 of them burst. How many did I have left?

Take away



Using **dienes** and **numicon** to progress to 2-digit subtract 1-digit and 2-digit subtract 2-digit (not **bridging** (crossing) over the tens)

24 – 11 = 13



- **Understanding simple symbols using jottings (using concrete apparatus alongside)**

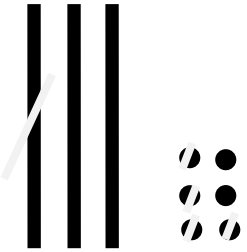
  8 – 3 = ☐ Mum baked 8 biscuits. I ate 3. How many were left?

Take away

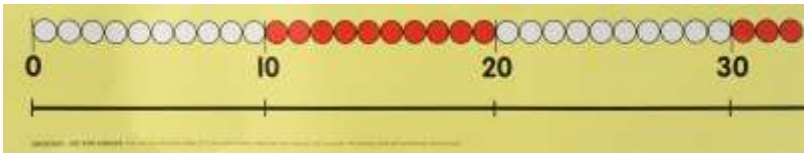
~~𝍸~~ | | | | |

Progressing on to 2-digit subtract 1-digit and 2-digit subtract 2-digit (not **bridging** over the tens), using **jottings**.

e.g. 36 – 14 = 22

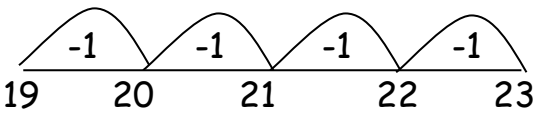


- **Using a number line to count back or on in ones (depending on the numbers), alongside a beadstring (use beaded number lines to begin with, then dry wipe number lines, progressing to empty number lines, then children drawing their own)**

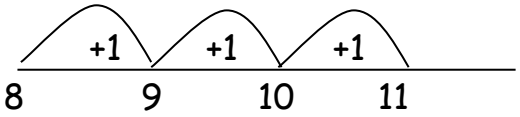


Children can begin by jumping back in ones. They should decide if it is more efficient to count back or count on to solve their calculation.

e.g. 23 – 4 =



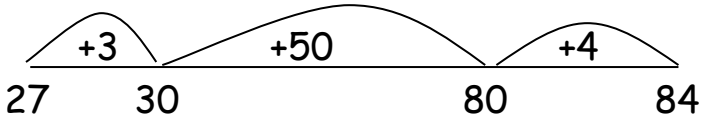
e.g. 11 – 8 = 3



- **Counting on a number line from the smallest to the largest number (ie. finding the difference between the 2 numbers)**

Children will need a secure knowledge of their number bonds to begin making efficient jumps on their number line.

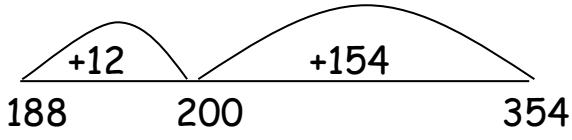
84 – 27 = 57cm I cut 27cm off a ribbon measuring 84cm. How much is left?



This method can be used with larger numbers by using number compliments to 100 and decimals. We would expect children to be using this method throughout KS2 until they are secure, accurate and efficient.

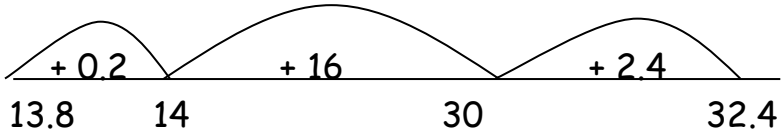
354 – 188 = 166

The library owns 354 books. 188 are on loan. How many are on the shelves?



$$\begin{array}{r} 154 \\ +\ 12 \\ \hline 166 \end{array}$$

32.4 – 13.8 =18.6



- **Expanded column subtraction (modelling alongside dienes/place value counters)**

  Early vertical subtraction can begin with **partitioning** (with no **decomposition** to begin with).

$$\begin{array}{r} 868 \\ -\ 345 \\ \hline 523 \end{array} \longrightarrow \begin{array}{r} 800 + 60 + 8 \\ 300 + 40 + 5 \\ \hline 500 + 20 + 3 = 523 \end{array}$$

  Children will then move on to **compensate** the ones and then the tens.

$$\begin{array}{r} 834 \\ -\ 378 \\ \hline 456 \end{array} \longrightarrow \begin{array}{r} \overset{700}{8}\overset{120}{\not{0}} + \overset{14}{\not{3}}\overset{}{\not{0}} + 4 \\ -\ 300 + 70 + 8 \\ \hline 400 + 50 + 6 = 456 \end{array}$$

- When the children have a deep and secure understanding they will move on to using **compact subtraction**. It is important to allow the children to use concrete units to aid understanding. Again with expanded subtraction, it will be necessary to **compensate** when the children cannot subtract a number.

647 – 286 =

```
   5 1
   6 4 7
 - 2 8 6
 -------
   3 6 1
```

12,634 – 3718=

```
   11 1 2 1
   1 2 6 3 4
 -   3 7 1 8
 -----------
   8 9 1 6
```

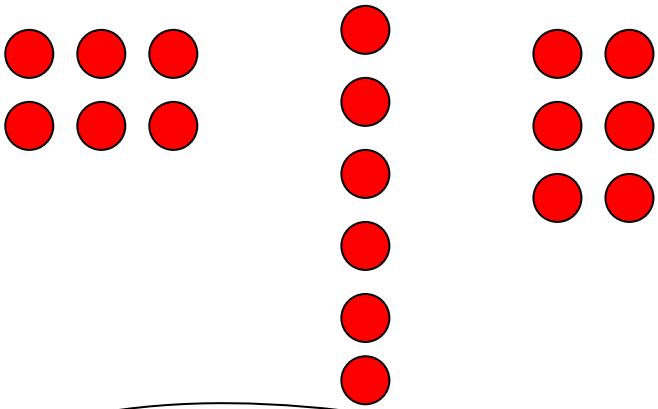
Children could use this to subtract up to 3 decimal places, if secure.

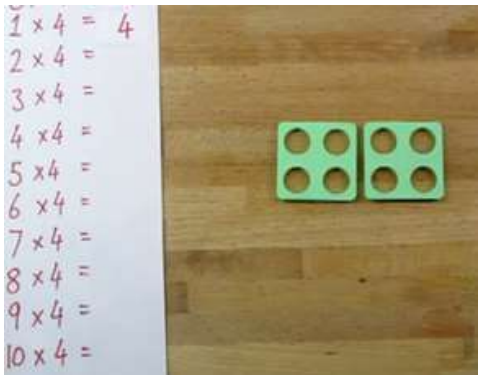
Multiplication

- Children need to have lots of opportunities to count in groups, starting in groups of 2s, 5s and 10s. They need to count along and back and begin from different starting points on the number line. Older children counting in decimal and fraction steps.

- Children need to have lots of experience of finding patterns with numbers and of making links between numbers that are factors of more than one multiple, i.e. colouring numbers on hundreds squares, sequencing playing cards. They need to look at the numbers involved in 'x' calculations and see if they are connected in any way.

- Play with numbers and their **arrays** (use the word array with the youngest children too). Encourage children to play around with what a number looks like in different array arrangements, i.e. 6 looks like . . . .





Children need to have visual images of what a number looks like in their head. Once this is in place they can begin to use them to solve multiplication problems.

- **Children need to start multiplication methods as stories using visual prompts**

  E.g. Little Red Riding Hood took 2 apples to Grandma, 2 apples to her mother and 2 apples to the Woodcutter, how many apples did she take all together? Use apples to visualise the problem, make different arrays, which one works for the problem, count in twos along the number line etc.

  Children might begin talking about this as repeated addition.
  e.g. 2 and 2 and 2 = 6

  - **Use pictures/objects**

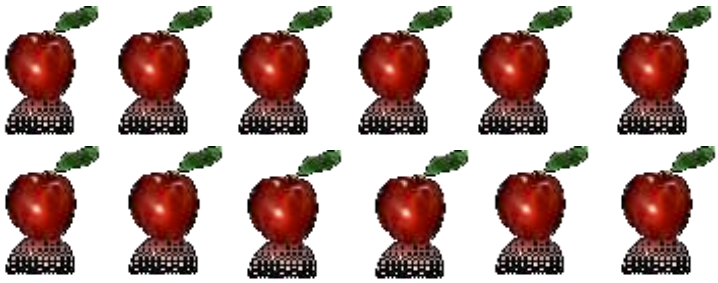
    Count pairs and groups of objects.

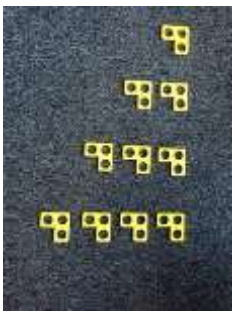
    E.g. How many socks in 3 pairs?

  - **Use pictures/symbols to record**
    E.g. || || || 3 pairs/groups of 2 socks is 6 socks
  - **Move to written representation of calculations but solve pictorially (use concrete apparatus alongside – cubes, bears, beadstring etc.)**

    E.g. Discuss as 6 'lots of' 2 or 2 'groups of' 6, discuss as an **array**, count in 2s, count in 6s etc.
    i.e. 6 x 2 = Or 10 x 3 =

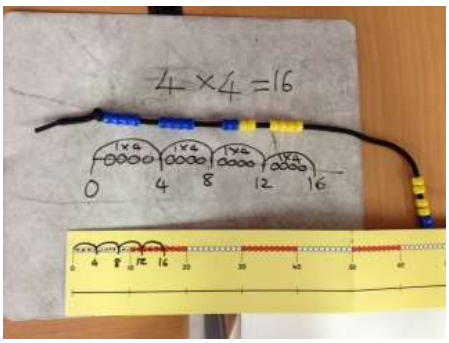
    

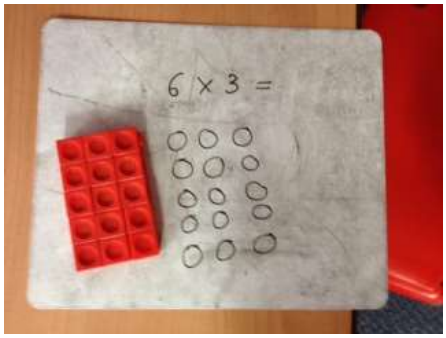
    

- **Doubling and halving to 20**

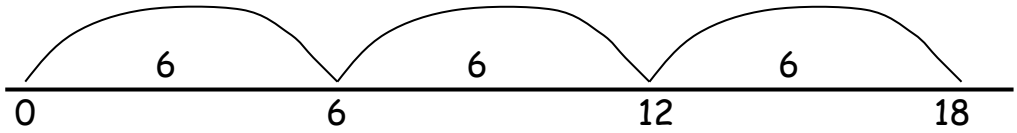
  It is essential that children learn their doubles and halves to support their multiplication strategies as they go through KS2.

- **Solve using a number line (use beadstrings and beaded number lines, and dry-wipe number lines to support initial use. Create the arrays alongside to model the commutative law)**





6 x 3 =



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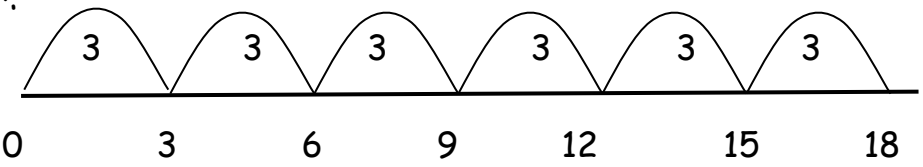
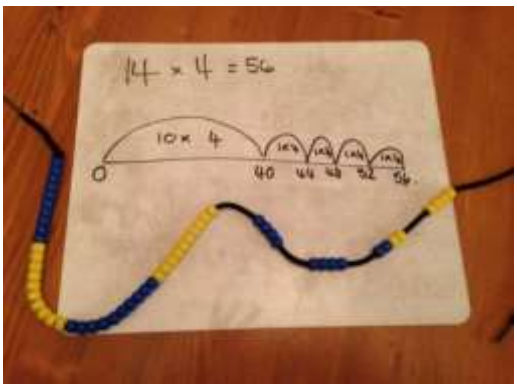


- **Partitioning to support number line**

Children progress on to using the number line in a more efficient way, using **partitioning** to support them.

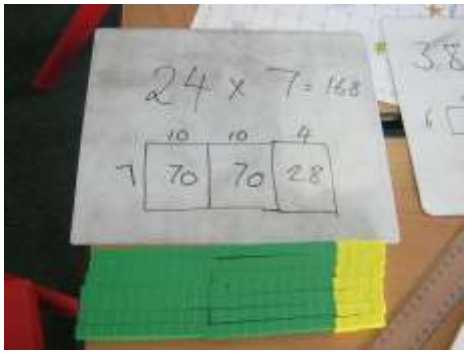
e.g. 14 x 4 =
10 x 4 =
4 x 4 =

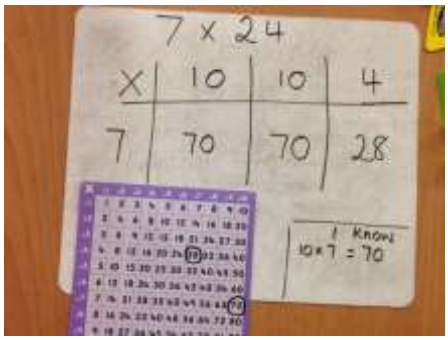
This can then be solved using a number line.



- **Solve more complex multiplications using the grid method**

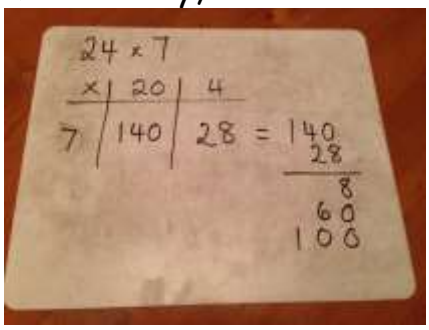
Use the **dienes** to **partition** calculations into an early grid.



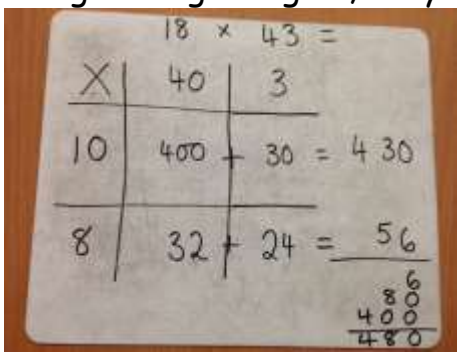


This leads on to the grid method.

The grids must be drawn in proportion to show the larger values. The children will be expected to use mental methods to add the columns horizontally, but could use column addition to support this.



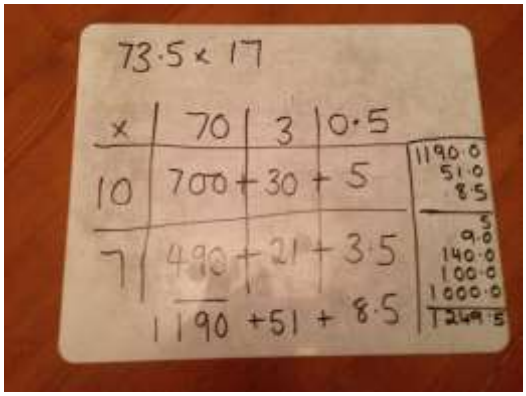
Once the children are confident and consistently accurate in multiplying 1-digit by 2-digit using the grid, they can move on to 2-digit by 2-digit multiplication.



3-digit by 3-digit…i.e. 358 x 115 =

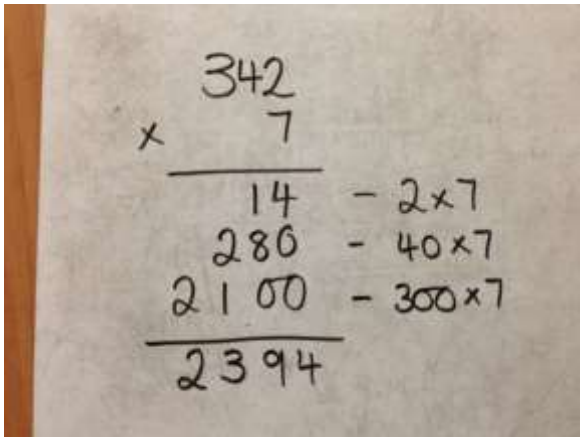
	100	10	5	
300	30000	3000	1500	34500
50	5000	500	250	5750
8	800	80	40	+ 920
				41170

And decimals…



The children need to have a deep and secure understanding of this method before moving on to **short** and **long multiplication**. Expanded multiplication should not be introduced until Year 5, and only then, if the children are ready.

- **Expanded multiplication (long multiplication)**

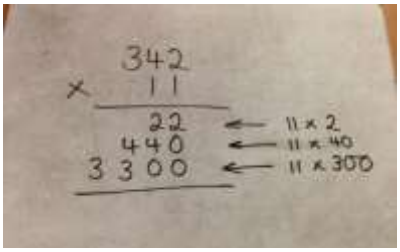


Partition the number that you are multiplying.
342 becomes **300 40** and **2**.
Record the totals of:
2 x 7
40 x 7
300 x 7
And then add them together.

```
  246
x   7
 ----
   42    (6 X 7)
  280    (40 X 7)
 1400    (200 X 7)
 ----
 1722
  1
```

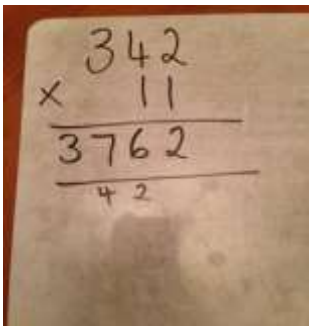
Children may need to **regroup** when adding and write this underneath the relevant column.

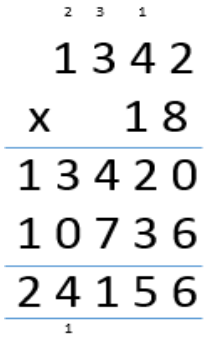
This can be extended to 3-digit by 2-digit.



- **Compacted multiplication (short multiplication)**

  Instead of recording the ones, tens and hundreds on separate lines, the totals are recorded under the correct column. Children will need to be very secure on their **place value** and understand **regrouping** for adding up the columns, before using this method.





Division

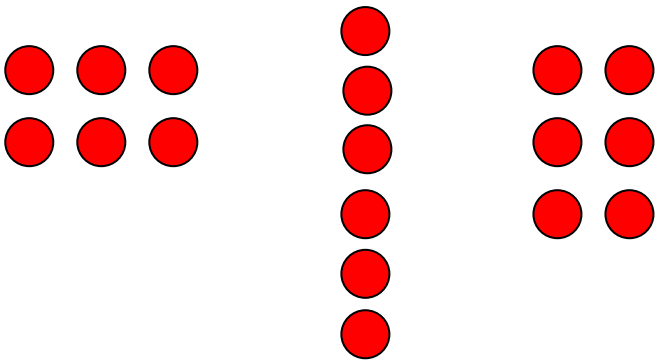
- **Children need to have lots of opportunities to count and share in groups, starting in groups of 2s, 5s and 10s.**

- **They need to count back and along in 2s 5s 10s etc. and they need to begin from different starting points on the number line.**

- **Fluency building needs to include counting out loud, backwards in increments of 2s, 5s, 10s etc. and for older children counting back in decimal and fraction increments (i.e. ¼, ½, ¾…, 0.1, 0.2, 0.3…)**

- **Children need to have lots of experience of finding patterns with numbers and of making links between numbers that are factors of more than one multiple, i.e. colouring numbers on hundreds squares, sequencing playing cards, repeated patterns on calculators. They need to look at the numbers involved in ÷ sums and see if they are connected in any way.**

- **Play with numbers and their arrays, (use the word array with the youngest children too). Encourage child to play around with what it looks like in different arrangements, i.e. 6 looks like:**



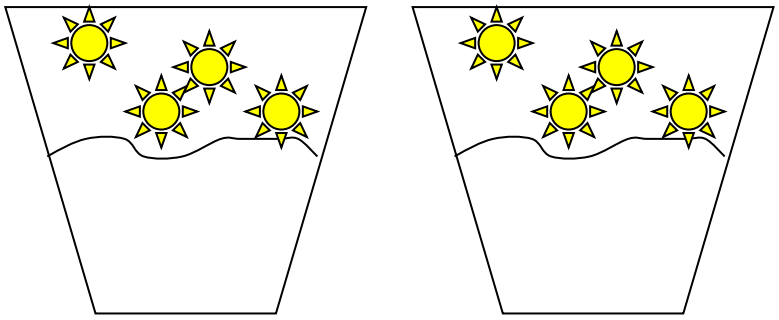
- **Children must understand grouping, sharing and ratio differences and from a young age discuss 'left overs'.**
  i.e. if Josie has 10 cakes and she shares them with 5 children including herself, how many cakes does each child get? Use toys to role play this. What if Josie had 11 cakes, what would happen?
  (Start with 11 and share out to each child until there is 1 left).

  i.e. In Jake's game he needs to organise his 12 friends into groups of 3. How many groups will he have? (Count in groups of 3 until all the people are used).

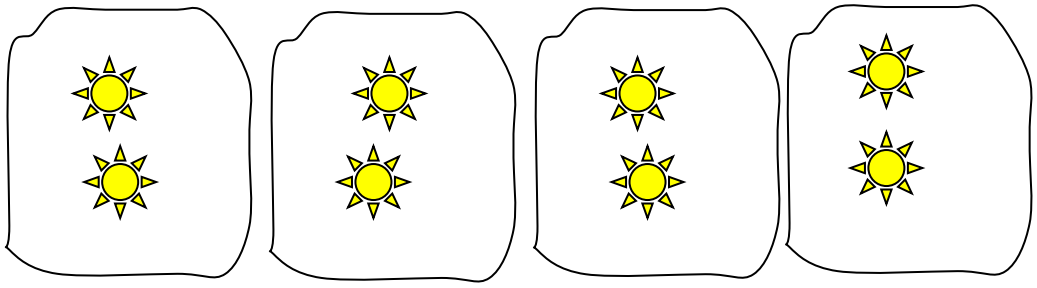
- **Use pictures and equipment to solve division**

  i.e 8 sunflowers seeds into 2 pots $8 \div 2 =$ ☐

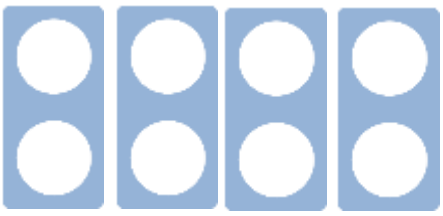
  by sharing:



  By grouping:



  Or

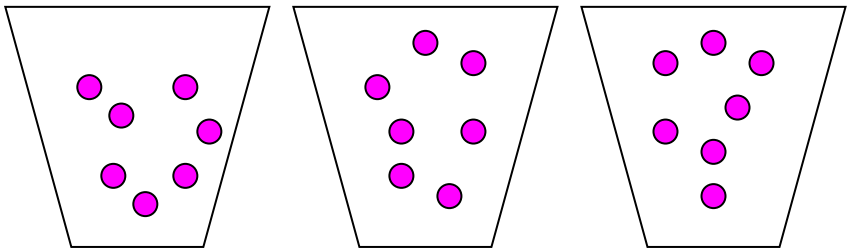


  Children may begin to discuss the link to multiplication and **arrays**.

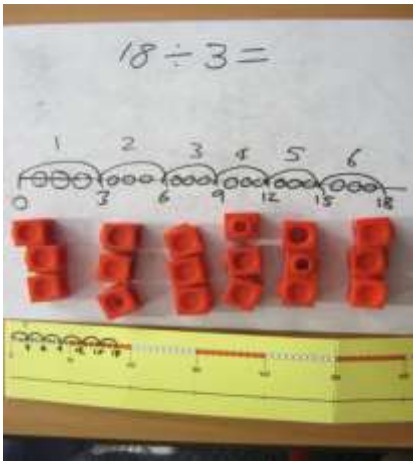
- **Make jottings to solve division**

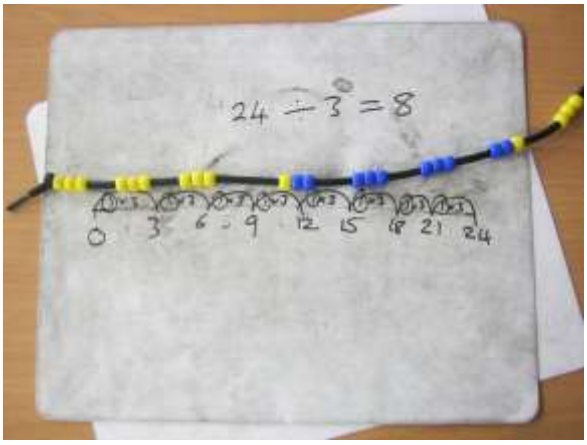
  i.e. $21 \div 3 =$

or



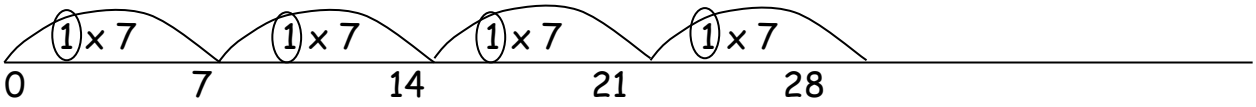
- **Using a number (alongside a cubes, beadstrings and beaded number lines, move to dry wipe number lines (below left) and empty number lines, before children draw their own (below right))**





28 ÷ 7 =

A chew bar costs 7p. How many can I buy with 28p?

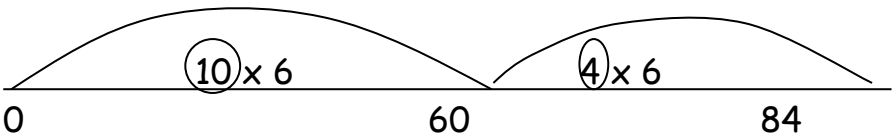


Circling the 'groups of' 7 can support children's understanding of how many groups of 7p are in 28p.

- **Start to reduce the steps on number line to become more efficient**

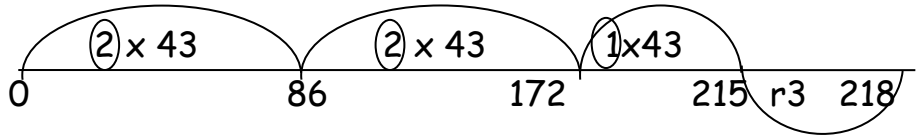
84 ÷ 6 =

I need 6 drawing pins to put up a picture. How many pictures can I put up with 84 pins?

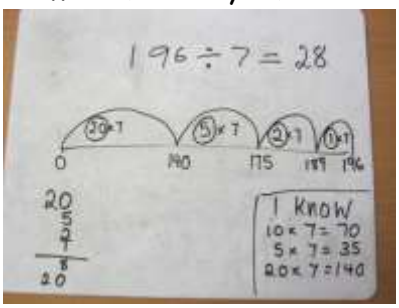


Where the division leads to a remainder, the remainder will be shown under the number line as shown below.

218÷43= 5r3



For some children, the addition of an 'I know' box can be very useful

e.g. 

- **Expanded Long division**

When pupils are consistently secure at using a number line <u>efficiently</u> for division, they can move on to **long division**. This should not usually be attempted before end of Year 5 or into Year 6.

In the first instance, we will use an expanded version of long division, alongside an 'I know' box and **dienes**, so that the children are conceptually secure.

532 ÷ 15

```
        3  5  r  7
    ┌──────────
15  │ 5  3  2
    4  5  0     (30 × 15)
    ──────
       8  2     (left over)
       7  5     (5 × 15)
       ──────
          7     (left over)
```

I know box:

20 x 15=300

30 x 15 =450

5 x 15 = 75

Formal short division should only be introduced once children have a good understanding of division, its links with multiplication and the idea of 'chunking up' to find a target number. This <u>should not</u> be attempted before Year 6. **Short division** to be modelled for understanding using **dienes** through calculations with 2 and 3-digit **dividends**.

The **short division method** is meant to be a speedier method *if* pupils understand what is happening when they are doing the division.

For example 81 ÷ 3 is first put into a division box.

	Tens	**Ones**
3	8	1

Make sure that the numbers are clearly split clearly into their **place value** columns.

When we do the short division we will be looking at each number that we are dividing into as a single digit, but it will have the right value, as when you put the digit down for the answer it will be in the right place: You then start to do the division:

How many threes are there in the first digit 8?

There are 2 groups of 3 in the first digit 8 because 2 x 3 = 6. So we have used up 6 of that digit and we have 2 left over. (In reality this is 2 tens for this question).

	Tens	**Ones**
	2	
3	8	$^{2}1$

As we have 2 tens (20) left over, we have 21 altogether left. We put the 2 next to the 1 so that you can read it as 21.

We next ask how many 3s there are in 21 and the answer is 7 with nothing left over. So we put the 7 above the 21.

	Tens	**Ones**
	2	7
3	8	$^{2}1$

So the answer is 81 ÷ 3 = 27

Here is another example using 4 digits divided by a one digit number:

Calculate 1304 ÷ 4

	Thousands	**Hundreds**	**Tens**	**Ones**
4	1	3	0	4

Four divided into 1 is not possible, so carry the 1 onto the next digit.

	Thousands	Hundreds	Tens	Ones
	0			
4	1	$^{1}3$	0	4

Four divided into 13 is 3 with 1 left over. This 1 is carried onto the next digit.

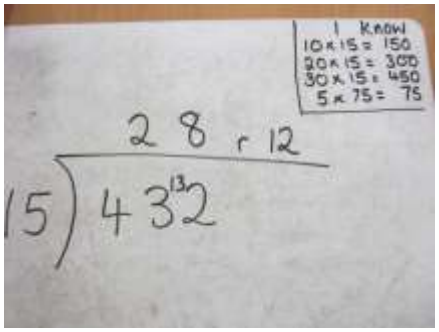
	Thousands	Hundreds	Tens	Ones
	0	3		
4	1	3	$^{1}0$	4

Four divided into 10 is 2 with 2 left over still to be divided. This is 2 carried onto the next digit.

	Thousands	Hundreds	Tens	Ones
	0	3	2	6
4	1	3	0	$^{2}4$

Four divided into 24 is 6 with nothing left over to be divided.

So the answer to 1304 ÷ 4 = 326



The children will then move on to a shortened version of long division with fractions and decimals as remainders. The **short division** needs to have been taught first so that the children are then secure in what is taking place.

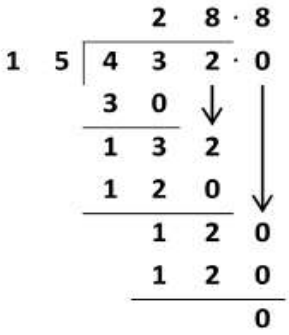
This method retains the sense of number, for example, 30 x 15 = 450 is used to calculate the remainder. However, a more efficient way of recording the same calculation is:

532 ÷ 15

```
   35r 7
15|532
  45
  82
  75
   7
```

532 ÷ 15 = 35 r 7 = 35 7/15

432 ÷ 15 becomes



Answer: 28·8

Glossary

Array – Objects or pictures arranges in columns and rows to support children's understanding of how multiplication is the same both ways. E.g. 4 x 3 = 4 rows of 3 counters, or turned, is 3 columns of 4 counters.

Bridging – crossing over a '10s' boundary (i.e. 10, 20, 130…), means going into the next tens numbers. Children may use their number facts/bonds to help them to reach the next ten, then move into the next tens numbers.

Concrete, Pictorial, Abstract – concrete is using apparatus allows children to have physical objects or resources to move around to help their understanding of the Maths involved in the calculation/problem. As a child's experience and confidence grows, they may draw objects to support their calculating and understanding. As understanding develops, children move on to using some form of abstract representation ie. Using a symbol to stand for a number or operation.

Decomposition – in subtraction when children cannot subtract one number from the other, they can borrow from the next column to allow them to complete the subtraction.

Fluency – fact fluency is the ability to recall the answers to basic facts automatically and without hesitation. Fact **fluency** is gained through lots of practice, with mastery of basic facts being a goal of both teachers and parents. Procedural **fluency** is the ability to apply methods accurately and efficiently, to use this solve different problems and to recognise when one strategy or procedure is more appropriate to use than another.

Formal written methods – adding and subtracting in a column, long and short multiplication (see above in a column), and long and short division (see above for explanation of method).

Inverse – Mathematically, inverse operations are opposite operations. Addition is the opposite of subtraction; division is the opposite of multiplication, and so on.

Jottings – Where children are solving a difficult calculation mentally, children are encourage to note down small pictures/notes to help them solve it.

Mastery/Mastered – this is something we want all children to acquire, or to continue gaining throughout their education. It is the belief that all children can achieve, through lots of practice, slowing down in Mathematical learning to explore a concept at a greater depth. It is not moving children on at a fast pace, not rushing them to explore larger numbers, or more difficult methods of calculating, before they are absolutely secure in their understanding of an operation, can use it to solve problems and calculate efficiently.

Mental strategies – The ability to calculate in your head. Number compliments and times tables are crucial to help children to work out more complex calculations, mentally.

Number facts/bonds/compliments – basic addition, subtraction, multiplication and division calculations that children should learn to recall instantly with no working out (in other words,

they need to learn them off by heart). These can include what numbers make 10, 20, 100 and times tables etc.

Number line – a line on which numbers are marked at intervals. This is the most useful method of calculating children will learn for all 4 operations. They will use this for a large part of their primary maths education and will move on when they are efficient at using it to calculate.

Operation/s - There are four operations in maths that help us to problem-solve. They are addition, subtraction, division and multiplication.

Partition – separating a number into smaller numbers e.g. 10 can be partitioned into 5 + 5, 34 can be partitioned into 30 + 4, or 20 + 14 etc.

Place Value – the numerical value that a digit has, depending on where it is positioned ie. 34, the '3' digit is worth '30' because it is in the tens column. NB. Under the 2014 Curriculum, We use 'ones' not 'units'.

Regrouping – changing groups of 'ones' into tens to make them easier to add up.

Written methods – A written strategy to work out a calculation. These include more formal methods (see above) as the children progress through their learning.